Vital Decisions Must Be Made to Ensure Successful Implementation of Customer Account Data Engine Capabilities

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DEPARTMENT OF THE TREASURY
WASHINGTON, D.C. 20220

July 13, 2007

MEMORANDUM FOR CHIEF INFORMATION OFFICER

FROM: Michael R. Phillips
Deputy Inspector General for Audit

SUBJECT: Final Audit Report – Vital Decisions Must Be Made to Ensure Successful Implementation of Customer Account Data Engine Capabilities (Audit # 200620012)

This report presents the results of our review of the Customer Account Data Engine (CADE). The overall objectives of this review were to review current CADE Release 2 activities for potential issues affecting the delivery of new capabilities planned for the 2007 Filing Season and reassess long-term CADE Project (hereafter referred to as the Project) goals and objectives in light of the growing complexity and enormity of the Project's tasks. This review was part of our Fiscal Year 2006 audit plan for reviews of the Internal Revenue Service's (IRS) Business Systems Modernization efforts.

Impact on the Taxpayer

The CADE will provide the foundation for managing taxpayer accounts to achieve the IRS modernization vision. It consists of databases and related applications that will replace the IRS' official repository of taxpayer information (the Master File). The Information Technology Modernization Vision and Strategy plans for a phased replacement of IRS computer systems to better support today's tax laws, policies, and taxpayer needs. The CADE is helping the IRS realize this Strategy.

Synopsis

The IRS initiated the Project in September 1999 and delivered Release 1.1 in August 2004, which successfully processed refund and even-balance Income Tax Returns for Single and Joint Filers With No Dependents (Form 1040EZ) for single taxpayers with no pending tax issues. Release 1.2 started processing tax returns in January 2005. The IRS and the PRIME contractor

delivered the first biannual release (Release 1.3.1) in September 2005. The second biannual release (Release 1.3.2) was delivered in January 2006 in time for the 2006 Filing Season. As of December 23, 2006, the CADE had processed more than 7.3 million tax returns and generated more than $3.4 billon in refunds. This was a significant increase over the approximately 1.4 million tax returns processed in Calendar Year 2005 that generated refunds totaling more than $427 million.

The PRIME contractor was to deliver Release 2.1 by August 31, 2006, and Release 2.2 by December 31, 2006. In June 2006, the IRS and the PRIME contractor agreed to revise the Release 2 scope. The Release 2 requirements were revised based on the contracted goal of processing 33 million tax returns during the 2007 Filing Season and did not consider the complexity of the programming involved for processing these returns. Subsequently, Release 2.1 was approximately $4.2 million (15 percent)[1] over budget and was not within the acceptable 10 percent budget variance tolerance.[2] Further, the IRS deferred several Release 2.1 and 2.2 requirements to later releases. The implementation of Release 2.2 was postponed from the start of the 2007 Filing Season, January 16, 2007, until March 6, 2007, so the IRS could make required performance improvements and complete filing season updates.

A pattern of deferring Project requirements to later releases and missing release deployment dates has continued from the Project's beginning. Allowing this pattern to continue will undermine the long-term success of the Project. The IRS and the PRIME contractor have deferred Project requirements and missed target dates because they agreed to an unrealistic scope of work, did not follow the Enterprise Life Cycle[3] Preliminary Design Phase guidelines, and did not assign adequate PRIME contractor staffing.

In addition, the approach taken to implement the CADE's architectural design will not support the Project's long-term goals and objectives. While the CADE is being phased in over multiple years and processing increasingly more complex tax returns, the IRS has not completed addressing (1) the need to include a database that stores historical account data, (2) essential processing requirements deferred since Release 1 (first planned for implementation in January 2002), and (3) a process to improve the efficiency of the daily processing cycle.

To meet the CADE's long-term computer processing demands, further consideration needs to be given to alternative design approaches. The Project design currently includes building a computer system large enough to process the highest daily volume of tax returns received by the IRS, although this processing capacity is needed for only a few days each year. Alternative design solutions, such as obtaining additional computer resources on an interim basis or delaying the processing of some tax return types on extremely high-volume processing days, have been

[1] CADE Release 2.1 was budgeted to use $27,049,000 and required $31,239,000 for completion.
[2] *Business Systems Modernization 2006 and 2007 Expenditure Plan*, dated August 2006.
[3] Appendix VI presents an overview of the Enterprise Life Cycle.

considered but have not been thoroughly developed. In addition, based on the current design of the Project, meeting storage and processing demand may be cost prohibitive.

Recommendations

The Chief Information Officer should ensure the IRS negotiates a reasonable scope of work for future CADE release development that considers the amount and difficulty of the work and the filing season time constraints. This would include ensuring the scope of work includes adequate staffing plans and ensuring the PRIME contractor and Project team follow Enterprise Life Cycle guidance in meeting Preliminary Design Phase criteria for each release and major release segment. In planning future release activity, the Chief Information Officer should limit delivery to essential capabilities and filing season updates and consider postponing new capabilities until key business decisions are made and previously deferred essential requirements are implemented. Finally, the Chief Information Officer should partner with the Wage and Investment Division Business Modernization Office to jointly review alternative design solutions and identify process improvements for the Project. Alternative design solutions need to be explored to ensure the CADE can operate as efficiently and effectively as possible.

Response

The Chief Information Officer agreed with all of our recommendations. Planned corrective actions include a new process for gathering requirements early in the process by partnering with the Business Rules and Requirements Management Program Office to conduct detailed requirements identification. This strategy supports the IRS' ability to adequately define the scope of work, clarify business needs, and document clearly defined requirements within established boundaries. Since April 2007, CADE release managers review and analyze staff resources listed by the PRIME contractor on a weekly basis to ensure adequate contractor support is provided. Enterprise Life Cycle guidelines for performing Customer Technical Reviews and Life Cycle Stage Reviews are being accomplished through a tailoring plan. Tailoring plans will be used for each subsequent CADE release and major release segment. Contracting and development activities are in process to implement previously deferred requirements. Further, the Chief Information Officer is actively engaged and continues to ensure the CADE Program Office and Wage and Investment Division Business Modernization Office jointly review design solutions and identify process improvements. In support of this issue, a joint technical assessment team is being formed to identify CADE technical constraints and improvement opportunities with regard to the architecture, performance, and software quality. The IRS expects to have preliminary outcomes from this effort by June 1, 2008. Management's complete response to the draft report is included as Appendix IX.

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

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Abbreviations

CADE	Customer Account Data Engine
IRS	Internal Revenue Service
MIPS	Millions of Instructions Per Second

Background

The Customer Account Data Engine (CADE) will provide the foundation for managing taxpayer accounts to achieve the Internal Revenue Service's (IRS) modernization vision. The CADE consists of databases and related applications that will replace the IRS' existing Master File[1] processing systems, the IRS' official repository of taxpayer information.

The IRS initiated the CADE Project (hereafter referred to as the Project) in September 1999 and delivered Release 1.1 in August 2004, which successfully processed refund and even-balance Income Tax Returns for Single and Joint Filers With No Dependents (Form 1040EZ) for single taxpayers with no pending tax issues. Release 1.2 started processing tax returns in January 2005. The IRS and the PRIME contractor delivered the first biannual release (Release 1.3.1) in September 2005. The second biannual release (Release 1.3.2) was delivered in January 2006 in time for the 2006 Filing Season.

Through June 8, 2006, the IRS had obligated $165.7 million for the design, development, and implementation of the CADE and planned to spend an estimated $233.9 million through Fiscal Year 2007.

Congress authorized $54 million in Fiscal Year 2005 and $60 million in Fiscal Year 2006 for the Project. Additionally, the IRS requested $85 million in Fiscal Year 2007 for the Project, but this amount has been reduced to about $58 million. Appendix IV presents an analysis of the Project release costs through Fiscal Year 2007, which total about $233.9 million.

In July 2006, the CADE Data Architecture and Analysis Study identified alternatives to organize and manage Project data. Also, in October 2006, the Modernization and Information Technology Services organization published the Information Technology Modernization Vision and Strategy, which established project development priorities that include the Project. This Strategy provides a 5-year plan for developing modernization projects and processes.

This review was performed at the Modernization and Information Technology Services organization's facilities in New Carrollton, Maryland, during the period August 2006 through February 2007. The audit was conducted in accordance with *Government Auditing Standards*. This review was part of our Fiscal Year 2006 audit plan for reviews of the IRS' Business Systems Modernization efforts. Detailed information on our audit objectives, scope, and methodology is presented in Appendix I. Major contributors to the report are listed in Appendix II.

[1] See Appendix VIII for a glossary of terms.

Results of Review

The Customer Account Data Engine Project Has Started to Move Toward the Long-Term Information Technology Modernization Vision and Strategy

The Information Technology Modernization Vision and Strategy plans for a phased replacement of IRS computer systems to better support today's tax laws, policies, and taxpayer needs. The CADE is helping the IRS realize its Information Technology Modernization Vision and Strategy.

The IRS successfully hired 25 computer programmers to supplement the PRIME contractor's efforts

Starting with Release 1, the IRS decided the PRIME contractor should use the C++ programming language. The PRIME contractor has had difficulty retaining qualified C++ computer programmers needed to program the CADE, in part due to the extensive overtime the programmers were required to work.

The IRS addressed this problem by hiring 25 C++ computer programmers to work with the contractor in a codevelopment process. The newly hired computer programmers reported to work on September 5, 2006, and formal training started the following week. By October 16, 2006, the new computer programmers were divided into five teams and assimilated into existing work groups at the PRIME contractor's New Carrollton, Maryland, facilities. They gained experience about the Project by performing less complex programming assignments on Release 2.2. They are now scheduled to assist with more complex programming assignments on the Release 3 physical design.

The Project has successfully aligned its multiyear release plan with the Accounts Management Services project

Using the Information Technology Modernization Vision and Strategy as a model, the Project team along with the Wage and Investment Division Business Modernization Office has successfully aligned its multiyear release plan with the Accounts Management Services project. This alignment helps assure the two projects support each other's capabilities. The Accounts Management Services project will improve the CADE's ability to process taxpayer address change requests and tax return math error notices.

CADE Release 2.1 began processing tax returns on September 5, 2006

Beginning with the development of Release 1.3, the IRS and the PRIME contractor planned to use a biannual release approach with one release in June of each year that would add complex capabilities and one release in January of each year that would include filing season updates. Appendix V, Table 3, presents the revised CADE biannual release schedule including return types and account characteristics for each release.

A biannual release (Release 2.1) was delivered on September 5, 2006. In addition to processing U.S. Individual Income Tax Returns (Form 1040 and 1040A) with no schedules, Release 2.1 added several new schedules to the CADE, including Form 1040 Itemized Deductions (Schedule A), Form 1040 Interest and Ordinary Dividends (Schedule B), and Form 1040 Credit for the Elderly or the Disabled (Schedule R). The Release also processes Interest and Ordinary Dividends for Form 1040A Filers (Schedule 1) and Credit for the Elderly or the Disabled for Form 1040A Filers (Schedule 3), adds the Head of Household filing status (without dependents), and expands name and address change capabilities.

