

GAO

Report to the Ranking Member,
Subcommittee on Financial Services
and General Government, Committee
on Appropriations, House of
Representatives

March 2011

**TAXPAYER
ACCOUNT
STRATEGY**

**IRS Should Finish
Defining Benefits and
Improve Cost
Estimates**



G A O

Accountability * Integrity * Reliability



Highlights of [GAO-11-168](#), a report to the Ranking Member, Subcommittee on Financial Services and General Government, Committee on Appropriations, House of Representatives

Why GAO Did This Study

In August 2008, the Internal Revenue Service (IRS) began defining a new strategy for modernizing the way it manages individual taxpayer accounts. The strategy, known as Customer Account Data Engine (CADE) 2, is expected to provide service, compliance, and other benefits to IRS and to taxpayers beginning in 2012. IRS expects to implement CADE 2 in three phases. The first phase is expected to be delivered in 2012, the second in 2014, and the third at a later yet to be determined date.

GAO was asked to (1) determine whether IRS has identified the expected benefits of CADE 2 and set targets for measuring success, (2) examine the estimated costs and assess IRS's process for developing them, and (3) assess IRS's process for managing the risks associated with CADE 2 and describe the risks IRS has identified using this process. To do so, GAO reviewed relevant documentation, attended program review meetings, and interviewed IRS officials.

What GAO Recommends

GAO's recommendations include (1) identifying all of the second phase benefits, setting the related targets, and identifying how systems and business processes might be affected; and (2) improving the credibility of revised cost estimates by including all costs or providing a rationale for excluded costs, and adjusting costs for inflation. In its comments on a draft of this report, IRS agreed with GAO's recommendations.

View [GAO-11-168](#) or key components. For more information, contact David A. Powner at 202-512-9286 or pownerd@gao.gov or James R. White at 202-512-9110 or whitej@gao.gov.

TAXPAYER ACCOUNT STRATEGY

IRS Should Finish Defining Benefits and Improve Cost Estimates

What GAO Found

IRS has identified 20 service, compliance, and other benefits for the first phase of CADE 2, including increasing the percentage of refunds processed daily and reducing the number of erroneous notices due to better account information, and has set quantitative targets for most of these benefits. GAO has previously reported that quantitative targets can be useful for tracking program performance. While it may not always be possible to quantify targets, doing so helps to objectively measure the extent to which expected benefits have been realized. However, IRS has not yet finalized expected benefits for the second phase or set related quantitative targets, because, according to officials, these are contingent upon yet to be made design and funding decisions. Nevertheless, addressing the second phase's benefits and related targets as the design is being considered could influence design decisions and help identify early on how systems and processes might be affected.

IRS reported preliminary life cycle cost estimates for the first two phases of the CADE 2 program of about \$1.3 billion through 2024. This includes about \$377 million for development and \$922 million for operations and maintenance. IRS's process for developing the preliminary estimates was generally consistent with best practices. However, the agency did not follow three practices intended to improve the credibility of cost estimates. Specifically, IRS did not (1) consistently document excluded costs or provide a rationale for excluding them; (2) use inflation in calculating costs; and (3) perform an analysis to examine the effects of changing ground rules and assumptions. While IRS stated it would perform the analysis of changing ground rules and assumptions in revised estimates to be available by the completion of our audit, until the agency implements all these practices its estimates may not be credible.

IRS's process for managing the risks associated with CADE 2 is generally consistent with best practices. Through its process, IRS identified significant risks facing CADE 2, including that filing season and other top information technology investment priorities may result in contention for key resources, the delivery of the first phase of CADE 2 may be delayed if deficiencies identified in requirements are not corrected in a timely manner, and the risk that technical challenges and other risks to implementing the database identified as a result of prototyping efforts may not be addressed. To its credit, IRS has developed mitigation strategies for each identified risk. While IRS is working to ensure CADE 2 is successfully managed, the schedule for delivering the initial phase is nevertheless ambitious. IRS officials have acknowledged this and are taking actions to increase their chances of meeting it, including moving certain activities up, performing others concurrently, and adding checkpoints to monitor the program's status. While these actions may increase the likelihood of meeting the schedule, some of them, such as performing activities concurrently, could potentially introduce more risk to CADE 2's successful development and implementation.

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Abbreviations

CADE	Customer Account Data Engine
CMMI	Capability Maturity Model Integration
IDRS	Integrated Data Retrieval System
IMF	Individual Master File
IPM	Integrated Production Model
IRS	Internal Revenue Service
IT	information technology
MITS	Modernization and Information Technology Services
PMO	Program Management Office
TIGTA	Treasury Inspector General for Tax Administration
TS1	transition state 1
TS2	transition state 2
W&I	Wage and Investment

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G A O

Accountability * Integrity * Reliability

United States Government Accountability Office
Washington, DC 20548

March 24, 2011

The Honorable José E. Serrano
Ranking Member
Subcommittee on Financial Services and General Government
Committee on Appropriations
House of Representatives

Dear Mr. Serrano:

In administering federal tax laws, the Internal Revenue Service (IRS) collected approximately \$2.35 trillion in 2010 and is projected to collect over \$3 trillion beginning in 2013. To do so, IRS depends heavily on information technology (IT) systems, including legacy tax processing systems that were developed in the 1960s that are complex and difficult to maintain.

In 1999, IRS initiated the Customer Account Data Engine (CADE) project to replace legacy systems for storing, managing, and accessing taxpayer accounts. Starting in 2005, CADE processed and recorded tax return and tax account information for millions of individual taxpayers with simple returns. However, IRS found that the development of the system was more complex and taking longer than initially anticipated and decided to undertake a broad review of its IT systems modernization efforts. The results of the review led IRS to adopt a new strategy for managing individual taxpayer accounts that would provide benefits to IRS and the taxpayers sooner than CADE. The new strategy is referred to as CADE 2.

To better understand the implications of moving to the new strategy, you asked us to (1) determine whether IRS has identified the expected benefits of CADE 2 and set targets for measuring success, (2) examine the estimated costs of the program and assess IRS's process for developing them, and (3) assess IRS's process for managing the risks associated with CADE 2 and describe the risks IRS has identified using this process.

To describe the expected benefits, we reviewed relevant documents, including the *CADE 2 Program Business Case and Benefits Management Plan*, and interviewed IRS officials from the offices of Wage and Investment (W&I) and Modernization and Information Technology Services (MITS). We also used program performance criteria established in our prior reports. To understand the estimated costs and assess IRS's process for developing them, we reviewed agency cost documentation and

compared it to the best practices identified in the *GAO Cost Estimating and Assessment Guide* and interviewed officials from IRS's Estimation Program Office. To determine CADE 2 key risks and IRS's management of them, we interviewed officials from the CADE 2 Program Management Office (PMO) and reviewed documentation associated with the risk management process and the identification of key risks. We evaluated IRS's risk management process against relevant criteria in the Software Engineering Institute's Capability Maturity Model Integration (CMMI) best practice guidance.

We conducted this performance audit from January 2010 to March 2011, in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives. Appendix I contains further details on our objectives, scope, and methodology.

Background

IRS's Business Systems Modernization program, which began in 1999, is a multibillion-dollar, high-risk,¹ highly complex effort that involves the development and delivery of a number of modernized tax administration and internal management systems, as well as core infrastructure projects, which are intended to replace the agency's aging business and tax processing systems and provide improved and expanded service to taxpayers and internal business efficiencies for IRS. CADE, one of the core systems of the Business Systems Modernization program, was intended to provide a modernized system of taxpayer accounts, with the ultimate goal of eventually replacing the Individual Master File (IMF), a 1960s legacy tax master file that maintains all taxpayer records for individual taxpayers.²

¹A long history of continuing delays and design difficulties and their impact on IRS's operations led us to designate IRS's systems modernization as a high-risk area in 1995 and the program has since remained high-risk. GAO, *High-Risk Series: an Update*, GAO-11-278 (Washington, D.C.: Feb. 16, 2011).

²At its inception, CADE was also intended to replace the Business Master File, which contains taxpayer data about businesses, and the Employee Master File, which contains data about employee retirement plans. Over the years, due to implementation challenges, IRS scaled back the project to only include the IMF.

