

TREASURY INSPECTOR GENERAL FOR TAX ADMINISTRATION



The Individual Tax Processing Engine Project's Estimation Methodology Aligns with Best Practices and the Project Addressed the Independent Verification and Validation Recommendations

March 30, 2022

Report Number: 2022-25-029

HIGHLIGHTS: The Individual Tax Processing Engine Project's Estimation Methodology Aligns with Best Practices and the Project Addressed the Independent Verification and Validation Recommendations

Final Audit Report issued on March 30, 2022

Report Number 2022-25-029

Why TIGTA Did This Audit

The Customer Account Data Engine 2 (CADE 2) Program is one of the most complex modernization programs in the Federal Government and involves major changes to core IRS tax processing systems. CADE 2 is being developed via multiple transition states and a target state. The primary goal of Transition State 2 is to reengineer core components of the Individual Master File.

The Individual Tax Processing Engine project is converting lines of legacy Assembly Language Code to Java, a modern software language. The code conversion is a major milestone towards retiring the Individual Master File.

This audit was initiated to determine whether the methodology to estimate the Individual Tax Processing Engine project's velocity, *i.e.*, productivity, and delivery dates was effective and to follow up on the implementation of the independent verification and validation recommendations.

Impact on Tax Administration

The CADE 2 Program is intended to provide state-of-the-art individual taxpayer account processing as well as data-centric technologies to improve service to taxpayers.

However, deployment delays and cost overruns can decrease stakeholder and public confidence in the IRS's ability to develop, monitor, and use its resources effectively to deliver improved taxpayer services.

What TIGTA Found

The IRS has taken steps to improve the process for estimating the development time required to convert lines of code from Assembly Language Code to Java. The IRS established a Trajectory Model to track and monitor the Individual Tax Processing Engine project's velocity, *i.e.*, productivity. The Trajectory Model was initially updated after the completion of every third product increment, a period of 30 weeks. In October 2020, the IRS began updating the Trajectory Model after every product increment, a period of 10 weeks, because the models were being used on a more frequent basis to track Individual Tax Processing Engine project progress.

The methodology used in the Trajectory Model to estimate project velocity is consistent with industry best practices. The methodology is based on the number of project resources at each skill level, the expected code conversion output per week at each skill level, and the number of weeks in a product increment.

On July 1, 2019, Congress passed the Taxpayer First Act that required the IRS to complete the development of plans for all other phases of the CADE 2 Program by July 1, 2020. The Taxpayer First Act also required that an independent contractor complete the verification and validation of the CADE 2 implementation plans.

In July 2020, the independent contractor's report made three recommendations to reduce risk and increase the likelihood of success for the CADE 2 Program's Individual Tax Processing Engine project. The independent contractor recommended that the CADE 2 Program Management Office should 1) implement a more rigorous strategy around unit test coverage and data; 2) make a concerted effort to externalize business rules where possible; and 3) resolve the disconnected approach between the Applications Development and the Enterprise Systems Testing functions for scenario testing. The IRS addressed two of these recommendations and the other is in progress. The IRS established and met the unit testing coverage goal of 80 percent and coordinated with the Information Technology functions to identify and implement a new testing approach to replace scenario testing. Currently, the IRS is in the process of completing activities to document business rules.

What TIGTA Recommended

TIGTA made no recommendations as a result of the work performed during this audit. IRS management reviewed this report prior to its issuance and agreed with the facts and conclusions presented.



TREASURY INSPECTOR GENERAL
FOR TAX ADMINISTRATION

U.S. DEPARTMENT OF THE TREASURY

WASHINGTON, D.C. 20220

March 30, 2022

MEMORANDUM FOR: COMMISSIONER OF INTERNAL REVENUE

A handwritten signature in blue ink that reads "Michael E. McKenney".

FROM: Michael E. McKenney
Deputy Inspector General for Audit

SUBJECT: Final Audit Report – The Individual Tax Processing Engine Project’s Estimation Methodology Aligns with Best Practices and the Project Addressed the Independent Verification and Validation Recommendations (Audit # 202120016)

This report presents the results of our review to determine whether the methodology to estimate the Individual Tax Processing Engine project’s velocity and delivery dates was effective and to follow up on the implementation of the Independent Verification and Validation recommendations. This review is part of our Fiscal Year 2022 Annual Audit Plan and addresses the major management and performance challenge of *Modernizing IRS [Internal Revenue Service] Operations*.