As of December 23, 2006, the CADE had processed more than 7.3 million tax returns and generated more than $3.4 billon in refunds. This is a significant increase over the approximately 1.4 million tax returns processed in Calendar Year 2005 that generated refunds totaling more than $427 million.

Plans for Deploying Customer Account Data Engine Releases Have Not Been Achieved

The IRS used task orders to require the PRIME contractor to deliver Release 2.1 by August 31, 2006, and Release 2.2 by December 31, 2006. In June 2006, the IRS and the PRIME contractor agreed to a task order modification[2] to revise the Release 2 scope and obligate funding. The Release 2 requirements were revised based on the contracted goal of processing 33 million tax returns during the 2007 Filing Season and did not consider the complexity of the programming involved for processing these returns.

The Enterprise Life Cycle provides the direction, processes, and tools for accomplishing business change in a repeatable and reliable manner.

The Enterprise Life Cycle[3] is the internal control approach used by the IRS to manage and effect business change. It consists of eight phases including the Preliminary Design Phase. A phase is a broad segment of work that encompasses activities of similar scope, nature, and detail, and provides a natural breakpoint in the life cycle. The Customer Technical Review and the Life Cycle Stage Review are internal control points within the Preliminary Design Phase that ensure all release requirements are properly identified.

[2] Task Order 123, Modification 29.
[3] Appendix VI presents an overview of the Enterprise Life Cycle.

A Customer Technical Review is performed by IRS stakeholders to review selected technical and business products created by a project. The purpose of the review is to obtain early and continuous stakeholder feedback, identify and resolve issues and actions required to gain stakeholder approval, and provide a forum to resolve conflicting comments between the stakeholders and developer on the products produced.

A Customer Technical Review deals with a single or small set of related work products while a Life Cycle Stage Review deals with all work products that comprise the solution.

A Life Cycle Stage Review provides a broad look across the technical and business aspects of a project's development to verify it is complete, consistent, and correct given its point in the life cycle. Results of the Life Cycle Stage Review are used as input for the decision to move the project from the design phase to the development phase.

CADE Release 2 was over budget, requirements were deferred from both biannual releases (Release 2.1 and 2.2), and target deployment dates were not met

Release 2.1 was approximately $4.2 million (15 percent)[4] over budget and was not within the acceptable 10 percent budget variance tolerance.[5] Further, the IRS deferred several Release 2.1 and 2.2 requirements to later releases. Table 1 presents the deferred requirements and the related releases and major release segments.

Table 1: CADE Release 2 Deferred Requirements

Requirement	Release 2.1	Release 2.2
Spousal Cross-Reference	Moved to Release 2.2	-
Married Taxpayers	Moved to Release 2.2	-
Dependents	Moved to Release 2.2	-
Continuous Processing	Moved to Future Release	-
Naming Standards	Moved to Future Release	-
Split Refunds	-	Moved to Release 3
Naming Standards	-	Moved to Future Release

Source: The CADE Weekly Task Review.

The delivery of Release 2.2 was postponed from the start of the 2007 Filing Season, January 16, 2007, until March 6, 2007, so the IRS and the PRIME contractor could make

[4] CADE Release 2.1 was budgeted to use $27,049,000 and required $31,239,000 for completion.
[5] *Business Systems Modernization 2006 and 2007 Expenditure Plan,* dated August 2006.

required performance improvements and complete filing season updates. During this period, tax returns eligible for processing by the CADE were sent back to the IRS' current processing system (the Individual Master File). Therefore, approximately 17.2 million potential CADE tax returns filed through February 16, 2007, did not have an opportunity for processing by the CADE. As a result, Release 2.2 will not process its goal of 33 million tax returns, and a significant number of taxpayers will not receive the benefits of expedited refunds.

The Project continues to follow a pattern of deferring requirements and missing target release deployment dates

During the 2006 Filing Season, the Project overcame some of the setbacks that plagued its early development. However, a pattern of deferring Project requirements to later releases and missing release deployment dates is continuing.

- The first release of the CADE was originally designed to store historical data and be delivered in January 2002. The IRS delivered Release 1.1 in August 2004 without the ability to store historical data, citing overall complexity as the reason for the deferral.
- Release 1.3.2 deferred requirements such as processing prior year returns and offsets to tax overpayments to later releases because of inadequate design, coding and unit testing and insufficient staffing.[6]
- Release 2.1 deferred requirements to later releases because all of the work related to the release requirements was not identified during the Enterprise Life Cycle Preliminary Design Phase of the Project.
- Release 2.2 delivered several requirements after the start of the 2007 Filing Season and will postpone the delivery of other requirements because of insufficient staffing.

The pattern of deferring requirements and missing target release deployment dates, if allowed to continue, will undermine the long-term success of the Project. The IRS and the PRIME contractor have deferred Project requirements and missed target dates because they agreed to an unrealistic scope of work for Release 2, did not follow the Enterprise Life Cycle Preliminary Design Phase guidelines, and did not assign adequate PRIME contractor staffing. We have previously reported similar occurrences. Appendix VII presents our prior audit findings, recommendations, and IRS corrective actions. In addition, the IRS has documented these problems as lessons learned from prior releases; however, the problems continue to remain unresolved.

During the Customer Technical Review and Life Cycle Stage Review processes, IRS executives allowed the PRIME contractor to exit the Release 2.1 Preliminary Design Phase of the Project on

[6] *Focusing Management Efforts on Long-Term Project Needs Will Help Development of the Customer Account Data Engine Project* (Reference Number 2006-20-076, dated June 2006).

May 6, 2006, with the condition it would subsequently deliver the remaining work related to the release requirements. The Project received a waiver from the requirement of complying with all Enterprise Life Cycle guidance until the initiation of Release 2.

By late June 2006, indications surfaced that the revised Release 2.2 delivery date of December 31, 2006, was in jeopardy. Development fell behind schedule by approximately 2 weeks to 3 weeks, trying to finish the logical design work that should have been completed during the Preliminary Design Phase. The Project's schedule could not keep pace with its plan, which resulted in the need for another revision in August 2006. The August revision kept all previously agreed-to requirements, postponed the planned completion date of the application testing, but essentially left the deployment dates the same. Leaving the deployment dates intact reduced the Release 2.2 development and testing time to 4 months; the recommended time for development and testing is approximately 11 months.

In addition to the reduced development time, the staffing practice used by the PRIME contractor was insufficient to deliver the scope of work contracted. The PRIME contractor's staffing practice did not treat each biannual release as a separate release. The practice involved reassigning staff between releases to meet immediate needs, but the reassigned staff was not replaced with other staff members so the planned work could be completed. We previously reported[7] the PRIME contractor did not have adequate staffing to fix the Release 1.3.1 defects, requiring the transfer of designers and developers assigned to Release 1.3.2. The PRIME contractor also did not have staffing available to meet the work demands for Release 1.3.2. This pattern of not replacing transferred staff has had a cumulative effect on the timely delivery of the contracted requirements for Release 2 and is affecting the design and development of Release 3.

The Release 3 project schedule is continuing the pattern of deferring requirements, not assigning sufficient staffing, and postponing completion dates. Specifically, the IRS is considering revising the Release 3 scope by deferring some requirements to Release 4. Resource assessments show the Project was understaffed by 8 percent in January 2007. Further, the Release 3 project schedule has been revised.

Recommendation

Recommendation 1: The Chief Information Officer should:

- Ensure the IRS negotiates a reasonable scope of work for future CADE release development that considers the amount and difficulty of the work and the filing season time constraints.

[7] *Focusing Management Efforts on Long-Term Project Needs Will Help Development of the Customer Account Data Engine Project* (Reference Number 2006-20-076, dated June 2006).

- Ensure the IRS analyzes the amount of staffing used during prior releases to help verify the PRIME contractor's staffing plans are adequate to accomplish the scope of work projected for future project releases.
- Ensure the Project follows Enterprise Life Cycle guidance for performing Customer Technical Reviews and Life Cycle Stage Reviews after completion of the design phase for each release and major release segment.
- Not allow the PRIME contractor to exit the Preliminary Design Phase without identifying all of the work related to the release requirements.

Management's Response: The Chief Information Officer agreed with this recommendation and will ensure the IRS negotiates a reasonable scope of work for future CADE release development that considers the amount and difficulty of the work and the filing season time constraints. The Chief Information Officer has begun to address the cause of scope estimation problems through implementation of a formal Business Systems Requirements Report document using IRS processes in the Business Rules and Requirements Management Program Office to conduct detailed requirements elicitation. With these better-defined requirements early in the development life cycle, the IRS will be able to more effectively segment functionality into releases and major release segments to assure only manageable scopes of work are undertaken at Milestones 4A and 4B. Based on having better requirements definition, the IRS was successful in putting in place a fixed-price contract for Release 3 development. Beginning with Release 4.0, the IRS will further identify, prioritize, and approve business requirements to manage scope, mitigate business risks, and meet business needs within an improved framework.

The Chief Information Officer agreed that the IRS should analyze the amount of staffing used during prior releases to help verify the PRIME contractor's staffing plans are adequate. As of April 6, 2007, the IRS has mandated that PRIME contractors provide a list of employees supporting CADE releases. CADE release managers review and analyze resources listed to ensure adequate support is provided by the contractors. This information is provided weekly to the CADE Program Office. If staffing issues are identified, they are addressed at the Weekly Task Review meetings. This applies to the existing CADE Cost-Plus-Fixed-Fee and Cost-Plus-Incentive-Fee task orders. As the IRS pursues more Firm Fixed-Price development efforts in the future, it will not have the same access to staff level details.

The Chief Information Officer agreed that the Project should follow Enterprise Life Cycle guidance for performing Customer Technical Reviews and Life Cycle Stage Reviews after completion of the design phase for each release and major release segment. As the complexity of projects has increased, and as the IRS gains more experience in managing large complex development efforts, it has found that appropriately tailoring the Enterprise Life Cycle to ensure the effective use of contractor resources is critical to

delivering within cost and schedule parameters. This tailoring aligns with the current Enterprise Life Cycle methodology.

Finally, the Chief Information Officer agreed to not allow the PRIME contractor to exit the Preliminary Design Phase without identifying all of the work related to the release requirements. The IRS will identify all work related to a release before exiting the Preliminary Design Phase. It is also tailoring the Enterprise Life Cycle to align with best practices to ensure that project continuity is not lost; specifically, when low-risk activities can be implemented in parallel with Enterprise Life Cycle approvals. As mentioned in a prior corrective action, the IRS will ensure the scope and requirements for a release are fully understood so that it will be possible to segment work into distinct builds or subreleases as it continues to mature the development process for the CADE in accordance with the Enterprise Life Cycle guidance. Each of the builds or subreleases for new CADE functionality will complete logical and physical design before development.