The IMF is the authoritative data source for individual tax account data. Tax data and related information pertaining to individual taxpayers are posted to the IMF, and the IMF is updated annually to incorporate new tax law procedures and changes. The IMF is a critical component of IRS's ability to process tax returns, as all the other IRS information system applications use data from this source. According to IRS, the IMF is a complex computer system that maintains all individual taxpayer records but has inherent limitations that significantly constrain IRS's ability to achieve its mission. The delays in weekly updates of taxpayer accounts, the lack of synchronization of taxpayer data across dozens of systems, the complexity of the data, the large volumes of data, and the ongoing need to embed new tax laws and business rules contribute to IRS systems storing, sharing, and processing data that is often incomplete, untimely, or inaccurate.³

With CADE, IRS started establishing a database and related functionality for posting, settlement, maintenance, refund processing, and issue detection for taxpayer account and return data for relatively simple tax returns for individual taxpayers. Since 2005, CADE has processed and recorded tax return and tax account information for increasing numbers of individual taxpayers. IRS reported that, in 2010, CADE

- processed about 41 million relatively simple returns (about 30 percent of the total individual income tax returns received); and
- issued about 36 million refunds that totaled in excess of \$66 billion (approximately 14 percent of total refunds), and processed over 7 million taxpayer payments amounting to approximately \$90 billion—with zero defects in balancing.⁴

In addition, IRS reported that it issues refunds with CADE approximately 5 days faster than refunds processed by the IMF.

³IRS, *Customer Account Data Engine Database Implementation Project Charter Transition State 1, Revision: 1.0* (Washington, D.C.: Mar. 22, 2010); *Individual Master File (IMF) - Privacy Impact Assessment* (Washington, D.C. : June 7, 2007).

⁴Numbers are as of October 29, 2010, except for number of payments processed, which are as of September 13, 2010, and payment dollar totals, which are as of tax season 2009.

Challenges and Risks Facing CADE That Led to CADE 2

Although IRS made progress in processing individual taxpayer returns with CADE, IRS found that each successive release of the system was far more difficult as more complex accounts were to be supported, raising concerns about the effort required to address these increasing complexities. Also, since the CADE system operates concurrently with IMF processing, work must be done across the two environments, increasing the complexity of filing season operations and resulting in a greater risk for errors in processing taxpayer account information. IRS was concerned that, without a significant change in approach, CADE would not be completed until at least 2020.

These challenges led the IRS Commissioner to form a team of senior IRS technologists and external advisers to review CADE and IRS's modernization strategy for individual taxpayer accounts. The review identified six risks with the CADE strategy. As a result of the review, in August 2008, IRS began defining a new strategy to address the challenges confronting CADE and deliver improved individual tax processing capabilities sooner. Specifically, the new strategy called for accelerating completion of a modernized database and converting to a single processing system sooner than the current approach would allow. The new strategy is referred to as CADE 2. Table 1 describes the CADE risks reported by IRS and how CADE 2 intends to address them.

Table 1: IRS's Plans for Addressing CADE Risks

CADE risks	CADE 2 program response
<i>Lack of a target-state architecture</i> to guide design decisions leading to changes in each release of CADE that increased rework to complete migration from IMF to CADE.	IRS is expected to define and manage a target-state architecture for managing individual taxpayer accounts. This target-state solution architecture is to define the application architecture, data architecture, operational flows, and standards for the program and provides a clear definition of what it means to be done.
<i>Increasing risk of delivering the most complex business functionality</i> that would extend final delivery of CADE solution to 2020 or later.	IRS has developed a transition strategy that is expected to deliver the most complex data and business functionality in early releases. The program is also using prototypes (see the following paragraph) to prove out complex technical and performance concepts early in the program and provide the necessary guidance and information needed for detailed design.
<i>Increasing filing season implementation complexity</i> that requires costly, complex transitional integration software for exchanging account data between CADE and IMF and maintaining data in both CADE and IMF formats.	IRS has defined a set of transition states that are expected to reduce the complexity of integration and operation and maintenance of dual systems. The transition strategy is expected to reduce filing season complexity by accelerating migration to a single system for managing individual taxpayer accounts.

CADE risks	CADE 2 program response
<i>Increasing delivery effort and cost for each filing season</i> because IMF and CADE must run in parallel until migration of accounts off of IMF to CADE is complete. IRS must design, develop, integrate, and test system modifications needed to address tax law changes each filing season (i.e., each year) in both systems.	By accelerating migration to a single system for managing individual taxpayer accounts, the CADE 2 program transition strategy is expected to reduce the effort and cost associated with implementing filing season changes.
<i>Integration challenges with increased risks of breakdowns</i> as more complex taxpayer accounts are added to CADE since each new release requires integration across more systems and processes than prior releases.	The CADE 2 PMO was established to address and manage the integration challenges of building state-of-the-art applications and databases, leveraging functionality embedded in current systems and integrating each release of the solution with upstream and downstream systems. It is expected that the PMO will engage the appropriate IRS business partners and MITS delivery partners, as well as contractors, to manage this complex transition and balance the needs for successful delivery each filing season.
<i>Critical shortage of IRS staff with in-depth business and technical knowledge</i> of IMF and CADE, both of which have to be maintained until the migration is complete. These staff work not only on CADE 2, but assist with other responsibilities, including IRS's tax filing season operations and other Business Systems Modernization projects.	The PMO is expected to (and according to IRS, has begun to) establish the partner and contractual relationships required to manage and leverage the limited number of staff that possess the in-depth business and technical knowledge of IMF, CADE, and CADE 2. Changes in the relationships between the PMO and delivery partners are expected to increase flexibility to leverage resources with the critical IRS expertise and provide more IRS employees with the specialized skills needed to deliver and maintain the CADE 2 solution.

Source: IRS.

As noted in the table, IRS used prototypes to test and prove complex technical and performance concepts early and provide guidance and information needed for detailed design.⁵ These prototypes were completed in 2010, although some remaining tasks in one of them—the Database Performance Test Prototype—will be completed later.⁶

⁵IRS had five prototypes: (1) Java Viability: to test viability of Java Common Operating Environment for CADE, including for posting and settlement; (2) Database Extract, Transform, and Load: to evaluate approaches to extract daily changes in the current IMF, transform to database format, load onto the CADE 2 database; (3) Penalty and Interest: to analyze existing computer code and identify changes to allow common calculation; (4) Performance Modeling and Monitoring: to create a performance model that is based on the workload that must be processed in each CADE 2 major phase; and (5) Database Performance Test: to assess whether the IMF daily updates can be extracted, transformed, and loaded into the CADE 2 database within the required daily time window.

⁶IRS proved that data can be extracted from the IMF, transformed, and loaded into new CADE 2 database through the extract, transform, and load prototype. However, the remaining question—whether the database can be loaded within the daily time window IRS needs—and any other open tasks are being rolled into the first phase of the CADE 2 Database integration project work.

CADE 2 Is Expected to Deliver Functionality in Three Phases (Transition States)

CADE 2 is expected to deliver its functionality incrementally through three phases known as transition states. Table 2 shows the target completion dates and key characteristics for transition state 1 (TS1), transition state 2 (TS2), and the target state.

Table 2: Overview of CADE 2 Transition States

Transition states and target completion dates	Key characteristics of CADE 2 transition states
TS1 January 2012	Dual Systems—IMF and CADE <ul style="list-style-type: none"> • daily batch processing of individual taxpayer returns provided by modifying the IMF to run on a daily, rather than weekly, basis • comprehensive database established for housing all individual taxpayer accounts and loaded with data from CADE and IMF • database provides timelier updates of taxpayer information for use by IRS employees for compliance and customer service
TS2 January 2014	Single System—CADE <ul style="list-style-type: none"> • target technology developed and deployed (single processing system; IMF retired) • high-priority downstream service and compliance applications modified to take advantage of the new database • some key financial material weaknesses and applications addressed
Target state TBD	Single System—CADE <ul style="list-style-type: none"> • complete the transition of applications that use the target database so downstream systems fully leverage the database • address all financial and security material weaknesses identified at the inception of the program^a • eliminate transitional components that were required during the transition states

Source: GAO analysis of IRS data.

^aWe have previously reported that one significant weakness is IRS's inability to distinguish between types of unpaid tax assessments (GAO, *Financial Audit: IRS's Fiscal Years 2010 and 2009 Financial Statements*, GAO-11-142 (Washington, D.C., Nov. 10, 2010)). An unpaid assessment is a legally enforceable claim against a taxpayer and consists of taxes, penalties, and interest that have been assessed to the taxpayer but not yet collected or abated (reduced). Since these assessments involve the Business Master File, and this system remains outside the scope of CADE 2, IRS will therefore be unable to fully address all financial material weaknesses with CADE 2.