Copies of this report are also being sent to the IRS managers affected by the information in the report. If you have any questions, please contact me or Danny R. Verneuille, Assistant Inspector General for Audit (Security and Information Technology Services).

Table of Contents

[Background](#).....Page 1

[Results of Review](#)Page 2

[The Trajectory Model's Estimation Methodology Aligns with Best Practices](#)Page 2

[Two of the Independent Verification and Validation Recommendations Were Addressed and One Is in Progress](#).....Page 5

Appendices

[Appendix I – Detailed Objectives, Scope, and Methodology](#).....Page 10

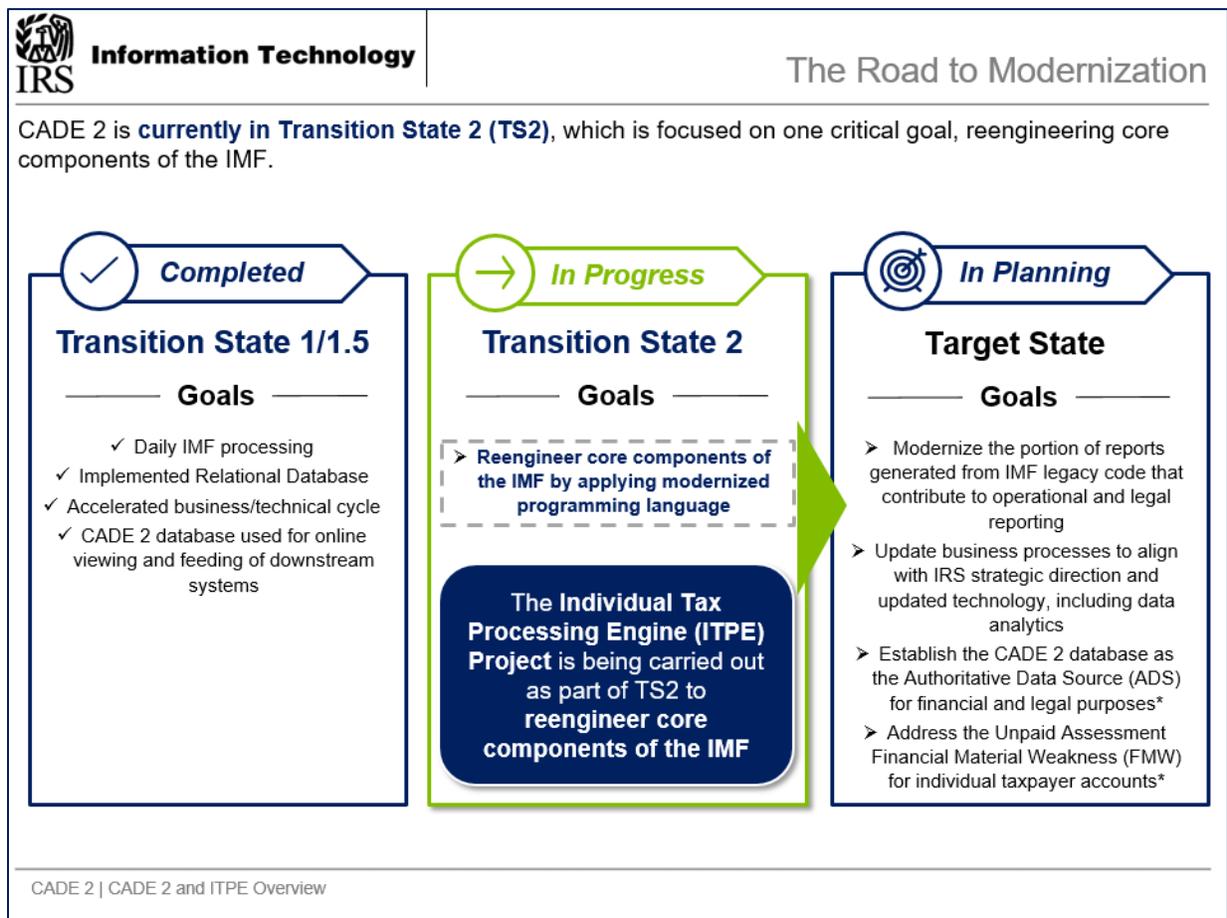
[Appendix II – Glossary of Terms](#).....Page 11