The Approach Taken to Implement the Architectural Design Will Not Support Customer Account Data Engine Project Long-Term Goals and Objectives

As discussed previously, the Enterprise Life Cycle is the internal control approach used by the IRS to manage and effect business change. The Enterprise Life Cycle is made up of layers, phases, and stages. A phase is a broad segment of work that encompasses activities of similar scope, nature, and detail and provides a natural breakpoint in the life cycle. Two phases included in the Enterprise Life Cycle are the Domain Architecture Phase and the Preliminary Design Phase. Several stages are used to monitor the work in these phases, including:

- The Business System Architecture Stage, which has the purposes to develop a system architecture that packages requirements into deliverable components to provide the guiding structure for achieving the enterprise goal.
- The Application Requirements Stage, which has a purpose to develop a set of software requirements that follow the design of the system architecture and develop the software applications to meet this design.

The CADE Risk Management Plan is another control requiring the Project to use an organized, systematic decision-making process to identify, analyze, plan, track, control, communicate, document, and resolve risks and issues so the likelihood of achieving Business Systems Modernization Program goals is increased.

The approach taken to implement the CADE architectural design will not support the Project's long-term goals and objectives. While the CADE is being phased in over multiple years and

processing increasingly more complex tax returns, the IRS has not completed addressing the following issues:

- **Storing Historical Data** – As previously discussed, the Project planned to build a database in 2002 to store historical account data as part of Release 1. This requirement was deferred because of the complexity of the task and its necessity was not immediate to releases that did not require reference to these data. Currently, the CADE does not store historical taxpayer account data. It only stores the taxpayer account data used in processing the current year returns. The IRS indicated it will develop a plan to use historical data when Release 4 is being developed.
- **Implementing Essential Processing Requirements** – Similar to the historical data issue, the Project has deferred essential processing requirements from the January 2002 Release 1 plans. These requirements were deferred because of the focus on delivering processing requirements to meet immediate release needs. For example, the CADE cannot process prior tax year returns for taxpayer accounts currently residing on the CADE database. Future plans (i.e., the CADE Independent Requirements Project) call for the development and implementation of this and six other essential requirements that include processing overpayments and validating outstanding balances. These requirements are planned for development and implementation concurrently with Release 3.
- **Improving Daily Processing Routines** – The smallest unit of work performed by the CADE is the daily processing cycle, and each daily processing cycle must be successfully completed in 1 day before the next daily cycle can do any significant amount of processing. As release complexity increases, the CADE's ability to complete each daily processing cycle in 1 day will be affected. While several alternative approaches have been considered and an additional day (Sunday) has been added to the processing cycle on an as-needed basis, there are no long-term plans currently in place to improve the efficiency of the daily processing cycle.

The Project team identified these deferred essential processing requirements as conditions that need resolution. The Enterprise Life Cycle Business System Architecture Stage and Application Requirements Stage for the Project included the requirements for historical data storage processes and daily processing routines. The IRS Risk Management process identified the need to implement the deferred processing requirements.

The Customer Technical Review compares project design products with the project's architecture and requirements. The Enterprise Life Cycle states (1) the Customer Technical Review can provide benefits with early identification of variances from the architecture and requirements and (2) when real problems are not exposed until late in the project (i.e., during testing), they are difficult and costly to resolve.

Unless sufficient time is provided to deliver the capabilities needed to support the long-term objectives and goals of the release scope, the CADE will be unable to process tax returns for all individual and business taxpayers as planned. Additionally, the longer these decisions are delayed, the greater the risk of costly rework.

Recommendation

Recommendation 2: The Chief Information Officer should limit future Project delivery to essential capabilities and filing season updates. Further, the Chief Information Officer should consider postponing new capabilities until key business decisions are made and the following requirements are implemented:

- Historical data are stored.
- Requirements identified by the CADE Independent Requirements Project are developed and implemented.
- Daily processing routines are improved.

Management's Response: The Chief Information Officer agreed with this recommendation and has tasks underway to develop the historical data store and the requirements that are captured in the CADE Independent Requirements Project, and has also undertaken efforts to see what improvements can be made to daily processing. The scope of Releases 3.1 and 3.2 has been fully defined and work is well underway under a fixed-price arrangement with the PRIME contractor. As part of scoping Releases 3.1 and 3.2, many new capabilities were deferred to ensure the above noted infrastructure improvements and previously deferred requirements were incorporated; however, some new capabilities have been included in Release 3.2. The IRS will continue to carefully plan and approve increments of new functionality to include in future CADE releases.

Implementing Current Technology to Support the Customer Account Data Engine's Ultimate Computer Processing Demands May Be Cost Prohibitive

The IRS has several directives to guide capacity testing for its systems including:

- The Internal Revenue Manual, which requires capacity management planning and testing by assessing the capacity requirements of new systems to determine whether infrastructure needs (hardware, system software, network, etc.) can be met by current infrastructure components, whether procurements are necessary to supplement capacity, or whether design modifications are necessary to reduce capacity requirements.

- The Manager's Guide to the Enterprise Life Cycle, which states the Integration Phase may include testing system performance through a realistic simulation of peak volumes.
- The Enterprise Life Cycle Supplement entitled "Enterprise Integration and Test," which requires capacity testing.

The Project is currently building a computer system large enough to process the highest daily volume of tax returns received by the IRS, although this processing capacity is needed for only a few days each year. Alternative design approaches, such as obtaining additional computer resources on an interim basis or delaying the processing of some tax return types (e.g., deferring "no refund" type returns until the next day) on extremely high-volume processing days, have been considered but have not been thoroughly developed because of the focus on delivering current Project releases. Other potential internal solutions that have been considered to address the short-term performance demands include distributing CADE peak workload demands between the two Enterprise Computing Centers at Martinsburg, West Virginia, and Memphis, Tennessee, and prioritizing computer processing time among the various modernization applications to manage peak workload demands.

During our meetings with the Project team, we discussed other potential solutions for increasing computer processing capacity, including:

- Use of supercomputing centers with vast computing resources by obtaining limited access to their supercomputers. Examples of supercomputing centers include the Los Alamos National Laboratory, National Aeronautics and Space Administration Ames Research Center, National Security Agency, and Pittsburgh Supercomputing Center.
- Use of outside vendors that offer open access, computing time, and on-demand programs to provide peak workload demand assistance on an as-needed basis.
- Discussions with other Federal Government agencies with similarly sized programs to obtain performance-related lessons-learned information.

One aspect of processing performance is related to the storage and retrieval of CADE data that are currently stored on magnetic tape cartridges. The current magnetic tape storage pool available to the CADE at the Enterprise Computing Center in Martinsburg, West Virginia, is limited in size and will be challenged to handle future needs. The CADE currently has access to 40 terabytes of storage. Future plans call for the purchase of an additional 50 terabytes of storage using direct access storage devices. In early February 2007, Release 2.2 experienced processing problems related to the tape storage pool.

Another aspect of processing performance is the number of business rules that can be efficiently processed. Processing performance can be measured in millions of instructions per second (MIPS). To ensure adequate computer processing capacity was available for the 2007 Filing Season, the IRS purchased an additional 550 MIPS at a cost of approximately $3.4 million. Currently, the hardware and software cost for 1 MIPS is about $5,000, with an additional

estimated annual maintenance cost of about $1,200. Assuming the Release 3 ratio of 2 MIPS to 3 business rules remains constant, the CADE will require approximately 25,000 MIPS by 2012. This also assumes the ratio will not increase, even though business rule volume and complexity will increase and the volume of tax returns will rise from 50 million to more than 135 million.

Table 2 presents estimated business rules and tax return volumes by year and release.

Table 2: Business Rules and Tax Return Volume by Year and Release

	2006	2007	2008	2009	2010	2011	2012
	Release 1	Release 2	Release 3	Release 4	Release 5	Release 6	Release 7
Business Rules	624	2,066	6,078	15,882	31,832	34,316	38,285
Tax Return Volume	7 million	33 million	50 million	70 million	90 million	110 million	135 million

Source: The IRS Applications Development organization.

It will cost more than $226.5 million (which includes maintenance costs of about $98.3 million) to fund the MIPS required to support the CADE processing through 2012. Further, this projection includes only individual taxpayers and not business taxpayers.

The Project has recognized the need to meet capacity requirements for current processing. Although it has performed annual capacity assessments for current and subsequent year demand to support CADE releases, it has not thoroughly developed the estimated long-term needs as prescribed by the Enterprise Life Cycle and the Internal Revenue Manual.

The IRS needs to decide whether to reduce CADE capabilities because of capacity constraints or to continue development with the hope of using new technology or alternative resources (e.g., supercomputer centers, outside vendors) to satisfy the computer processing demands. If new technology does not emerge to more efficiently perform computer processing, CADE costs may be prohibitive.

Recommendation

Recommendation 3: The Chief Information Officer should partner with the Wage and Investment Division Business Modernization Office to jointly review alternative design solutions and identify process improvements for the Project. Alternative design solutions, such as delaying processing of some tax returns on extremely high-volume processing days or obtaining additional computer resources on an interim basis, need to be explored to ensure the CADE can operate as efficiently and effectively as possible.

Management's Response: The Chief Information Officer agreed with this recommendation and is actively engaged and continues to ensure the CADE Program Office and Wage and Investment Division Business Modernization Office jointly review design solutions and identify process improvements for the Project. The Chief Information Officer will continue to work with the Submission Processing organization to identify alternatives for processing tax returns on high volume days, and the Wage and Investment Division Business Modernization Office will continue to work along with the Enterprise Computing Center to implement Saturday tax return processing during the filing season. This approach avoids a backlog by allowing weekend volume to be spread across CADE cycles. These procedures were first utilized for the 2006 Filing Season and continued in the 2007 Filing Season, and are outlined in memorandums signed by the Deputy Director, Submission Processing, dated January 26, 2006, and January 18, 2007, respectively. The IRS remains committed to ensuring all taxpayers processed by the CADE receive the same advantages. Additionally, the Submission Processing organization continues to evaluate potential automated routines for returns initiated through the Electronic Filing System for processing in the CADE to further balance workload throughout the day. The IRS will also continue to explore alternative solutions for successful implementation. In support of this issue, a joint technical assessment team is being formed to identify CADE technical constraints and improvement opportunities with regard to the architecture, performance, and software quality. The IRS expects to have preliminary outcomes from this effort by June 1, 2008.

Appendix I

Detailed Objectives, Scope, and Methodology

The overall objectives of this review were to review current CADE Release[1] 2 activities for potential issues affecting the delivery of new capabilities planned for the 2007 Filing Season and reassess long-term CADE Project goals and objectives in light of the growing complexity and enormity of the Project's tasks. This review was part of our Fiscal Year 2006 audit plan for reviews of the IRS' Business Systems Modernization efforts.