IRS Has Established Two Projects to Achieve TS1 Goals

TS1 consists of the following two projects:

Daily Processing: According to IRS, this project is to enable IRS to process and post all individual taxpayer returns filed and other transactions by updating and settling individual taxpayer accounts in 24-48 hours with current, complete, and authoritative data, and provide

employees with timely access.⁷ More specifically, through the Daily Processing project, IRS is expected to

- modify the IMF to run daily, i.e., modify current transaction processing to occur daily versus weekly;
- make changes to the Integrated Data Retrieval System (IDRS)⁸ and the notice generation process to support the daily vs. weekly processing cycle; and
- prepare daily “loads” to update the CADE 2 database for IDRS and other downstream systems as they are able to support daily processing.

Database Implementation: According to IRS, this project is to establish the CADE 2 database, a relational database that will house data on individual taxpayers and their accounts; develop a capability to transfer data from IMF to the database; and provide for the transfer of data from the database to downstream IRS financial, customer service and compliance systems. Specifically, the project is expected to enable IRS to

- perform a one-time initialization of the database when TS1 begins (this will involve loading all taxpayer account data from IMF and the CADE database into the CADE 2 database and then validating it);
- perform daily updates to the database after TS1 begins by extracting, transforming, and loading daily processing changes to IMF data;⁹ and

⁷A prerequisite for Daily Processing is the implementation of a new cycle definition that shifts the current weekly cycle to begin 1 day sooner in the week. In August 2010, the CADE 2 Executive Steering Committee approved the decision to accelerate the business and corresponding technical cycle to this new cycle definition (also referred to as Accelerated IMF Weekly) as a required component of TS1. The new cycle will also accelerate data availability by a full week (7 days) to a key downstream IRS customer service system.

⁸IDRS is a mission critical system consisting of databases and operating programs that support IRS employees working active tax cases within each business function across IRS. This system manages data that has been retrieved from the Tax Master Files allowing IRS employees to take specific actions on taxpayer account issues, track status, and post transaction updates back to the Tax Master Files. It provides for systemic review of case status and notice issuance based on case criteria, alleviating staffing needs and providing consistency in case control.

⁹This will involve using data integration tools to parse the IMF records, reformat the data to match the CADE 2 database table structures, and establish the linkages and relationships required in the CADE 2 database.

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- utilize the database to provide individual taxpayer account information to selected downstream systems to assist IRS service and compliance personnel. For example, the CADE 2 database is intended to provide daily updates to IDRS, as well as weekly updates to the Integrated Production Model (IPM)—a downstream data repository designed to support IRS compliance functions that house IMF and Business Master File data, information returns, and other data. IPM is expected to include current individual taxpayer data from the CADE 2 database.

Regarding the status of these two projects, IRS completed efforts to define the TS1 projects' logical design in December 2010 and began the detailed design phase, which includes activities such as documenting the physical design of the solution. IRS expects to complete this phase by April 2011.

IRS has also defined overall objectives for TS2 and the target state, but detailed planning of TS2 is in the early stages, with the formation of a planning team that expects to define a high-level approach by early May 2011.

Treasury Inspector General for Tax Administration and GAO Have Recently Reported on CADE 2

In December 2009, the Treasury Inspector General for Tax Administration (TIGTA) identified several challenges that IRS needed to address to effectively manage identified CADE 2 risks, including, among other things, implementing a governance structure for the PMO to provide oversight and direction for the implementation of CADE 2 and developing contingency plans in the event that CADE 2 cannot be fully implemented.¹⁰ IRS officials completed a contingency strategy in November 2010.

In May 2010, we reported that, while much had been done to define CADE 2's transition states, IRS had not identified time frames for completing key planning activities for TS2.¹¹ Consequently, we recommended IRS establish these time frames. In response, IRS stated that it would develop a plan for launching TS2 activities that will outline the approach and a high-level plan for the transition state. IRS also noted that business requirements would be completed in parallel with the development of the plan. In

¹⁰Treasury Inspector General for Tax Administration, *Reengineering Individual Tax Return Processing Requires Effective Risk Management*, 2010-20-001 (Washington, D.C.: Dec. 7, 2009).

¹¹GAO, *Business Systems Modernization: Internal Revenue Service's Fiscal Year 2010 Expenditure Plan*, GAO-10-539 (Washington, D.C.: May 10, 2010).

December 2010, IRS initiated TS2 planning activities and set a target of May 2011 for agreeing on the scope and plan for the transition state.

In November 2010, TIGTA reported on the prototypes undertaken by IRS to gain confidence in the CADE 2 solution.¹² TIGTA found that the five prototype teams that were established generally managed their objectives effectively, and that the teams also identified risks that faced the successful execution of the prototype plans and took steps to overcome the barriers. TIGTA recommended that IRS take several actions to reemphasize compliance with the elements of the CADE 2 Prototype Process. In its response, IRS agreed with TIGTA's recommendations and described steps to address them.

IRS Has Established a New Management Structure for the CADE 2 Program

While the MITS organization has primary responsibility for developing, managing, and delivering the CADE 2 program, IRS has established a new governance approach for the program, including the CADE 2 PMO that is to manage the program and the relationship with the program's stakeholders, define the solution specifications to meet the requirements and the delivery of the program scope, and specify the roles and responsibilities of all parties. The new governance approach is intended to foster rapid decision-making and proactive risk management and issue resolution, as well as ensure that the appropriate stakeholders are involved, engaged, and collaborating as a unified team in making CADE 2 decisions.

The CADE 2 PMO is headed by an Associate Chief Information Officer and made up of several groups, each responsible for a different aspect of the program. These groups include

- *Delivery Management.* Responsible for overseeing and coordinating activities across the projects that are implementing the solution for each of the transition states.
- *Program Management and Control.* Responsible for executing the program management processes, CADE 2 solution planning, and governance and control activities.

¹²Treasury Inspector General for Tax Administration, *Prototype Process Improvements Will Benefit Efforts to Modernize Taxpayer Account Administration*, 2011-20-001 (Washington, D.C.: Nov. 24, 2010).

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- *Chief Architect.* Responsible for setting the overall technical direction in alignment with IRS's business and technical architecture, as defined in the enterprise architecture.¹³
 - *Chief Engineer.* Responsible for reviewing detailed design and interfaces to ensure the CADE 2 solution will work, is secure, and integrates with other systems and infrastructure.
 - *Business Operations.* Responsible for providing the administrative support for all branches of the PMO.

These groups are to work with (1) delivery partners who are other MITS organizations (e.g., Applications Development and Enterprise Operations) that work to deliver the program scope, (2) business partners (e.g., W&I and the Chief Financial Officer) who are organizations who either use the system or define the business requirements and, as such, play a key role in overseeing CADE 2, and (3) other stakeholder groups who support, influence, or oversee the program.

To oversee and guide the PMO, IRS also established several executive-level boards and advisory councils composed of business and IT officials. The executive-level boards include the following:

- The CADE 2 Executive Steering Committee, which consists of senior executives from MITS, W&I, and Department of the Treasury, and serves as an oversight group that ensures the program stays aligned with the IRS strategic plan and approves decisions with significant organizational or external impact; and
- The CADE 2 Governance Board, which consists of Associate Chief Information Officers from CADE 2 and Applications Development and the business modernization executive from W&I, and ensures that objectives

¹³An enterprise architecture can be viewed as a blueprint for organizational transformation and IT modernization. Generally speaking, it consists of "snapshots" of the enterprise's current, or "as-is," operational and technological environment and its target, or "to-be," environment, and contains a capital investment road map for transitioning from the current to the target environment. These snapshots consist of "views," which are basically one or more architecture products that provide conceptual, logical, or physical representations of the enterprise. Further, these views or representations are not static, but rather will evolve or change over time, making enterprise architecture a "living document" (see GAO, *Organizational Transformation: A Framework for Assessing and Improving Enterprise Architecture Management (Version 2.0)* [GAO-10-846G](#) (Washington, D.C.: August 2010).

are met; decisions and issues are resolved in a timely manner; risks are managed appropriately; and the expenditure of resources allocated is fiscally sound. The CADE 2 Governance Board also approves program risk response plans, milestone exits, and resolves escalated issues.

The advisory councils include the

- Executive Oversight Team, which consists of executives from the CADE 2 PMO, delivery partners, and senior-level business executives, and serves as the oversight for the day-to-day execution of the CADE 2 program;
- Associate Chief Information Officer Advisory Council representing leaders of each of the MITS technical units;
- Program Leadership Advisory Council, a broad group of executives from W&I, Agency Wide Shared Services, and across MITS that consult on key issues, risks, analyses, and recommendations on an as needed basis; and
- Architecture/Engineering Review Council recently created to provide architectural and engineering leadership across the program to ensure design and development efforts are complete and adhere to solution architecture and engineering best practices.

In addition, while the projects chartered under CADE 2 are expected to follow the IRS enterprise life cycle¹⁴ methodology that other projects are required to follow, IRS also defined a program management framework for CADE 2 that defines the phases, activities, deliverables, milestones, and reviews necessary to manage both the program and each of its component projects in a coordinated and integrated manner. The PMO and supporting boards are to play key roles in reviewing deliverables and approving milestone exits for the program and assuring that the projects are properly aligned and integrated with the program.

Finally, IRS has also defined and started implementing several processes to support its management of the CADE 2 program. They include processes for managing risks, the integrated master schedule, the prototype process, and other activities. While several of these processes

¹⁴The enterprise life cycle is the approach used by IRS to manage and implement business change through information systems initiatives. The enterprise life cycle provides the direction, processes, tools, and assets necessary to accomplish business change in a consistent and repeatable manner. According to the enterprise life cycle, each project must go through several phases including vision and strategy, project initiation, preliminary design, detailed design, development, and deployment.

were already established for projects, IRS enhanced them for CADE 2 to take into account the complexities associated with integrating projects into a program.

IRS Has Identified Benefits and Set Most Related Targets for the First Phase but Has Yet to Do So for the Second Phase

For TS1, IRS has identified 20 benefits. These benefits span three categories: service; compliance; and other benefits, including reduced system costs and improved security benefits.

Our past work at IRS established that quantitative targets can be useful for tracking program performance.¹⁵ While it may not always be possible to quantify targets, doing so helps to objectively measure the extent to which expected benefits have been realized.

As shown in table 3, IRS has set quantitative targets for 15 of the 20 benefits for TS1. (Table 7 in app. II describes all the benefits IRS has identified and the related quantitative targets where they exist.)

Table 3: Number of IRS-Quantified CADE 2 Benefits in TS1

Benefit category	Benefit subcategory	Benefits with quantitative targets in TS1
Service benefits	Faster refunds and processing	4 of 4
	Faster payment posting	1 of 1
	More efficient account adjustment	1 of 1
	Reduction in manual refunds	0 of 1
	Updated account information	1 of 2
	Faster notices	1 of 1
	Systematic resolution	1 of 1
Compliance benefits	Decreasing taxpayer overpayment	0 of 1
Other benefits	Reduced system maintenance costs	4 of 4
	Improved security	2 of 4
Total		15 of 20

Source: GAO analysis of IRS data.

¹⁵GAO, *Tax Administration: IRS Needs to Further Refine Its Tax Filing Season Performance Measures*, [GAO-03-143](#) (Washington, D.C.: Nov. 22, 2002).

An example of a benefit with a quantitative target is the percentage of refunds IRS will process on a daily basis. IRS expects CADE 2 to increase this from 30 to 80 percent, resulting in faster refunds to many taxpayers. Another example is the security benefit of reducing the number of IRS databases that contain extracts of data from CADE 2. IRS expects this to be reduced by 20 percent from the 2011 baseline.

IRS officials have stated that they have not set quantitative targets for five TS1 benefits for two reasons. First, officials told us that two benefits related to improved security and updated account information cannot be quantified and therefore do not have numeric targets. (See app. II for more details.) Second, IRS officials stated that competing priorities have impeded their ability to define the remaining targets. While they stated they plan to define these targets, they have not committed to specific time frames for doing so. Until IRS has set quantitative targets where feasible in TS1, it and other stakeholders including Congress will not have complete information on the specific benefits that can be expected from funds spent on this phase. In addition, it will be more difficult to objectively measure whether expected benefits have been delivered.

In contrast with TS1, IRS has not finalized the benefits expected in TS2 or defined related quantitative targets. Specifically, IRS has identified a list of 22 service, compliance, and other benefits including addressing financial material weaknesses it expects to achieve beyond TS1.¹⁶ These benefits are summarized in table 4 and described in greater detail in table 7 in appendix II. However, IRS has not yet determined whether these benefits are to be delivered in TS2 or the target state. According to IRS, committing to what can be delivered in TS2 is contingent upon a number of decisions yet to be made. Specifically, officials stated that IRS must first finalize its approach for TS2 (as noted earlier, the agency expects to do this by May 2011). Officials also stated that funding decisions for the upcoming fiscal year could impact IRS's plans for TS2.

In addition, IRS has not finished defining the full range of possible benefits it expects beyond TS1. For example, one possible compliance benefit that IRS is exploring is requiring providers of information returns to send those

¹⁶Specific financial material weaknesses IRS expects to address are weaknesses with the financial settlement application, common penalty and interest module, and history of freezes. IRS also plans to create an authoritative subsidiary ledger, comply with federal standards, provide traceability of transactions to their source, and provide traceability for financial report data to the detailed individual transactions.

returns to IRS and taxpayers at the same time, which would allow IRS to use this data earlier to conduct some compliance checks.¹⁷ Conducting earlier analyses of tax return information using CADE 2 and IPM could allow IRS to stop an erroneous refund before it goes out. IRS currently waits until well after the filing season to conduct some compliance checks, such as computerized matching of information returns and tax returns and examinations of taxpayers' books and records. Such compliance checks can lead to costly collection efforts from noncompliant taxpayers.

Finally, as summarized in table 4 and shown in greater detail in appendix II, IRS has not yet set quantitative targets for any of the benefits defined or committed to any time frames for doing so. As noted for TS1, until IRS has set quantitative targets where feasible in TS2, it and other stakeholders will not have complete information on the specific benefits than can be expected from funds spent, and it will be difficult to objectively measure whether expected benefits have been delivered.

¹⁷Although the majority of information returns are due to taxpayers by January 31 each year and to IRS by the end of February, IRS generally does not begin using the data reported on information returns for compliance purposes until several months later. It may not be possible to require all information returns to be provided to IRS at the same time they are provided to the taxpayer, given the complexities of some forms. However, IRS officials have stated that using third-party information earlier in the filing season could be beneficial because it would allow IRS to match information on tax returns to that data before it issues refunds.

Table 4: Summary of CADE 2 Benefits IRS Expects Beyond TS1 and Number of Related Quantitative Targets

Benefit category	Benefit subcategory	Benefits with quantitative targets beyond TS1
Service benefits	More efficient account adjustment	0 of 1
	Updated account information	0 or 1
	Systematic resolution	0 of 3
Compliance benefits	Increasing taxpayer compliance	0 of 3
	Increasing tax preparer compliance	0 of 2
	Improved collection process	0 of 1
	Improved audit case selection	0 of 3
Other benefits	Reduced system maintenance costs	0 of 3
	Addressed financial material weakness	0 of 5
Total		0 of 22

Source: GAO analysis of IRS data.

We acknowledge that thinking through the expected TS2 benefits (including those from the table in app. II and other potential benefits) and related targets as the approach and design are being considered may result in having to make adjustments later. However, the benefits and targets generated at this stage can influence design decisions and allow IRS to identify early how associated systems and business processes might be affected.

IRS’s Estimates the First Two Phases of CADE 2 Will Total About \$1.3 Billion; Process for Developing Estimates Was Largely Consistent with Best Practices

In July 2009, IRS reported preliminary life cycle cost estimates for TS1 and TS2 of about \$1.3 billion through 2024, including about \$377 million for development and \$922 million for operations and maintenance. The estimates include costs for eight categories of work needed to achieve the goals defined for TS1 and TS2. The majority of the costs are for the Operational Framework category (\$663 million or 51 percent of total costs), which is to provide for the infrastructure on which to develop, test, and deploy the new and enhanced applications under the CADE 2 program. The CADE 2 preliminary cost estimates are summarized in table 5.