To accomplish our objective, we identified the internal control systems used as guidance for the Project's development. These systems include the Enterprise Life Cycle[2] and the Internal Revenue Manual. We assessed the adequacy of Project development activities in relation to the guidance provided by these internal control systems. We also assessed the adequacy of Project development and program plans by reviewing Business Systems Modernization Program and project documentation and data provided by the IRS and by interviewing personnel in the Applications Development and Enterprise Services organizations. Specifically, we:

I. Determined whether the Applications Development organization and the PRIME contractor delivered all agreed-to Release 2.1 and 2.2 requirements.

   A. Reviewed CADE task order modifications identifying the requirements included in Release 2 and determined the adequacy of documentation tracing business rules to project requirements.

   B. Reviewed documentation identifying the Release 2 staffing levels to determine the adequacy of resources assigned to meet delivery plans.

   C. Reviewed the processes implemented for Release 2 to improve the design quality, computer code development, and application testing over the work performed for Release 1.3.

II. Assessed the IRS' ability to successfully realize the long-term Project goal of retiring the Individual Master File in 2012.

   A. Reviewed the CADE Data Architecture and Analysis Study to assess plans for long-term logical and physical designs, the process for loading and storing historical data, and transforming the CADE from a batch processing operation to a real-time processing operation.

[1] See Appendix VIII for a glossary of terms.
[2] Appendix VI presents an overview of the Enterprise Life Cycle.

B. Reviewed the Information Technology Modernization Vision and Strategy concepts and assessed the effect on the Project's long-term program goals and objectives.

C. Reviewed the CADE's data storage and processing requirements estimates to determine the resources and associated costs the IRS needs to commit to process and manage taxpayer accounts.

   1. Reviewed the estimates of processing capabilities in measurement terms of MIPS and the related costs to provide necessary MIPS capacity to meet processing requirements.

   2. Reviewed estimates of the number of business rules to estimate the MIPS and related costs necessary to support the CADE release schedule in 2012.

D. Reviewed the Project's current status and program goals and objectives to identify potential alternatives in system development and release plans.

Appendix II

Major Contributors to This Report

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Appendix III

Report Distribution List

Acting Commissioner C
Office of the Commissioner – Attn: Chief of Staff C
Deputy Commissioner for Operations Support OS
Associate Chief Information Officer, Applications Development OS:CIO:AD
Associate Chief Information Officer, Enterprise Services OS:CIO:ES
Director, Procurement OS:A:P
Director, Stakeholder Management OS:CIO:SM
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Audit Liaisons:
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- Director, Procurement OS:A:P
- Director, Program Oversight OS:CIO:SM:PO

Appendix IV

Customer Account Data Engine Project Costs

Table 1: Project Task Order[1] Costs Through Release 2

Task Order Number	Period of Performance	Cost
0019	1999 – 2000 (specific dates not available)	$2,166,234
0037	April 24, 2000 – August 31, 2000	$3,011,000
0054	September 1, 2000 – April 30, 2001	$13,971,165
0069	June 1, 2001 – August 31, 2001	$5,700,000
0071	May 1, 2001 – June 30, 2001	$1,534,012
0073	September 1, 2001 – August 31, 2004	$60,458,154
0123	October 1, 2004 – June 8, 2006	$78,862,590
		Total $165,703,155

Source: CADE contract task orders from the IRS Procurement Office.

Table 2: Estimated Project Costs and Schedule Through Release 2

Release Project Phases	Completed/Scheduled	Cost/Estimate
Milestone 1	December 31, 1999	$5,116,000
Milestones 2 and 3	June 30, 2001	$19,267,000
Milestone 4	July 30, 2004	$58,838,000
2003/2004 Filing Seasons (Release 1.1)	August 5, 2004	$24,550,000
2005 Filing Season (Release 1.2)	December 31, 2004	$23,403,000
Milestone 5	June 30, 2005	$17,450,000
2006 Filing Season (Release 1.3)	December 31, 2005	$28,300,000
2007 Filing Season (Release 2)	Mid-May 2007 (estimate)	$56,959,000
		Total $233,883,000

Source: Business Systems Modernization Expenditure Plans for Fiscal Years 2004, 2005, 2006, and 2007.

[1] See Appendix VIII for a glossary of terms.

Table 3: Project Cost and Schedule Variance Summary

Release	Milestone	Cost Variance	Cost Variance Percentage	Schedule Variance (in months)	Schedule Variance (percentage)
1	Operations and Maintenance[2]	$7,510,000	43%	0	0%
1.2	2005 Filing Season[3]	$10,000	0%	0	0%
1.3.1	2006 Filing Season	$668	3%	2	20%
1.3.2	2006 Filing Season[4]	$66	0%	0	0%
2.1	Mid-year Release	$4,190	15%	0	0%
2.2	2007 Filing Season	$1,225	5%	2	22%
Program Management	2005 Calendar Year Level of Effort	$1,935,000	24%	Not Applicable	Not Applicable
	2006 Calendar Year Level of Effort	$0	0%	Not Applicable	Not Applicable

Source: Business Systems Modernization Expenditure Plans for Fiscal Years 2004, 2005, 2006, and 2007 and the IRS.

[2] CADE Release 1 (Operations and Maintenance) was initially referred to as "CADE Release 1, Milestone 5" in the Business Systems Modernization Expenditure Plan.
[3] CADE Release 1.2 was initially referred to as "CADE Filing Season 2005" in the Business Systems Modernization Expenditure Plan. The IRS did not provide cost and schedule data for this release in subsequent Expenditure Plans.
[4] CADE Releases 1.3.1 and 1.3.2 were initially combined and referred to as "CADE Filing Season 2006" in the Business Systems Modernization Expenditure Plan.

Appendix V

Customer Account Data Engine Release Schedules

Table 1 presents the historical development of the CADE and the original release[1] schedule. The names of the tax forms and schedules planned for CADE processing are presented below Table 1. All tax forms and schedules listed in Tables 1 and 2 are available at the IRS web site (IRS.gov).

Table 1: Original CADE Release Schedule

	RELEASE 1.1/1.2	RELEASE 1.3.1	RELEASE 1.3.2	RELEASE 2.1	RELEASE 2.2	RELEASE 3	RELEASE 4	RELEASE 5
Tax Return Types	Form 1040EZ; Single filing status; refund or even-balance returns	Release 1.1/1.2 plus address change	Release 1.3.1 plus Forms 1040 and 1040A with no schedules; Forms 4868 and 2688; prior year returns (2003+); limited name-change returns	Form 1040EZ; Form 1040 Schedules A, B, and R; Form 1040A Schedules 1 and 3	Release 2.1 plus Form 1040 Schedules C, D, E, F, and H without an Employer Identification Number and their supporting schedules	All Form 1040 family and supporting forms without an Employer Identification Number; Form 1040A Schedule 2; refund, deceased refund, or fully paid returns	All Form 1040 family and supporting forms with an Employer Identification Number; Forms 941, 940, and 720; payroll, unemployment, and excise returns for Form 1040 taxpayers; refund, fully paid, balance-due, and even-balance returns	All remaining individual tax returns
Filing Status	Single	Single	Single	Single; Married; Head of Household, limited dependents	Single; Married; Head of Household, limited dependents	All (including Head of Household)	All	All
Account Characteristics	No account issues (open or closed)	No account issues (open or closed)	No account issues (open or closed)	No account issues (open or closed)	Married once; no open account issues	No open account issues; Earned Income Tax Credit	Power of Attorney; Centralized Authorization File; no open account issues	All accounts not included in previous Releases

[1] See Appendix VIII for a glossary of terms.

	RELEASE 1.1/1.2	RELEASE 1.3.1	RELEASE 1.3.2	RELEASE 2.1	RELEASE 2.2	RELEASE 3	RELEASE 4	RELEASE 5
Number of Returns								
Original Estimate	3 million				35 million	76 million	110 million	122 million
Revised Estimate - February 2005	2 million	2 million	To be determined	To be determined	33 million	50 million	80 million	140 million
Estimated Delivery: As of April 2000	January 2002			August 2002		July 2003	July 2004	July 2005
As of January 2004	August 2004		January 2006	To be determined	To be determined	To be determined	To be determined	To be determined
As of December 2004	August 2004	July 2005	January 2006	July 2006	January 2007	To be determined	To be determined	To be determined
As of February 2005	August 2004/ January 2005	July 2005	January 2006	July 2006	January 2007	Releases 3.1/3.2 July 2007/ January 2008	Releases 4.1/4.2 July 2008/ January 2009	July 2009

Source: CADE Individual Master File Release Content Master Plan Updates, dated June 5, 2003, and February 11, 2005.

Form 720 – Quarterly Federal Excise Tax Return
Form 940 – Employer's Annual Federal Unemployment (FUTA) Tax Return
Form 941 – Employer's QUARTERLY Federal Tax Return
Form 1040 – U.S. Individual Income Tax Return
Form 1040A – U.S. Individual Income Tax Return
Form 1040EZ – Income Tax Return for Single and Joint Filers With No Dependents
Form 2688 – Application for Additional Extension of Time To File U.S. Individual Income Tax Return
Form 4868 – Application for Automatic Extension of Time To File U.S. Individual Income Tax Return
Schedule A (Form 1040) – Itemized Deductions
Schedule B (Form 1040) – Interest and Ordinary Dividends
Schedule C (Form 1040) – Profit or Loss From Business
Schedule D (Form 1040) – Capital Gains and Losses
Schedule E (Form 1040) – Supplemental Income and Loss
Schedule F (Form 1040) – Profit or Loss From Farming
Schedule H (Form 1040) – Household Employment Taxes
Schedule R (Form 1040) – Credit for the Elderly or the Disabled
Schedule 1 (Form 1040A) – Interest and Ordinary Dividends for Form 1040A Filers
Schedule 2 (Form 1040A) – Child and Dependent Care Expenses for Form 1040A Filers
Schedule 3 (Form 1040A) – Credit for the Elderly or the Disabled for Form 1040A Filers

Table 2 presents the first biannual release schedule. The names of additional tax forms and schedules planned for CADE processing are presented below Table 2.