Table 5: Preliminary Estimates for the Eight Categories of Work for CADE 2

Dollars in millions

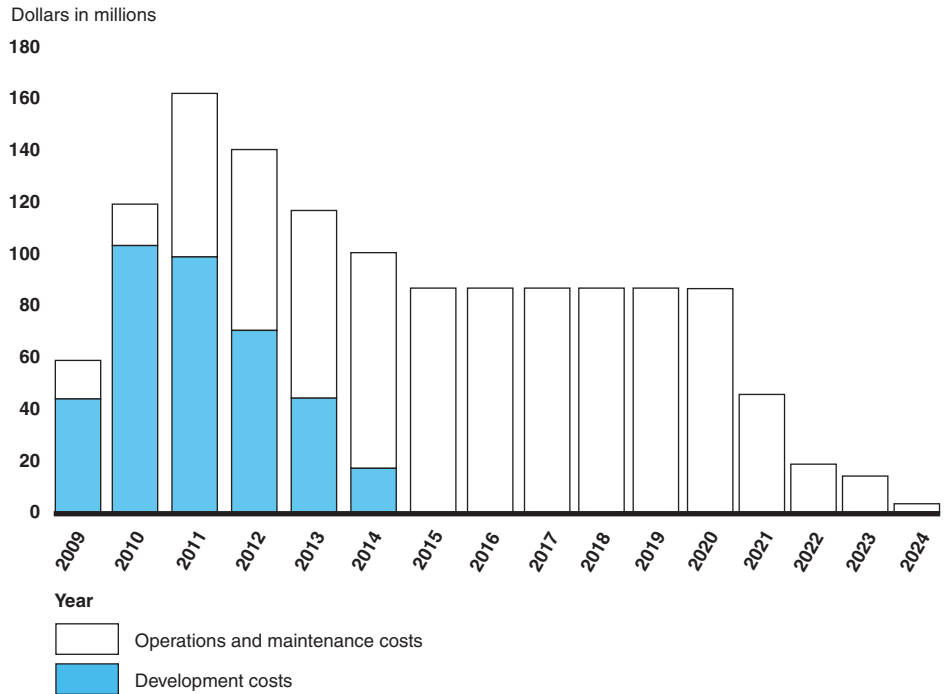
Cost category	Development cost	Operations and maintenance cost	Total cost
1. Program office	\$65	\$0	\$65
2. Current CADE enhancements	72	55	127
3. IMF enhancements	42	62	104
4. Database development (TS1)	15	20	35
5. Database development (TS2)	7	7	13
6. Operational framework (TS1 and TS2)	72	591	663
7. Database access	81	133	214
8. Financial settlement	24	54	78
Total	\$377	\$922	\$1,299

Source: IRS.

Note: IRS did not adjust these costs for inflation.

The estimated annual costs from 2009 through 2024 are shown in figure 1. At the time they were developed, IRS estimated CADE 2 development costs to end in 2015 and total costs to peak during 2011 at about \$162 million. Estimated costs between 2015 and 2024 are all recurring operations and maintenance costs.

Figure 1: IRS's Preliminary Estimates of Annual Costs for CADE 2 (not adjusted for inflation)



Source: GAO analysis of IRS data.

IRS's estimates did not include expected costs for the following items:¹⁸

- operations and maintenance of the IMF system to include enhancements needed to achieve the CADE 2 target state,
- prototype development and assessments,
- technical training (estimated at \$1 million to \$3 million),
- work required to reach the final target state, and

¹⁸Because these costs were excluded in calculating the preliminary estimate, the CADE 2 costs for TS1 and TS2 could potentially be higher than the roughly \$1.3 billion estimated.

-
- process reengineering costs/business costs associated with implementing the current weekly batch processing of accounts to the daily processing required at the completion of TS1.

With Some Exceptions, Process for Developing Preliminary Cost Estimates Was Consistent with Best Practices

The process IRS used to develop the CADE 2 preliminary cost estimates was generally consistent with the best practices outlined in the GAO cost estimating guide.¹⁹ Specifically, IRS followed a well-defined process for developing a comprehensive, documented, accurate, and mostly credible life cycle cost estimate for the first two phases of CADE 2. For example, the estimation process was performed in accordance with a well-defined plan by an independent Estimation Program Office. Parametric estimation models were used that contained catalogs based on historical data, along with cost estimating relationships, designed to produce estimates analogous to similar programs. In addition, IRS used simulation techniques to incorporate risks and determine confidence bounds on the estimates.

Further, IRS plans to update its estimates, consistent with the best practice to update estimates to reflect changes in technical or program assumptions. Specifically, since the estimates were prepared, IRS has developed a better understanding of the work required to meet CADE 2 objectives for TS1 and the current work breakdown structure (i.e., definition of work to be performed) no longer matches the one used to develop the preliminary estimates. IRS officials told us that, consistent with IRS's *Estimation Program Office Estimator's Guide*, they plan to revise their estimates after detailed design information for the database implementation and daily processing projects is completed and expect them to be available by the completion of our audit. CADE 2 PMO officials stated they did not expect the revised estimates to differ significantly from the current estimate.²⁰ It is important to note that, even when all TS1 cost elements have been updated to accurately reflect the current understanding of the work to be performed, the total cost of ownership through TS2 could still significantly differ from the new estimate, given that, as previously noted, the approach for TS2 has yet to be defined.

¹⁹GAO, *GAO Cost Estimating and Assessment Guide: Best Practices for Developing and Managing Capital Program Costs*, GAO-09-3SP (Washington, D.C.: March 2009).

²⁰According to the Estimation Program Office, based on the estimation methodology used, the actual costs of the program for TS1 and TS2 could range from \$975 million to \$1.95 billion.

We identified the following three practices IRS did not follow that could strengthen its methods for estimating CADE 2 costs to ensure they are more credible:

First, according to best practices, items excluded from estimates should be documented and explained. While IRS documented four of the five items that were excluded from the estimates, it did not provide an explanation for excluding these costs. In addition, IRS did not document that it excluded the business costs associated with moving to daily processing. IRS officials stated that, at the time the estimates were developed, these business costs were not well understood by the estimators and now believe that these costs would be relatively small, representing mostly costs for staff already being paid out of existing budgets. Nevertheless, consistently documenting excluded costs and providing a rationale for excluding them would improve credibility.

Second, IRS's estimates did not include inflation. According to best practices, adjusting costs for inflation correctly is necessary if the cost estimate is to be credible. Inflation reflects the fact that the cost of an item usually continues to rise over time. If a mistake is made in applying inflation, or if inflation is not included, cost overruns can result.

Third, IRS did not conduct a sensitivity analysis to examine the effects of changing assumptions and ground rules on its estimates. While IRS developed risk-adjusted estimates, it did not perform the formal sensitivity analysis necessary to understand which variables most affect the cost estimate. IRS officials stated they intend to include a sensitivity analysis in the revised cost estimates expected to be available by the completion of our audit. Performing this analysis will not only improve the credibility of the estimate, but it will provide management a better understanding of the relationship of key factors to cost, which is important in evaluating different options as part of subsequent risk and issue mitigation strategies and contingency plans.

IRS's Risk Management Process Is Generally Consistent with Best Practices

Given the size and significance of the CADE 2 program, it is important that IRS have an effective risk management process. According to best practices, an effective risk management process identifies potential problems before they occur, so that risk-mitigating activities may be planned and invoked as needed across the life of the product and project in order to mitigate adverse impacts on achieving objectives. It includes assigning resources, identifying and analyzing risks, and developing risk mitigation plans and milestones for key mitigation deliverables.²¹

IRS's risk management process for CADE 2 is generally consistent with best practices. For example, regarding resources assigned to risk management, the CADE 2 PMO's Director for Program Management and Control is responsible for "executing" the risk management process. Biweekly meetings are held where the Director for Delivery Management and project officials discuss project status and risks and determine whether risks need to be escalated as candidate risks to the program level. Monthly risk and issue meetings are held to discuss the program-level risks. Finally, those risks that require additional oversight are then presented to the Chief Technology Officer for review. Program-level and project-level risks are scored and tracked in a consistent manner using a risk repository tool. Risk mitigation plans and associated milestones are defined for each risk. Officials from the PMO have also told us that the management structure and processes that have been established for the program are intended to help mitigate the risks associated with developing such a large and complex program.

While IRS is generally effectively carrying out the activities associated with the risk management process, the two key documents that support this process are in some cases inconsistent and do not fully reflect actions being taken. For example, the *Risk and Issue Management Process*²² document calls for automatically escalating those projects with a high to

²¹Carnegie Mellon Software Engineering Institute, Capability Maturity Model® Integration for Acquisition (CMMI-ACQ), Version 1.2 (November 2007).

²²IRS, *Customer Account Data Engine (CADE) 2 Risk and Issue Management Process* (May 31, 2010).

very high risk exposure score²³ to the next level of management while the *Risk and Issue Management Plan*²⁴ calls for escalating risks based primarily upon the judgment of the risk owner and responsible manager. The *Risk and Issue Management Process* identifies a specific set of actions to mitigate risks depending on the risk exposure score while the *Risk and Issue Management Plan* provides high-level guidance describing various alternatives that can be taken to mitigate risks. As another example, both documents identify the risk management roles but do not specify when in the process these roles are assigned or what the required qualifications are.

IRS recognizes its risk management procedures could be strengthened, and the Director for Program Management and Control intends to review these procedures by the completion of our audit, to ensure they are consistent and clearly reflect the process in place. This action will help IRS achieve optimal effectiveness in identifying, prioritizing, or managing risks that could affect the cost and schedule of the program.

IRS Has Identified Significant Risks Confronting CADE 2

Using its risk management process, IRS has identified several significant program risks for CADE 2. As of November 2010, six of these were considered “top risks.” These “top risks,” which include TS1 contingency planning and resource contention among IRS priorities are listed in table 6 along with the mitigation strategies that have been defined for them. (For a complete list of program risks, see app. III.)

²³The risk exposure score is a means of systematically evaluating and prioritizing risks based upon the two dimensions of risk: its likelihood of occurrence and its impact should it occur. Typically these two dimensions are assigned a numeric value, and the two are multiplied to obtain an exposure score. Plotting these scores on a two-dimensional graph allows one to identify the priority to assign to the risk based upon its location on the graph. Risks having a high score are located in the region of the graph corresponding to a higher probability of occurrence and a more serious impact.

²⁴IRS, *Customer Account Data Engine (CADE) 2 Program Management Office Risk and Issue Management Plan (PMO-RIMP)* (Oct. 15, 2010).

Table 6: Top CADE 2 Risks

Reported risk	IRS's description	Mitigation
Database implementation challenges	The Database Implementation project faces many challenges as the IRS moves toward establishing an authoritative relational database. These challenges include a number of technical hurdles and risks that were revealed as part of the recent extract, transform, and load prototyping efforts.	Establishing a dedicated CADE Database Implementation project team with end-to-end responsibility for delivery of the database software component.
TS1 contingency planning	If TS1 contingency planning and associated work efforts are not addressed in a timely manner, the CADE 2 program may not be able to exercise contingency options in the event that full TS1 is not ready for deployment in January 2012.	Presenting contingency options to governance boards and updating contingency or deployment strategies/plans will be based on decisions made by these boards.
Resource contention among IRS priorities	Filing season and other top IT investment priorities may result in resource contention for key resources.	Establishing a process for monitoring and updating the CADE 2 Staffing Strategy and Plan that includes understanding government staffing needs in Delivery Partner organizations.
Availability of FY 2011 funding	It is critical that the CADE 2 program obtain sufficient funds timely to successfully deploy the TS1 solution. If FY 2011 CADE 2 funding is not received within the first 3 months of FY 2011, the infrastructure for building out the production environment and disaster recovery for TS1 development may be in jeopardy.	Making a deliberate decision to manage the risk through financial operations control activities performed in conducting business operations.
Requirements maturity	The successful implementation of the CADE 2 solution is very dependent on a solid set of baselined requirements. If the deficiencies identified in the current state of requirements are not corrected timely, the delivery of CADE 2 TS1 may be delayed.	Identifying the list of requirement deficiencies and assigning a working group to validate corrective actions, assigning ownership, and developing an implementation plan for completing each correction action.
Database extract, transform, and load prototype 2	If the database extract, transform, and load prototype results show that a component of the database process fails, an alternative design solution will need to be recommended for the timely completion of the design of the Database Implementation project.	The database extract, transform, and load work breakdown structure has included tasks to validate the resulting data and to perform analysis for a recommended course of action after each iteration is complete. The recommendation for go or no-go decision point is made based on that analysis performed.

Source: IRS.

While IRS has taken many steps to reduce the risks associated with CADE 2, the agency will nevertheless be challenged in meeting its January 2012 schedule for delivering the benefits associated with daily processing and database implementation given the amount of work needed to complete TS1 over the next year. This includes completing logical design and detailed design activities, testing and integration of core daily applications and their development, and testing and population of the database with current CADE and IMF data. Further, as already noted, waiting to finish (1) defining targets for the TS1 benefits and (2) finalizing benefits and

related targets for TS2 creates a risk of costly or time-consuming late design changes.

Recognizing the challenges it faces, IRS has taken additional steps to increase the likelihood of meeting the schedule. These include moving certain activities up, performing others concurrently and adding checkpoints to monitor the program's status. In addition, IRS has recently completed a TS1 contingency strategy.²⁵ While these actions may increase the likelihood of meeting the schedule, some of them, such as performing activities concurrently, could potentially introduce more risk to CADE 2's successful development and implementation.

Conclusions

Defining benefits and related quantitative targets where feasible is important to understanding what to expect and how to measure performance against expectations. For TS1, while IRS has identified numerous expected benefits, it has not yet defined quantitative targets for all of them. Given that IRS is finalizing the design and preparing to implement TS1, it is important for the agency to complete defining the targets associated with TS1 benefits. Delaying the setting of targets could result in costly and time-consuming changes to the design and associated requirements. Similarly, addressing TS2 benefits and related targets as the design is being considered could influence design decisions and help identify early on how systems and processes might be affected.

In developing cost estimates for the first two phases of CADE 2, IRS did not disclose all excluded costs, provide a rationale for documented excluded costs, adjust for inflation, or perform a sensitivity analysis to examine the effects of changing assumptions and ground rules. IRS stated it would perform a sensitivity analysis in the revised estimates it expects to release by the completion of our audit.

To its credit, IRS has established a risk management process that is generally consistent with best practices and has identified mitigation strategies to address each identified risk. Several of the risks identified are significant and will require continued attention from IRS.

²⁵IRS, *CADE 2 Program TSI Contingency Strategy v. 1.1* (Nov. 1, 2010).

Recommendations for Executive Action

We recommend that the Commissioner of Internal Revenue direct the appropriate officials to take the following five actions:

- to provide a better basis for measuring CADE 2 performance in achieving TS1 benefits, set the remaining quantitative targets where feasible as soon as possible in 2011;
- in conjunction with developing the approach for TS2 expected in May 2011, finalize the phase's expected benefits, set quantitative targets where feasible, and identify how related systems and business processes might be affected; and
- to ensure the revised estimates for CADE 2 are credible,
 - include inflation when calculating costs,
 - include the costs IRS explicitly excluded or provide a rationale for excluding them, and
 - include any business costs associated with moving to daily processing or document that these costs were excluded and provide a rationale for excluding them.

Agency Comments and Our Evaluation

IRS's Commissioner provided written comments on a draft of this report (reprinted in app. IV.) In its comments, IRS stated that it appreciated that the report recognized the progress the agency had made and that it is following best practices on important disciplines like risk management and cost estimation. IRS also agreed with our recommendations and stated it would provide a detailed corrective action plan addressing each one along with its response to our final report. IRS also provided revised cost estimates for CADE 2 that address our finding related to the use of a sensitivity analysis.

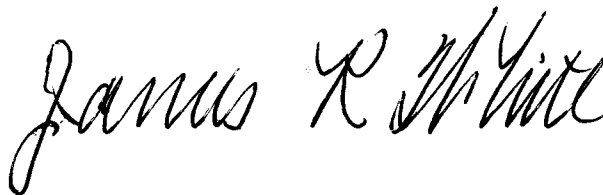
We are sending copies of this report to the appropriate congressional committees, and to the Chairmen and Ranking Members of other Senate and House committees and subcommittees that have appropriation, authorization, and oversight responsibilities for IRS. We will also send copies to the Commissioner of Internal Revenue, the Secretary of the Treasury, the Chairman of the IRS Oversight Board, and the Director of the Office of Management and Budget. The report also is available at no charge on the GAO Web site at <http://www.gao.gov>.

If you or your staff members have any questions or wish to discuss the material in this report further, please contact us at (202) 512-9286 or pownerd@gao.gov or at (202) 512-9110 or whitej@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made key contributions to this report are listed in appendix V.

Sincerely yours,



David A. Powner
Director, Information Technology
Management Issues



James R. White
Director, Tax Issues
Strategic Issues Team

Appendix I: Objectives, Scope, and Methodology

As agreed, our objectives were to

1. determine whether the Internal Revenue Service (IRS) has identified the expected benefits of Customer Account Data Engine (CADE) 2 and set targets for measuring success,
2. examine the estimated costs of CADE 2 and assess IRS's process for developing them, and
3. assess IRS's process for managing the risks associated with CADE 2 and describe the risks IRS has identified using this process.