Table 2: First Biannual CADE Release Schedule

January and June	2004 **RELEASE 1.1**	2005 **RELEASE 1.2 1.3.1**	2006 **RELEASE 1.3.2 2.1**	2007 **RELEASE 2.2 3.1**	2008 **RELEASE 3.2 4.1**	2009 **RELEASE 4.2 5.1**	2010 **RELEASE 5.2 6.1**	2011/2012 **RELEASE 6.2 7.1/7.2**
Tax Return Types	Form 1040EZ	**1.2 & 1.3.1** Form 1040EZ **(1.3.1 only)** Address changes	**1.3.2** Forms 1040 and 1040A, no schedules	**2.2** Form 1040A Schedules 1 and 3; Form 1040 Schedules A, B, D, and R and supporting forms; Form 1040 Schedules C, F, and E without an Employer Identification Number and supporting forms including Schedule SE; limited name change on return	**3.2** Form 1040 decedent returns; Form 1040 fully paid with remittance; Form 1040 with credit elect; Form 4868 with remittance; Form 4868 with no remittance; additional Form 1040 schedules and forms (to be determined); Form 1040-ES; Form 1040-V; Form 1040X; Form 1040A Schedule 2; Form 1040 Schedule EIC and supporting forms	**4.2** Balance-due returns; math error returns; Form 6251; additional Form 1040 schedules and forms (to be determined)	**5.2** Form 1040 Schedules C, E, F with an Employer Identification Number and supporting schedules including Schedule SE; Forms 940 and 720 payroll, unemployment, and excise tax returns for Form 1040 self-employed filers; additional Form 1040 schedules and forms (to be determined); delinquent returns	**6.2** Additional Form 1040 schedules and forms (to be determined) **7.2** Form 1040NR; Form 1040 Puerto Rico Resident; Form 1040 Self-Employed; Form 1040 Departing Alien; foreign address; additional Form 1040 schedules and forms (to be determined)
Filing Status	Single (never married); no dependents	Single (never married); no dependents	**2.1** Single, Married (joint), Head of Household, Married (separate)	**3.1** Single, Married (joint), Head of Household, Married (separate), Surviving Spouse	**4.1** Single, Married (joint), Head of Household, Married (separate), Surviving Spouse	**5.1** Single, Married (joint), Head of Household, Married (separate), Surviving Spouse	**6.1** Single, Married (joint), Head of Household, Married (separate), Surviving Spouse	**7.1** Single, Married (joint), Head of Household, Married (separate), Surviving Spouse

January and June	2004 **RELEASE 1.1**	2005 **RELEASE 1.2 1.3.1**	2006 **RELEASE 1.3.2 2.1**	2007 **RELEASE 2.2 3.1**	2008 **RELEASE 3.2 4.1**	2009 **RELEASE 4.2 5.1**	2010 **RELEASE 5.2 6.1**	2011/2012 **RELEASE 6.2 7.1/7.2**
Account Characteristics	Refund or even-balance returns; no account issues (open or closed)	Refund or even-balance returns; no dependents; no account issues (open or closed)	Refund or even-balance returns; no dependents; no account issues (open or closed)	**2.2** Married once; no open account issues **3.1** No open account issues; Earned Income Tax Credit	**3.2** No open account issues. Earned Income Tax Credit **4.1** Power of Attorney; Centralized Authorization File; no open account issues; Earned Income Tax Credit	No open account issues; Earned Income Tax Credit	Power of Attorney; Centralized Authorization File; no open account issues	All accounts not included in previous Releases
Estimated Number of Returns	Not applicable	Actual 1,423,517	Actual 7,372,572	**2.2** 33 million	**3.2** 50 million	**4.2** 70 million	**5.2** 90 million	**6.2** 110 million **7.2** 135 million

Source: Customer Relationship Management Executive Steering Committee, approved October 18, 2005.

Form 1040-ES – Estimated Tax for Individuals
Form 1040NR – U.S. Nonresident Alien Income Tax Return
Form 1040-V – Payment Voucher
Form 1040X – Amended U.S. Individual Income Tax Return
Form 6251 – Alternative Minimum Tax–Individuals
Schedule EIC (Form 1040 or 1040A) – Earned Income Credit
Schedule SE (Form 1040) – Self-Employment Tax

Table 3 presents the revised biannual release schedule as of November 16, 2006. The names of additional tax forms and schedules planned for CADE processing are presented below Table 3.

Table 3: Revised Biannual CADE Release Schedule

January and June	2007 RELEASE 2.2 3.1	2008 RELEASE 3.2 4.1	2009 RELEASE 4.2 5.1	2010 RELEASE 5.2 6.1	2011 RELEASE 6.2 7.1	2012 RELEASE 7.2
Tax Return Types	**2.2** Form 1040 Schedules C, F, and E without an Employer Identification Number and supporting forms including Schedule SE; Form 1040 Schedule D and its supporting forms; Form 8880 **3.1** Form 1040 fully paid with remittance; Form 1040-ES, Form 1040-V, Schedule EIC, and their supporting forms	**3.2** Form 1040 Descendent Returns; Form 1040 with credit elect; Form 1040A Schedule 2; Form 4868 with and without remittance **4.1** Balance-due returns; math error returns	**4.2** Form 1040X; Form 6251 **5.1** Delinquent returns; Form 1040X expanded	**5.2** None **6.1** Additional Form 1040 schedules and forms (to be determined); Form 1040 Schedules C and F with an Employer Identification Number and supporting schedules including Schedule SE	**6.2** None **7.1** Form 1040NR; Form 1040 Puerto Rico Resident; Form 1040-SS self-employed Puerto Rico Resident; Form 1040 foreign address; additional Form 1040 schedules and forms (to be determined); Forms 940 and 720 payroll; unemployment and excise tax returns for Form 1040 self-employed filers	**7.2** None
Filing Status	Not included in plan	Not included in plan	Not included in plan	Not included in plan	Not included in plan	
Account Characteristics	**2.2** Clean dependents; married filing jointly and separately (married once) **3.1** Dependents expanded	**3.2** Deceased taxpayers; name change (last name) **4.1** None	**4.2** None **5.1** Power of Attorney; Centralized Authorization File	**5.2** None **6.1** Taxpayers with a history of multiple marriages	**6.2** None **7.1** All open issues	**7.2** None

	2007 RELEASE 2.2 3.1	2008 RELEASE 3.2 4.1	2009 RELEASE 4.2 5.1	2010 RELEASE 5.2 6.1	2011 RELEASE 6.2 7.1	2012 RELEASE 7.2
January and June						
Estimated Number of Returns	Not included in plan	Not included in plan	Not included in plan	Not included in plan	Not included in plan	Not included in plan

Source: The IRS Applications Development organization.

Form 1040-SS – U.S. Self-Employment Tax Return (Including the Additional Child Tax Credit for Bona Fide Residents of Puerto Rico)
Form 8880 – Credit for Qualified Retirement Savings Contributions

Appendix VI

Enterprise Life Cycle Overview

The Enterprise Life Cycle[1] is the IRS' 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 Enterprise Life Cycle addresses large and small projects developed internally and by contractors.

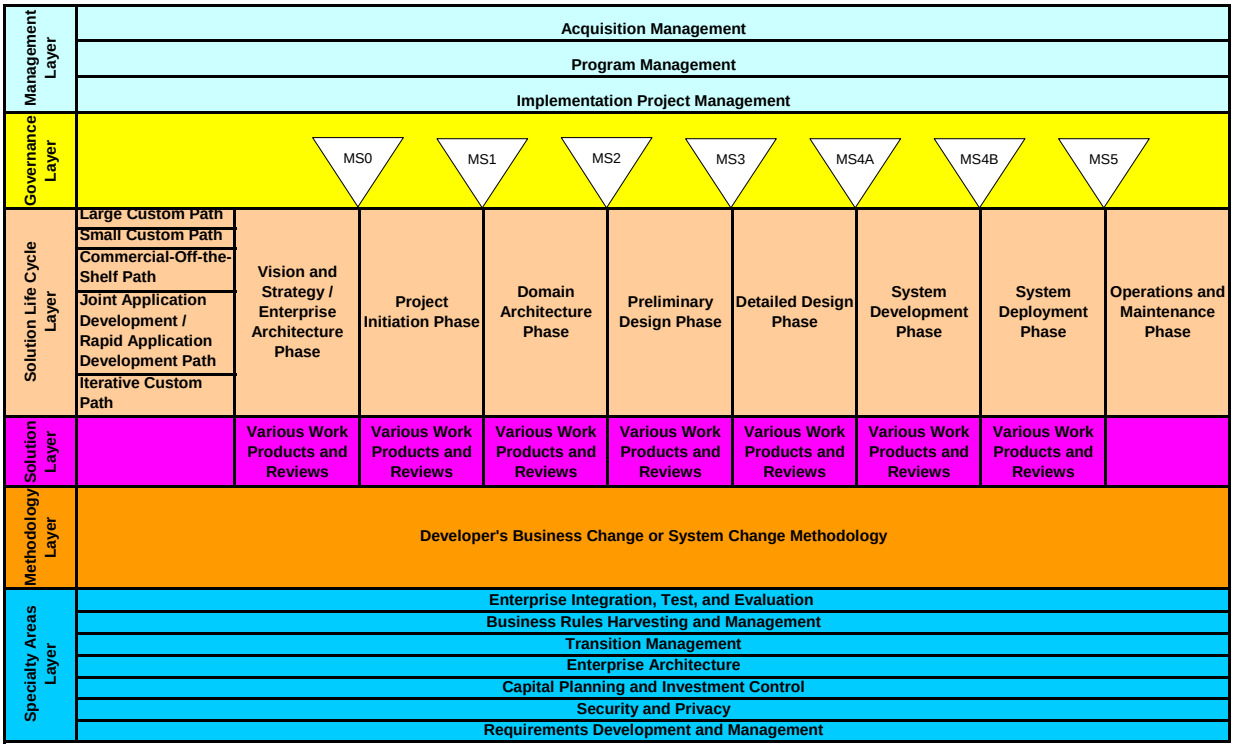
The Enterprise Life Cycle includes such requirements as:

- Development of and conformance to an 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 Enterprise Life Cycle improves the IRS' 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 layers, paths, phases, and milestones (shown as "MS" in Figure 1) within the Enterprise Life Cycle Framework.

[1] See Appendix VIII for a glossary of terms.

Figure 1: Enterprise Life Cycle Framework



Source: Graphical representation of the Enterprise Life Cycle Framework modified from the Enterprise Life Cycle Guide.

Enterprise Life Cycle Layers

The Enterprise Life Cycle is a framework for organizing and using IRS directives, processes, procedures, templates, and standards to accomplish business change. It is organized as a set of six interacting layers.

- The **Management Layer** specifies how to plan and control business change programs, projects, acquisitions, and solutions throughout the Enterprise Life Cycle.
- The **Governance Layer** specifies additional controls imposed from outside the project or program.
- The **Solution Life Cycle Layer** specifies what should be done, but not how to do it.
- The **Solution Layer** manages the solution as it is produced, including providing standards for consistent solution specification and formal review of solution content. This Layer provides control over work products that may be produced by multiple internal and external developers using differing methodologies.

- The **Methodology Layer** details how to do the work and specifies a unique set of work products to be produced. Specific methodologies are not part of the Enterprise Life Cycle Framework.
- The **Specialty Areas Layer** provides additional guidance for areas of particular importance within the IRS. These areas include Enterprise Integration, Test, and Evaluation; Business Rules Harvesting and Management; Transition Management; Enterprise Architecture; Capital Planning and Investment Control; Security and Privacy; and Requirements Development and Management.

Enterprise Life Cycle Paths

A path specifies a unique "philosophy" or orientation for performing the work. Although the Enterprise Life Cycle specifies a standard for the work required to produce and operate business change solutions, there are multiple ways to approach and accomplish the required work. Paths are like alternate roads, each of which crosses different terrain, but all of which lead to the same destination. The Enterprise Life Cycle provides five distinct paths or approaches to developing systems:

- The **Large Custom Path** is for large projects.
- The **Small Custom Path** is for small projects.
- The **Commercial-Off-the-Shelf Path** is a commercial software-based approach.
- The **Joint Application Development/Rapid Application Development Path** is a highly accelerated, prototyping-based approach for very small, standalone solutions or solution components.
- The **Iterative Custom Path** is a hybrid approach that combines elements of the other approaches.