For our first objective, we reviewed relevant documents, including the *CADE 2 Program Business Case and Benefits Management Plan*, and interviewed officials from IRS offices: Wage and Investment and Modernization and Information Technology Services (MITS). We also used criteria from our prior work to identify attributes of successful performance measures. We reviewed documents including the *Program Roadmap, Business Case and Benefits Management Plan*, and *Benefits Roadmap*, and the *Office of Management and Budget Exhibit 300*.

For our second objective, we summarized the estimated costs reported in the July 2009 *CADE 2 Estimate Summary/ Basis of Estimate* and totaled costs by year for each of the major categories for which estimates were developed. We reviewed several documents, including the July 2009 *CADE 2 Estimate Summary/ Basis of Estimate* and the *Estimation Breakdown Summary* reports and capabilities and solution concept documents (e.g., the *Integrated Master File Enhancements: Capabilities Definition and Solution Concept* document and the *Financial Settlement: Capabilities Definition and Solution Concept* document), which support the *Basis of Estimate*. We also reviewed IRS's *Estimators' Reference Guide* and aspects of the SEER-SEM methodology that was used to develop the estimates. We also interviewed staff from the Estimation Program Office, as well as members of the Program Management and Control function of the CADE 2 Program Management Office (PMO) responsible for tracking the program's cost. We compared what we learned with the 12 steps for developing well-documented, comprehensive, accurate, and credible cost estimates identified in the *GAO Cost Estimating and Assessment Guide*.¹

¹[GAO-09-3SP](#).

For our third objective, we reviewed documented procedures supporting the risk management process, including the *Risk and Issue Management Process*, the *Risk and Issue Management Plan*, the user guide for the Item Tracking Reporting and Control system that is used to track risks and the *MITS Risk Identification Procedure*. We also reviewed artifacts of the risk management process, including program risk logs and detailed risk reports. We participated in meetings in which risks were discussed and reviewed agendas and meeting minutes for others. We also interviewed several officials, including the CADE 2 Program Director, the Director of the CADE 2 PMO Program Management and Control office, and the Director of the CADE 2 PMO Delivery Management office. Through document reviews and interviews with appropriate officials, we also examined the following areas in greater depth: (1) schedule, (2) contractor oversight, (3) requirements management, (4) prototypes, and (5) human capital. We selected these areas because, based on our experience, they represent areas of risk or have been problematic for IRS in the past. In addition, we examined IRS's prototyping efforts to understand how the agency was using them to mitigate risks. We evaluated what we learned about IRS's risk management process against relevant criteria for Software Engineering Institute's Capability Maturity Model Integration (CMMI) to determine the effectiveness of the process.

To obtain background information on the program, we reviewed a host of documents developed by the CADE 2 PMO, including the *CADE 2 Program Charter*, *Solution Architecture*, *Program Roadmap*, *Program Management Plan*, the charters of the two CADE 2 transition state 1 projects (Daily Processing and Database Implementation), as well as governance team meeting minutes. We also observed CADE 2 meetings, conducted interviews with and received briefings from CADE 2 officials, including the IRS Chief Technology Officer, the Deputy Chief Information Officer for Strategy and Modernization, the Associate Chief Information Officer who serves as executive-in-charge of the CADE 2 program, and the Chief Architect of the CADE 2 program.

We conducted this performance audit from January 2010 to March 2011 primarily at the New Carrollton Federal Building in New Carrollton, Maryland, where the CADE 2 staff are located, and Atlanta, Georgia, where the Wage and Investment division staff are located, in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions

based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Appendix II: Additional Information about CADE 2 Benefits

Table 7 shows a list of benefits the IRS has defined to date for transition state 1 (TS1) and beyond, a related quantitative target for a benefit if applicable, and the transition state in which IRS expects to realize the benefit. According to IRS, defining which benefits will be delivered in transition state 2 (TS2) is contingent upon a number of decisions yet to be made and actual benefits may differ from those currently expected depending on the outcome of these decisions.

Table 7: CADE 2 Benefits

Benefit category	Benefit subcategory	Qualitative benefit	Quantitative target	Transition state
Taxpayer service benefits	Faster refunds and processing (four benefits)	Increase in the percentage of refunds identified for daily processing.	Increase the percentage of refunds for daily processing from 30 percent to 80 percent.	TS1
		Reduce interest paid on refund amount owed to taxpayer due to delays.	Reduce interest paid on taxpayer refunds to \$38.00 per 1 million dollars (i.e., the total refund interest divided by total refund dollars issued on original settlement).	TS1
		Increase in daily updates for Web based applications for individual taxpayers.	Increase refunds identified for refund processing to 100 percent.	TS1
		Increase in transactions processed daily.	Increase transactions processed daily to 100 percent compared to total IRS transactions identified for daily processing.	TS1
	Faster payment posting (one benefit)	Increase in taxpayer transactions for daily processing will result in faster payment posting.	Increase transactions posted daily to 80 percent of payment transactions which include payments with extensions, payments with returns and estimated payments.	TS1
	More efficient account adjustment (two benefits)	Increase in taxpayer transactions under a certain threshold that will result in daily posted adjustments to accounts.	Increase account adjustments processed daily to 80 percent compared to potential adjustment transactions.	TS1
		Reduce number of erroneous notices due to better account information.	Not identified.	TS2/target state
	Reduction in manual refunds (one benefit)	Improve IRS's ability to respond to a reduction in the number of manual refund requests as a result of daily processing.	Not identified.	TS1
	Updated account information (three benefits)	Reduce undelivered mail from quicker updates for taxpayer name and address changes.	Not identified. ^a	TS1
		Provide earlier viewing of posted information from daily updates to the Integrated Data Retrieval System (IDRS).	Provide daily updates of transactions that are viewable in IDRS within 48 hours (2 business days) after posting.	TS1

**Appendix II: Additional Information about
CADE 2 Benefits**

Benefit category	Benefit subcategory	Qualitative benefit	Quantitative target	Transition state
		Reduce labor intensive research on internal and external third party data.	Not identified.	TS2/target state
	Faster notices (one benefit)	Distribute notices earlier than legacy timeframes as a result of daily processing.	Increase of notices posted daily by 25 percent over CADE (2010) baseline.	TS1
	Systematic resolution (four benefits)	Reduce merge processing time of taxpayer accounts and data to support problem resolution.	Reduce time combining taxpayer information in CADE 2 by 50 percent.	TS1
		Improve refund time from better case selection using additional analytical tools.	Not identified.	TS2/target state
		Reduce process costs to IRS from reducing case closure by hand and improve accuracy (decrease in transposition errors, name control mismatch, etc.).	Not identified.	TS2/target state
		Provide timely refund from better case selection.	Not identified.	TS2/target state
Compliance benefits	Decreasing taxpayer overpayments (one benefit)	Improve account accuracy by decreasing the percentage of overpayments.	Not identified.	TS1
	Increasing taxpayer compliance (four benefits)	Modify automated filters during first few weeks of filing season based on analysis of tax returns filed early in the filing season.	Not identified.	TS2/target state
		Freeze erroneous tax refund, eliminating collection activity.	Not identified.	TS2/target state
		Implement a common module for penalty and interest calculation with documented standard posting rules.	Not identified.	TS2/target state
	Increasing tax preparer compliance (two benefits)	Modify automated filters during first few weeks of filing season based on analysis of preparers of tax returns filed early in the filing season.	Not identified.	TS2/target state
		Freeze erroneous tax refund, eliminating collection activity.	Not identified.	TS2/target state
	Improved audit case selection (three benefits)	Reduce no change rate, reduce taxpayer burden associated with unnecessary audits of compliant taxpayers, and increase yield per audit with more complete and timely data.	Not identified.	TS2/target state
		Apply advanced decision analytics earlier in collection process after first notice.	Not identified.	TS2/target state
		Assign cases to optimal treatment strategies at an earlier stage.	Not identified.	TS2/target state