Enterprise Life Cycle Phases and Milestones

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 (called a milestone) at which IRS executives make "go/no-go" decisions for continuation of a project. Project funding decisions are often associated with milestones.

Figure 2: Enterprise Life Cycle Phases and Milestones

Phase	General Nature of Work	Concluding 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.

Appendix VII

Corrective Actions to Prior Audit Recommendations

Table 1 presents the findings reported by the Treasury Inspector General for Tax Administration and the IRS' subsequent planned corrective actions and implementation status. The report titles are presented below Table 1.

Table 1: Status of Treasury Inspector General for Tax Administration Report Findings and IRS Corrective Actions Related to the CADE Project

Report Number and Date	Finding and Recommendation	Corrective Action	Status
2003-20-018 **November 2002**	The Pilot Plan Needs to Include Adequate Defect Reporting Procedures. To ensure the defect reporting databases provide reliable information for the pilot defect reports, the Business Systems Modernization Office should require the PRIME contractor[1] to provide written procedures directing that the IRS approve defect report resolution actions prior to defect report closure.	The IRS monitors Information Technology Asset Management System use and requires the PRIME contractor to develop procedures to include defect report resolution. Under the draft procedures, the PRIME contractor initiates the recommendation to close in the Information Technology Asset Management System and the IRS is responsible for the final closure. Those procedures are currently under review. Approval and distribution of the procedures is planned for November 30, 2002.	Closed

[1] See Appendix VIII for a glossary of terms.

Report Number and Date	Finding and Recommendation	Corrective Action	Status
2003-20-018 **November 2002 (continued)**	The Pilot Plan Needs to Include Adequate Defect Reporting Procedures. To ensure the defect reporting databases provide reliable information for the pilot defect reports, the Business Systems Modernization Office should require the PRIME contractor to provide detailed procedures for reconciling defect reports in the ClearQuest® database and the Information Technology Asset Management System.	The PRIME contractor has drafted procedures that document the process the IRS will use when interfacing defect reporting information between the ClearQuest® database and the Information Technology Asset Management System defect tracking tools. These procedures contain specific information on the reconciliation of these reports. The procedures are currently under review and are scheduled to be approved and distributed by November 30, 2002.	Closed
2003-20-089 **March 2003**	File and Job Names Need to Be Compatible With Current Tax Processing Systems. The Deputy Commissioner for Modernization and Chief Information Officer need to ensure development of job and file naming standards is expeditiously completed by the IRS Enterprise Operations Services organization. The Business Systems Modernization Office needs to work with the PRIME contractor to ensure these naming standards are used in the development of future CADE releases and all other IRS modernization projects.	The Business Systems Modernization Office agreed with the recommendation and is developing naming standards. Key naming standards will be published and available for use by the current processing and modernization environments by August 1, 2003.	Closed

Report Number and Date	Finding and Recommendation	Corrective Action	Status
2003-20-089 **March 2003 (continued)**	The Balancing, Control, and Reconciliation Process Needs to Be Completed and Tested Prior to Release 1. The Business Systems Modernization Office should monitor the completion of the remaining work contained in the detailed schedule to assess the progress in completing the balancing, control, and reconciliation process development. The Business Systems Modernization Office should require the PRIME contractor to complete the remaining work on the balancing, control, and reconciliation process and fully test these processes to ensure they meet the design requirements.	The Business Systems Modernization Office agreed with the recommendation and will continue to monitor the actions taken in balancing, control, and reconciliation in preparation for Release 1 deployment. The Business Systems Modernization Office will continue to work with the PRIME contractor to ensure the remaining work for the balancing, control, and reconciliation process for Release 1 is tested and completed.	Closed Closed
2003-20-089 **March 2003**	Improvements to the Computer Handbook Will Help to Ensure an Effective Release 1 Deployment. The Business Systems Modernization Office should work with the PRIME contractor to incorporate minimum documentation standards and the Documentation Task Force's findings into Release 1 and future releases.	The Business Systems Modernization Office agreed with the recommendation and will work with the PRIME contractor to incorporate minimum documentation standards and the Documentation Task Force's findings into the CADE.	Closed

Report Number and Date	Finding and Recommendation	Corrective Action	Status
2003-20-089 **March 2003 (continued)**	Improvements to the Computer Handbook Will Help to Ensure an Effective Release 1 Deployment. The Business Systems Modernization Office should work with the PRIME contractor to incorporate these documentation standards into the Enterprise Life Cycle. Incorporating standards into the Enterprise Life Cycle will provide guidance in developing documentation for current and future CADE releases, as well as all other IRS modernization projects.	The Business Systems Modernization Office is working with the PRIME contractor and Information Technology Services organization as a task group to define standard deliverables that will facilitate improved transition of modernization systems into the current processing environment. The computer operations handbook subtask group is working to define gaps and requirements for standard deliverables needed by the Information Technology Services organization for operations and maintenance support.	Closed
2005-20-005 **November 2004**	Significant Software Changes Were Added to CADE Release 1.1. The Chief Information Officer should direct the Business Systems Modernization Office to work with the PRIME contractor to ensure future project development changes undergo appropriate performance testing, simulating high-volume processing, before deploying the system.	The Business Systems Modernization Office is planning a semiannual release of the CADE in July and January each year. The July delivery will involve higher risk, more complex functionality, and the January delivery will include filing season changes combined with additional changes as capacity permits. Because the returns from earlier in the filing season will be available for testing, the IRS can conduct performance testing on the July release using the highest volume periods. The IRS will determine whether to conduct additional performance testing on the	Closed

Report Number and Date	Finding and Recommendation	Corrective Action	Status
2005-20-005 November 2004 (continued)		January release based on the likelihood of the changes affecting performance.	
2005-20-005 November 2004	The CADE Program Does Not Have a Dedicated System Architect. The Chief Information Officer should ensure the Business Systems Modernization Office makes the system architecture resources being acquired available to the CADE program on a full-time basis.	During Calendar Year 2004, the Business Systems Modernization Office has been actively searching for qualified engineering resources. While the Business Systems Modernization Office has had success recruiting a few candidates (some of which are dedicated to the CADE), it is very difficult to attract qualified individuals to work for the Federal Government. The Business Systems Modernization Office's recruiting efforts will continue. In the interim, MITRE Corporation employees and members from the Enterprise Architecture team are providing CADE engineering and architecture support. The PRIME contractor is continuing to provide full-time architecture support to the Project.	Closed
2005-20-005 November 2004	Disaster Recovery Capabilities Were Not Tested Prior to CADE Release 1.1 Implementation. To ensure the ability of the IRS to restore the CADE after a disaster with the least disruption to the IRS mission, the Chief Information	Disaster recovery for the CADE needs to be periodically tested. However, it should be part of an enterprise disaster recovery and testing strategy for mainframe computing operations and databases at the Enterprise Computing Center. The IRS	Closed

Report Number and Date	Finding and Recommendation	Corrective Action	Status
2005-20-005 **November 2004 (continued)**	Officer needs to ensure disaster recovery capabilities for future releases of the CADE are fully tested prior to implementation.	generally deploys major functionality enhancements for future CADE releases in July and deploys filing season changes and smaller system enhancements as part of CADE filing season releases in January. The Systems Integration Enterprise Architecture Office will work with the Enterprise Operations Service organization and the Enterprise Computing Center to ensure CADE disaster recovery testing is included in the annual disaster recovery testing performed each fall. Because most new functionality will be deployed in the July release, the fall testing would be timely prior to the start of the new filing season when the IRS will be encountering high volumes.	
	To ensure the ability of the IRS to restore the CADE after a disaster with the least disruption to the IRS mission, the Chief Information Officer needs to ensure all aspects of the CADE disaster recovery capabilities are tested during the Annual IRS Disaster Recovery Test.	The Director, Enterprise Computing Center, will test the recovery and restoration of key components of CADE processing to ensure a high confidence level in the IRS' ability to recover the CADE in the event of a disaster. The CADE was part of the annual Enterprise Computing Center Master File Disaster Recovery test. The test was conducted during the weeks of October 18, 2004, and October 25, 2004.	Closed

Report Number and Date	Finding and Recommendation	Corrective Action	Status
2005-20-005 **November 2004 (continued)**	Improvements to the CADE Operator's Guide Need to Be Completed. The Chief Information Officer should direct the Business Systems Modernization Office to ensure pilot and production operational documentation for future CADE releases is reviewed, tested, and approved before both the pilot test and live production are allowed to proceed. This review should also ensure the corrective action to our March 2003 report is incorporated in this review and the IRS' minimum documentation standards are completed and met in current and future CADE releases.	The Business Systems Modernization Office made the required changes to the operational documentation for Release 1.1; however, the final copy with "no markup" was not available for a few weeks following initial operation. Going forward, the Business Systems Modernization Office plans to have full documentation available at implementation. There are no plans for additional CADE pilots.	Closed
2005-20-005 **November 2004**	Manual Processes Within CADE Release 1.1 Need to Be Automated for Future Releases. The Chief Information Officer should direct the Business Systems Modernization Office to ensure inefficient manual processes are automated in future CADE releases.	Changes will be included in the January 2005 and July 2005 deliveries addressing the specified operational inefficiencies.	Closed
2006-20-076 **June 2006**	The PRIME Contractor's Inadequate Testing Resulted in Reduced Capabilities for CADE Release 1.3 The IRS and the PRIME contractor agreed to defer eight Release 1.3.2	Prior to Federal Government testing, the PRIME contractor will be required to provide the IRS with notification regarding the completion of unit testing. The Project team has placed this requirement of formal notification	Closed

Report Number and Date	Finding and Recommendation	Corrective Action	Status
2006-20-076 **June 2006 (continued)**	requirements to help ensure the CADE would process tax returns in time for the 2006 Filing Season. This occurred because the PRIME contractor did not effectively and efficiently use computer language (coding practices). Also, the PRIME contractor's unit testing did not adequately identify programming defects.	regarding the completion of unit testing in the Release 2 task order and will continue to do so in future task orders. This corrective action will be incorporated into the ongoing Test Process Improvement Project, which addresses Corrective Actions from Treasury Inspector General for Tax Administration audit *System Requirements Were Not Adequately Managed During the Testing of the Custodial Accounting Project* (Reference Number 2005-20-019, dated December 2004). The Test Process Improvement Working Group of Stakeholders will review existing test guidance and make the appropriate modification to ensure unit testing was adequately performed by the PRIME contractor and the application being provided to the IRS is ready for integration and testing. The recommendations of the Working Group will be vetted through the formal IRS document review processes, and revised guidance will be posted to the Process Asset Library after executive approval.	Closed