**Appendix II: Additional Information about
CADE 2 Benefits**

Benefit category	Benefit subcategory	Qualitative benefit	Quantitative target	Transition state		
	Improved collection process (one benefit)	Apply advanced decision analytics earlier (after first notice) that can lead to increased revenue collection by routing audit cases earlier to the most effective treatment.	Not identified.	TS2/target state		
Other benefits	Reduce system maintenance costs (seven benefits)	Improve data cleanliness and integrity.	Improve distribution of data quality in the CADE database with target of weighted average of the critical categories; reduce the number of accounts with errors with target of 5 percent reduction below 2011 baseline.	TS1		
		Improve data quality: data library where all data is consistent, standardized, easy to understand and accurate.	Not identified.	TS2/target state		
		Reduce time and effort to produce data extracts.	Reduce number of requests for data extracts by 5 percent below 2011 baseline; reduce 50 percent below 701 extract baseline reports from the Individual Master File tapes in a given quarter.	TS1		
		Improve system maintainability.	Increase in percentage of production systems being monitored by automated monitoring and management systems with target of 100 percent.	TS1		
		Reduce operational complexity in processing accounts in one system.	Increase in percentage of individual taxpayer accounts that reside in relational database to a range of 96 percent to 99 percent, and reduce costs to zero for CADE production support; reduce hours spent to zero associated with CADE production support.	TS1		
		Reduce number of staff required to maintain multiple versions of the same functionality through deployment of common services.	Not identified.	TS2/target state		
		Consolidate case management system.	Not identified.	TS2/target state		
		Improved security (four benefits)	Improve centralized control of the data.	Reduce the number of databases at IRS that contain extracts of data by 20 percent below 2011 baseline.	TS1	
				Improve security processing.	Reduce number of issues identified in post production security audits from the past quarter. Target: High: 0 , Moderate:5-10, Low: N/A.	TS1
				Improve ability to track risk reduction to taxpayer data provided by security requirements and controls.	Not identified. ^a	TS1

**Appendix II: Additional Information about
CADE 2 Benefits**

Benefit category	Benefit subcategory	Qualitative benefit	Quantitative target	Transition state
		Secure data in motion between systems; deploy encryption solution for data in motion.	Not identified.	TS1
	Address financial material weakness (five benefits)	Improve compliance with Privacy and Disclosure policy and protection of personally identifiable information.	Not identified.	TS2/target state
		Address compliance with Federal Financial Management System Requirements to improve financial integrity, and reporting.	Not identified.	TS2/target state
		Develop financial settlement application.	Not identified.	TS2/target state
		Demonstrate incremental progress toward supporting financial requirements for a subsidiary ledger.	Not identified.	TS2/target state
		Demonstrate incremental progress toward addressing material financial weaknesses.	Not identified.	TS2/target state

Source: GAO analysis of IRS data.

*According to IRS officials, these benefits are not tangible and are not quantifiable.

Appendix III: CADE 2 Program Risks

The following (see table 8) are the IRS's reported CADE 2 program risks and their planned mitigation strategies as of November 2010.

Table 8: IRS Reported CADE 2 Risks and Mitigation Strategies

Risk	IRS description	Mitigation
Undocumented individual taxpayer processing business requirements	IRS's ability to rewrite Individual Master File individual taxpayer processing code in a modernized language to accurately reflect current business processing is dependent on thorough and well-documented business requirements.	For TS2, the business has created and implemented a harvesting plan to mitigate risks. The plan includes starting the harvesting requirements early and increasing the business resources to harvest business requirements.
TS1 contingency planning	If TS1 contingency planning and associated work efforts are not addressed in a timely manner, the CADE 2 program may not be able to exercise contingency options in the event that full TS1 is not ready for deployment in January 2012.	Presenting contingency options to governance boards and updating contingency or deployment strategies/plans will be based on decisions made by these boards.
Recovery time objectives—disaster recovery	Disaster recovery requirements for CADE 2 may not align with current enterprise disaster recovery capabilities and service level agreements, which may result in business impacts.	Modernization and Information Technology Services is working with key stakeholders to develop an enterprisewide disaster recovery strategy of which a piece of it is CADE 2. IRS will refocus CADE 2 disaster recovery specific needs to be aligned with the enterprisewide strategy.
Resource contention among IRS priorities	Filing season and other top IT investment priorities may result in resource contention for key resources.	Establishing a process for monitoring and updating the CADE 2 Staffing Strategy and Plan that includes understanding government staffing needs in Delivery Partner organizations.
Database extract, transform, and load prototype 2	If the database extract, transform, and load prototype results show that a component of the database process fails; then, an alternative design solution will need to be recommended for the timely completion of detailed design of the Database Implementation project.	The database extract, transform, and load work breakdown structure has included tasks to validate the resulting data and to perform analysis for a recommended course of action after each iteration is complete. The recommendation for go or no-go decision points is made based on that analysis performed.
Availability of FY 2011 funding	It is critical that the CADE 2 program obtain sufficient funds timely to successfully deploy the TS1 solution. If FY 2011 CADE 2 funding is not received within the first 3 months of FY 2011, the infrastructure for building out the production environment and disaster recovery for TS1 development may be in jeopardy.	Making a deliberate decision to manage the risk through financial operations control activities performed in conducting business operations.

Appendix III: CADE 2 Program Risks

Risk	IRS description	Mitigation
SharePoint performance	The CADE 2 program is using SharePoint as its primary mechanism for ensuring information and work products are available to key stakeholders. This increases the amount of time it takes to access, review, and act on CADE 2 information stored in SharePoint. If current SharePoint performance continues to be very slow, there will be an impact on the program's ability to effectively access key data.	Enterprise Services is assisting the CADE 2 Program Management Office (PMO) with moving all SharePoint content from the existing SharePoint 2003 site to a SharePoint 2007 site. This will improve the performance problems that generated this risk. The CADE 2 PMO is providing the necessary administrative access for Enterprise Services so that the SharePoint content can be moved.
Extract, transform, and load separate platform problem—data translation and data flow degradation	If there is not an alternative solution derived after the engineering alternative analysis study is completed to improve configuration of the extract, transform, and load on separate platforms and to improve the performance data translation/movement of data through transport stacks, the system data flow performance will be degraded putting the data flow process at risk.	Enterprise services is leading the CADE 2 extract, transform, and load Alternatives Analysis effort to address the risk associated with possible data flow degradation. As a result of this analysis, it has been recommended not to pursue any of the alternatives to replace Electronic File Transfer Utility.
Database implementation challenges	The Database Implementation project faces many challenges as the IRS moves toward establishing an authoritative relational database. These challenges include a number of technical hurdles and risks that were revealed as part of the recent extract, transform, and load prototyping efforts.	Establishing a dedicated CADE Database Implementation project team with end-to-end responsibility for delivery of the database software component.
Requirements maturity	The successful implementation of the CADE 2 solution is very dependent on a solid set of baselined requirements. If the deficiencies identified in the current state of requirements are not corrected in a timely manner, then, the delivery of CADE 2 TS1 may be delayed.	Identifying the list of requirement deficiencies and assigning a working group to validate corrective actions, assigning ownership, and developing an implementation plan for completing each correction action.

Source: IRS.

Appendix IV: Comments from the Internal Revenue Service



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

March 10, 2011

Mr. David Powner
Director, Information Technology Management Issues
U.S. Government Accountability Office
441 G Street, NW
Washington, DC 20548

Dear Mr. Powner:

Thank you for the opportunity to comment on the draft report, *Taxpayer Account Strategy: IRS Should Finish Defining Benefits and Improve Cost Estimates* (GAO-11-168). Completion of the core taxpayer account database is a top priority for the IRS, and I continue to appreciate the valuable feedback that the GAO team has provided along the way. The IRS's technology infrastructure runs the tax filing season every year for approximately 140 million individual taxpayers, and manages the distribution of over \$300 billion in refunds. It is critically important that we make appropriate investments to maintain this important part of the United States' economic infrastructure.

I appreciate that your report recognizes the progress that the IRS has made, and that we are following best practices on important disciplines like risk management and cost estimation.

Even as we continue to make great progress, we can always do better. We agree with your recommendations for improvement, and will provide a detailed corrective action plan addressing each of the recommendations with our response to the final report. In fact, we have already acted on one of your recommendations related to the use of a sensitivity analysis on our cost estimates. We completed the CADE 2 Revised Basis of Estimate shortly after completion of your audit, which includes both a sensitivity analysis and a summary of the differences between the early Milestone 0 Basis of Estimate and the revised Basis of Estimate (at Milestone 3).

We appreciate your continued support and guidance. If you have any questions or would like to discuss our response, please contact Terence V. Milholland, Chief Technology Officer, at (202) 622-6800.

Sincerely,

A handwritten signature in black ink, appearing to read "D. Shulman".

Douglas H. Shulman

Appendix V: GAO Contacts and Staff Acknowledgments

GAO Contacts

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Staff Acknowledgments

In addition to the individuals named above, Sabine R. Paul, Assistant Director; Joanna Stamatiades, Assistant Director; Rebecca Eyler; Mary D. Fike; Nancy Glover; Sairah R. Ijaz; Robert Kershaw; Paul B. Middleton; John Ockay; and Jennifer Wong made key contributions to this report.

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