Report Number and Date	Finding and Recommendation	Corrective Action	Status
2006-20-076 **June 2006 (continued)**	Successful Development of the CADE Is Dependent Upon Its Ability to Serve As an Efficient and Effective Foundation for Modernized Systems and Applications The CADE's design for managing taxpayer accounts is not fully developed to provide a foundation for the IRS' current and planned modernized systems. In April 2005, the Business Systems Modernization Office initiated the CADE Data Architecture and Analysis Study to enable the Project team to adapt a flexible release strategy by establishing a long-term plan to organize and manage Project data. Also, the Modernization and Information Technology Services organization is forming the Modernization Vision and Strategy to establish project development priorities with the IRS business operations. The Strategy will provide a 5-year plan for developing modernization projects and processes. Until these efforts are completed, successful deployment of a long-term CADE release strategy cannot move forward and the future releases may not be deployed when planned.	The Modernization and Information Technology Services organization will review the deliverables of the CADE Data Study to serve as the basis for developing data models that will guide the logical and physical designs for Releases 3 and 4. The Modernization and Information Technology organization will review Modernization and Vision project strategies for extracting operational and analytical data and develop a high-level data strategy for data warehousing. Building upon the CADE data models and the high-level data warehousing strategy, the Modernization and Information Technology organization will develop a data access strategy and transition plan.	Closed

Report Number and Date	Finding and Recommendation	Corrective Action	Status
2006-20-076 **June 2006 (continued)**	Controls to Manage CADE Requirements Do Not Allow Ready Access for Project Team Use Adequate procedures were not in place to ensure all CADE release requirements are timely controlled. As of February 23, 2006, an interim process to control Release 2 requirements was in development. The Business Systems Modernization Office will use this process until a vendor able to develop a repository meeting the IRS needs is identified.	As an interim measure, a project repository has been developed within the CADE to track and control requirements for each release. This vehicle will remain in place until the implementation of the planned Enterprise Services organization repository.	Closed
2006-20-076 **June 2006**	Defining CADE Project Release Requirements Will Help Enable the Use of Fixed-Price Contracts The Business Systems Modernization Office implemented contracting guidance on April 30, 2004 (entitled "Enabling Fixed-Price Contracting for Business Systems Modernization Task Orders"), which requires contracts and task orders for Business Systems Modernization Office acquisition projects be fixed price at the appropriate life cycle development phase, unless the Federal Government's interest is best served by other contract types. The IRS is not using fixed-price contracts for Release 1.3 development activities	The Projects will continue to work with the IRS Procurement Office to ensure the task orders awarded are segregated to include Milestones 2, 3, and 4A as well as separate task orders for Milestone 4B. This separation of the Milestone 4B task order positions the IRS with the ability to award firm fixed-price contracts in accordance with the firm fixed-price guidance established on April 30, 2004. This leads to more cost-effective acquisitions, better value, and greater competition. The Acquisition Development organization will continue to work with the Enterprise Services organization to establish requirements earlier in the life	Closed

Report Number and Date	Finding and Recommendation	Corrective Action	Status
2006-20-076 **June 2006 (continued)**	or for Release 2 design work performed by the PRIME contractor. The IRS recognized challenges in working with the PRIME contractor to use fixed-price contracts. The benefits of fixed-price contracting will be realized only when the CADE Project requirements are fully developed and agreed to, when comprehensive estimates of effort to perform the contract tasks are made, and when meaningful negotiations are held.	cycle, using the interim suite of policies and procedures that address the core disciplines of requirements development and management. This documentation is available to all projects through the Business Rules and Requirements Management web site. The CADE, in conjunction with the IRS Contracting Officers, reevaluated the benefits of using a fixed-price contract for the remaining work (Milestone 4B) on Release 2. The risk profile that was presented by the PRIME contractor was much higher than the risk the Federal Government was ready to assume. After full review, negotiations, and consideration, the IRS made a business decision to continue with the cost-plus-award-fee contract. The primary drivers were maintaining the current task order end dates and dollar values.	

Source: Treasury Inspector General for Tax Administration audit reports and IRS management responses.

2003-20-018 - *Improvements in the Customer Account Data Engine Pilot Plan Need to Be Considered to Help Ensure the Pilot's Success* (Reference Number 2003-20-018, dated November 2002).

2003-20-089 - *Adhering to Established Development Guidelines Will Help to Ensure the Customer Account Data Engine Meets Expectations* (Reference Number 2003-20-089, dated March 2003).

2005-20-005 - *To Ensure the Customer Account Data Engine's Success, Prescribed Management Practices Need to Be Followed* (Reference Number 2005-20-005, dated November 2004).

2006-20-076 - *Focusing Management Efforts on Long-Term Project Needs Will Help Development of the Customer Account Data Engine Project* (Reference Number 2006-20-076, dated June 2006).

Appendix VIII

Glossary of Terms

Term	Definition
Best Practice	A best practice is a technique or methodology that, through experience and research, has proven to reliably lead to a desired result.
Business Rule	A business rule is a statement that defines or constrains some aspect of the business.
Business Rules Harvesting	Business rules harvesting is a general term used to broadly describe the entire set of activities involved in gathering, formalizing, analyzing, and validating business rules for a particular scope.
Byte	A byte is commonly used as a unit of storage measurement in computers, regardless of the type of data being stored. It is also one of the basic integral data types in many programming languages. Generally, a byte is a contiguous sequence of eight binary digits.
C++ Programming Language	Programmers can write or code software programs using several different programming languages. C++ is an object-oriented, high-level programming language developed by Bell Labs.
CADE Independent Requirements Project	The CADE Independent Requirements Project objective is to complete requirements the PRIME contractor was unable to deliver in prior CADE releases.

Popular Use and Standard Meaning

Name	Symbol	Quantity
kilobyte	KB	2^{10} (10^3)
megabyte	MB	2^{20} (10^6)
gigabyte	GB	2^{30} (10^9)
terabyte	TB	2^{40} (10^{12})

Term	Definition
Centralized Authorization File	The Centralized Authorization File contains information about the type of authorizations taxpayers have given their representatives for their tax returns.
Clean Dependent	A clean dependent has the following characteristics for acceptance in CADE tax return processing: the dependent was claimed on the Calendar Year 2005 tax return submitted by the taxpayers, and was also claimed on the taxpayers' Calendar Year 2004 and Calendar Year 2003 tax returns. The dependent must also have a valid Taxpayer Identification Number.
ClearQuest®	ClearQuest® is a defect and change tracking system that captures and manages all types of change requests throughout the development life cycle, helping organizations quickly deliver higher quality software.
Contracting Officer	A contracting officer is an agent of the Federal Government empowered to execute contracts and obligate Government funds.
Deferral	A deferral is an approved request for verification of a requirement or set of requirements to be moved to another phase of testing.
Direct Access Storage Device	A direct access storage device is a peripheral device that is directly addressable, such as a disk or drum. The term is used in the mainframe world.
Enterprise Computing Center	An Enterprise Computing Center supports tax processing and information management through a data processing and telecommunications infrastructure.
Enterprise Integration, Test, and Evaluation	Enterprise Integration, Test, and Evaluation includes processes for integrating multiple components of a solution and conducting various types and levels of testing on the solution.
Enterprise Life Cycle	The Enterprise Life Cycle is a structured business systems development method that requires the preparation of specific work products during different phases of the development process.

Term	Definition
Executive Steering Committee	An Executive Steering Committee oversees investments, including validating major investment business requirements and ensuring that enabling technologies are defined, developed, and implemented.
Filing Season	The filing season is the period from January through mid-April when most individual income tax returns are filed.
Firm Fixed-Price Task Order	A firm fixed-price task order sets a price that is not subject to any adjustment because of cost overruns incurred by the contractor.
Forms 1040, 1040EZ, and 1040A	Forms 1040, 1040EZ, and 1040A are the series of IRS forms that include individual income tax returns.
Individual Master File	The Individual Master File is the IRS database that maintains transactions or records of individual tax accounts.
Information Technology Asset Management System	The Information Technology Asset Management System delivers an inventory system that enables tracking, reporting, and management of information technology assets.
Information Technology Modernization Vision and Strategy	The Information Technology Modernization Vision and Strategy establishes a 5-year plan that drives investment decisions; addresses the priorities around modernizing front-line tax administration and supporting technical capabilities; and leverages existing systems (where possible) and new development (where necessary) to optimize capacity, manage program costs, and deliver business value on a more incremental and frequent basis.
Infrastructure	Infrastructure is the fundamental structure of a system or organization. The basic, fundamental architecture of any system (electronic, mechanical, social, political, etc.) determines how it functions and how flexible it is to meet future requirements.
Level of Effort Contract	A level of effort contract is a contract form that describes the scope of work in general terms and requires the contractor to provide a specified level of effort (number of hours or percentage of effort) over a stated period of time.

Term	Definition
Logical Design	Logical design describes the functions required of a system; that is, what is to be done, not how it will be done. Logical design is concerned with the processes to be performed.
Magnetic Tape	Magnetic tape contains a magnetically coated strip of plastic on which data can be encoded. Storing data on tapes is considerably cheaper than storing data on disks. Tapes also have large storage capacities, ranging from a few hundred kilobytes to several gigabytes. Accessing data on tapes, however, is much slower than accessing data on disks.
Master File	The Master File is the IRS database that stores various types of taxpayer account information. This database includes individual, business, and employee plans and exempt organizations data.
Milestone	Milestones provide for "go/no-go" decision points in a project and are sometimes associated with funding approval to proceed.
MITRE Corporation	The MITRE Corporation was hired by the IRS as a Federally Funded Research and Development Center to assist with the IRS' systems modernization effort.
Physical Design	Physical design describes how the processing will be performed; for example, whether data are input by a person or read by a bar code reader, whether a file is electronic or print. Tools to represent the physical design include system flowcharts and structure charts.
PRIME Contractor	The PRIME contractor is the Computer Sciences Corporation, which heads an alliance of leading technology companies brought together to assist with the IRS' efforts to modernize its computer systems and related information technology.
Process Asset Library	The Process Asset Library is a web-based repository that contains process content for the IRS. The contents include policy, directions, procedures, templates, and standards used by the IRS to define, implement, and manage business change for the IRS Business Modernization Program.
Release	A release is a specific edition of software.

Term	Definition
Split Refund	A split refund lets a taxpayer divide his or her refund, in any proportion, and directly deposit the funds among two or three different accounts with United States financial institutions.
Task Order	A task order is an order for services planned against an established contract.
Unit Testing	Unit testing ensures program modules perform in accordance with requirements.
Vision and Strategy	The Vision and Strategy phase translates the fundamental business strategy into a transformation strategy for business processes, information technology, and organizational change.

Appendix IX

Management's Response to the Draft Report

RECEIVED
JUN 28 2007

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

CHIEF INFORMATION OFFICER

June 21, 2007

MEMORANDUM FOR DEPUTY INSPECTOR GENERAL FOR AUDIT

FROM: Richard A. Spires
Chief Information Officer

SUBJECT: Draft Report – Vital Decisions Must Be Made to Ensure Successful Implementation of Customer Account Data Engine Project Capabilities (Audit #200620012) (i-trak # 2007-24147)

Thank you for the opportunity to review the subject draft audit report and to meet with the audit team to discuss previous report observations. As a result of these meetings, the audit team has incorporated some of our suggestions into the draft report.

We appreciate TIGTA's acknowledgment that we are making significant progress toward the long-term Information Technology Modernization Vision and Strategy. Further, we are pleased the report recognizes that the IRS has effectively hired programmers to supplement the PRIME contractor's efforts and that we have successfully taken steps to have the programmers assist in the complex programming assignments on the Release 3 physical design. Likewise, your recognition of the successful alignment to the multi-year release plan with Account Management Services Project is duly noted.

We have accomplished much since the data gathering for this audit was completed. The IRS held a Customer Account Data Engine (CADE) Summit, where we worked with the PRIME contractor to reassess the roles and responsibilities and development approach for CADE based on lessons learned from Release 2.2. The Applications Development and Enterprise Services organizations have begun working together to plan and execute activities associated with CADE releases. This improved cross-functional partnership positions the team to elicit and manage detailed technical requirements aligned to the scope of each release.

In addition, a joint technical assessment team is being formed to identify CADE risks, technical constraints, and improvement opportunities with regard to architecture, performance, and software quality. This joint assessment facilitates the identification of key technical issues that impact scalability, productivity, quality, and performance. This strategy leverages existing technical resources, while ensuring that solution architectures are consistently suited to meet both the short-term needs of CADE and the longer-range goals of transforming our business and technical environment.

We acknowledge and appreciate the audit team's advice on ways to further improve the process to effectively manage and monitor the CADE project. As you know, we continue to evaluate all recommendations and are including your recommendations in our future implementation plans. The attachment to this memo describes our planned actions to implement your recommendations.

We appreciate your continued support and value the assistance and guidance your team provides. If you have any questions, please contact me at (202) 622-6800. Members of your staff may also contact Perry Robinett, Director of Program Oversight, at (202) 283-6283.

Attachment

Draft Report – Vital Decisions Must Be Made to Ensure Successful Implementation of Customer Account Data Engine Project Capabilities (Audit #200620012) (i-trak # 2007-24147)

RECOMMENDATION #1: The Chief Information Officer should:

A. Ensure the IRS negotiates a reasonable scope of work for future CADE release development that considers the amount and difficulty of the work and the filing season time constraints.

B. Ensure the IRS analyzes the amount of staffing used during prior releases to help verify the PRIME contractor's staffing plans are adequate to accomplish the scope of work projected for future project releases.

C. Ensure the Project follows Enterprise Life Cycle guidance for performing Customer Technical Reviews and Life Cycle Stage Reviews after completion of the design phase for each release and major release segment.

D. Not allow the PRIME contractor to exit the Preliminary Design Phase without identifying all of the work related to the release requirements.

CORRECTIVE ACTION #1A: We agree with the recommendation that the Chief Information Officer (CIO) should ensure the IRS negotiates a reasonable scope of work for future Customer Account Data Engine (CADE) release development that considers the amount and difficulty of the work and the filing season time constraints. The CIO has begun to address the cause of scope estimation problems through implementation of a formal Business Systems Requirements Report document using IRS processes in the Business Rules and Requirements Management (BRRM) Program Office to conduct detailed requirements elicitation. This strategy supports our ability to adequately define the scope of work, clarify business needs, and document clearly defined requirements within established boundaries. With these better-defined requirements early in the development life cycle, we will be able to more effectively segment functionality into releases, and thereby sub-releases, to assure only manageable scopes of work are undertaken at Milestones (MS) 4A and 4B.

Based on having better requirements definition, the IRS was successful in putting in place a Fixed Price Contract for Release 3 development.

Beginning with Release 4.0, we will further identify, prioritize, and approve business requirements to manage scope, mitigate business risks, and meet business needs within an improved framework. CADE will implement further separation of the logical and physical design phases leading to actual software development. We will evaluate the detailed requirements along with estimates of size and complexity to determine, with executive approval, how much work to undertake in MS 4A and MS 4B.

IMPLEMENTATION DATE: February 1, 2008

RESPONSIBLE OFFICIAL: Director, Corporate Data Domain

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.

Draft Report – Vital Decisions Must Be Made to Ensure Successful Implementation of Customer Account Data Engine Project Capabilities (Audit #200620012) (i-trak # 2007-24147)

CORRECTIVE ACTION #1B: We agree with the recommendation that the Chief Information Officer should ensure the IRS analyzes the amount of staffing used during prior releases to help verify the PRIME contractor's staffing plans are adequate to accomplish the scope of work projected for future project releases. As of April 6, 2007, the IRS has mandated that Computer Sciences Corporation (CSC) provide a list of employees supporting CADE releases. The CADE Release Managers review and analyze the resources listed to ensure the CSC contractors provide adequate support. This information is provided on a weekly basis to the CADE Program Office. If staffing issues are identified, they are addressed at the Weekly Task Review Meetings. This applies to the existing CADE Cost Plus Fixed Fee (CPFF) and Cost Plus Incentive Fee (CPIF) task orders. As we pursue more Firm Fixed Price (FFP) development efforts in the future, we will not have the same access to staff level details.

IMPLEMENTATION DATE: Completed April 6, 2007

RESPONSIBLE OFFICIAL: Director, Corporate Data Domain

CORRECTIVE ACTION #1C: We agree with the recommendation that the CIO should ensure projects follow Enterprise Life Cycle (ELC) guidance for performing Customer Technical Reviews and Life Cycle Stage Reviews after completion of the design phase for each release and major release segment. As the complexity of our projects has increased, and as we gain more experience in managing large complex development efforts, we have found that appropriately tailoring the ELC to ensure we maximize the effective use of contractor resources is critical to delivering within cost and schedule parameters. This tailoring aligns with our current ELC methodology. For CADE, we have adopted an approach of sub-releases (or software builds) as part of the overall release. We structure these sub-releases to have minimal dependencies with other sub-releases, and each still follows an abbreviated waterfall process with the full set of large custom artifacts completed by the end of the last sub-release/build and the official MS exit. This approach also supports early and valuable feedback during the appropriate set of reviews tailored for each sub-release during completion of each release's design phase. We continue working to ensure guidelines for tailoring the ELC to fit this development approach are clearly articulated, understood, and followed by the projects. This provides us the flexibility needed to manage the development effort as a modification to the strict waterfall approach by exercising sound executive judgment for when to apply this tailored approach.

A specific example of a sub-release structure on CADE is the separate build of the initialization routine as part of the filing season release. This initialization routine updates the CADE database for the upcoming filing season and moves taxpayers, whom we designate as likely to be able to be processed by CADE, from the Master File to CADE. While clearly related to the daily and weekly CADE processing software, the initialization routine is run only once at the beginning of the year, which lends itself to a separate design and build cycle. By handling this initialization software as a sub-release, we make better use of resources and reduce the risk for timely delivery.

Using this tailored method, we will still complete the logical and physical designs for each sub-release to ensure adherence to the ELC.

IMPLEMENTATION DATE: June 30, 2007

RESPONSIBLE OFFICIAL: Deputy ACIO, Business Integration

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.

CORRECTIVE ACTION #1D: We agree with the recommendation that the CIO should not allow the PRIME contractor to exit the Preliminary Design Phase without identifying all of the work related to the release requirements. We will identify all work related to a release before exiting the Preliminary Design Phase. We are also tailoring the ELC to align with best practices to ensure that project continuity is not lost; specifically when low risk activities can be implemented in parallel with ELC approvals. As mentioned in Corrective Action #1C, we will ensure that the scope and requirements for a release are fully understood such that it will be possible to segment work into distinct builds or sub-releases as we continue to mature the development process for CADE in accordance with the ELC guidance. Each of the builds or sub-releases for new CADE functionality will complete logical and physical design before development.

IMPLEMENTATION DATE: August 1, 2007

RESPONSIBLE OFFICIAL: Director, Corporate Data Domain

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 Information Officer should limit future Project delivery to essential capabilities and filing season updates. Further, the Chief Information Officer should consider postponing new capabilities until key business decisions are made and the following requirements are implemented:

- Historical data is stored.
- Requirements identified by the CADE Independent Requirements Project are developed and implemented.
- Daily processing routines are improved.

CORRECTIVE ACTION #2: We agree with this recommendation. We have tasks underway to develop the historical data store and the requirements that are captured in the CADE Independent Requirements Project, and have also undertaken efforts to see what improvements

can be made to daily processing. The scope of Releases 3.1 and 3.2 has been fully defined and work is well underway under a fixed-price arrangement with the PRIME contractor. As part of scoping Releases 3.1 and 3.2, many new capabilities were deferred to ensure the above noted infrastructure improvements and previously deferred requirements were incorporated; however, some new capabilities have been included in release 3.2. We will continue to carefully plan and approve increments of new functionality to include in future CADE releases.

IMPLEMENTATION DATE: July 1, 2007

RESPONSIBLE OFFICIAL: Director, Corporate Data Domain

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 #3: The Chief Information Officer should partner with the Wage and Investment Business Modernization Office to jointly review alternative design solutions and identify process improvements for the Project. Alternative design solutions, such as delaying processing of some tax returns on extremely high volume processing days or obtaining additional computer resources on an interim basis, need to be explored to ensure the CADE can operate as efficiently and effectively as possible.

CORRECTIVE ACTION #3: We agree with this recommendation. The CIO is actively engaged and continues to ensure the CADE Program Office and Wage and Investment (W&I) Business Modernization Office jointly review design solutions and identify process improvements for the project. We will continue to work with Submissions Processing to identify alternatives for processing tax returns on high volume days and W&I will continue to work along with the Enterprise Computing Center to implement Saturday Generalized Mainline Framework (GMF) runs during the filing season. This approach avoids a backlog by allowing weekend volume to be spread across CADE cycles. These procedures were first utilized for Filing Season 2006 and continued in Filing Season 2007, and are outlined in memorandums signed by the Deputy Director of Submission Procession dated January 26, 2006, and January 18, 2007, respectively. The IRS remains committed to ensuring all taxpayers processed by CADE receive the same advantages. Additionally, Submissions Processing continues to evaluate potential automated routines for returns initiated through the Electronic Filing System for processing in CADE to further balance workload throughout the day.

The IRS will also continue to explore alternative solutions for successful implementation. In support of this issue, a joint technical assessment team is being formed to identify CADE technical constraints and improvement opportunities with regard to the architecture, performance, and software quality. We expect to have preliminary outcomes from this effort by June 1, 2008.

IMPLEMENTATION DATE: July 1, 2008

Draft Report – Vital Decisions Must Be Made to Ensure Successful Implementation of Customer Account Data Engine Project Capabilities (Audit #200620012) (i-trak # 2007-24147)

RESPONSIBLE OFFICIAL: Director, Corporate Data Domain

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.