[Appendix III – Abbreviations](#).....Page 13

Background

The Customer Account Data Engine (CADE) 2 Program is one of the most complex modernization programs in the Federal Government and involves major changes to core Internal Revenue Service (IRS) tax processing systems. CADE 2 is a relational database¹ that contains data from the Individual Master File (IMF) and is intended to provide state-of-the-art individual taxpayer account processing as well as data-centric technologies to improve service to taxpayers. In order to limit risk and demonstrate incremental progress toward the target solution, the IRS created the transition states presented in Figure 1. The CADE 2 Program is currently progressing through the largest and most critical transition state: Transition State 2. The primary goal of Transition State 2 is to reengineer core components of the IMF, written in an old programming language called Assembly Language Code, into a modern programming language (Java²). In April 2016, the IRS chartered the CADE 2 Individual Tax Processing Engine (ITPE) project to update the IMF's programming language.

Figure 1: CADE 2 Transition States



Source: CADE 2 and ITPE Overview dated July 17th, 2019.

¹ See Appendix II for a glossary of terms.

² Java is an IRS-wide development preference.

The IRS has taken steps to improve the process for estimating the development time required to convert lines of code (LOC) from Assembly Language Code to Java. At the outset of the ITPE project, the IRS identified the complexity of the IMF Assembly Language Code containing several irregular coding conventions that do not exist in modern programming languages as a constraint. The IRS chose LOC as the method to estimate the size of the ITPE development effort. There are 214,000 LOC to convert for the entire ITPE project. To measure progress, the IRS monitors the ITPE velocity, *i.e.*, productivity, by comparing planned LOC work to actual work completed.

On July 1, 2019, Congress passed the Taxpayer First Act³ that required an independent contractor to complete the verification and validation of the CADE 2 implementation plans by July 1, 2020. The verification and validation shall include the performance milestones and cost estimates included in such plans.

In August 2019, the CADE 2 Program Management Office worked with a contractor to create the CADE 2 Program Management Office Trajectory Model (hereafter referred to as the Trajectory Model). In September 2019, the CADE 2 Program Management Office used data from prior product increments⁴ to update the Trajectory Model to estimate the Assembly Language Code LOC conversion for each product increment, starting with Product Increment-9.⁵ Due to completing an extensive analysis to account for the ITPE project's complexity and capturing all required work, and using an updated Trajectory Model, the IRS determined that the development end date for ITPE should be moved from August 2021 to September 2022. In addition, in July 2020, the independent contractor hired to perform the verification and validation review required by the Taxpayer First Act completed its report titled *Independent Verification & Validation of the CADE 2 Program – Final Report* (hereafter referred to as the IV&V report).

Results of Review

The Trajectory Model's Estimation Methodology Aligns with Best Practices

The IRS established a Trajectory Model to track and monitor the ITPE project's velocity. The Trajectory Model was initially updated after the completion of every third product increment, a period of 30 weeks. In Product Increment-15,⁶ the CADE 2 Program Management Office began updating the Trajectory Model after every product increment, a period of 10 weeks, because the models were being used on a more frequent basis to track project progress. In August 2020, the CADE 2 Program Management Office conducted an impact analysis and extended the ITPE development end date from September 2022 to April 2023. This seven month extension was

³ Pub. L. No. 116-25, 133 Stat. 981.

⁴ Date range for the prior product increment (Product Increment-6, -7, and -8): February 6, 2019, through September 3, 2019.

⁵ September 4, 2019, through November 12, 2019.

⁶ October 28, 2020, through January 5, 2021.

The Individual Tax Processing Engine Project's Estimation Methodology Aligns with Best Practices and the Project Addressed the Independent Verification and Validation Recommendations

due to resources that were permanently realigned to support the Coronavirus Aid, Relief, and Economic Security Act⁷ legislation and Filing Season 2021.

We reviewed the methodology used in the Trajectory Model to estimate project velocity and determined that it is consistent with industry best practices. The Trajectory Model's methodology is based on the number of resources at each skill level, the expected output per week at each skill level, and number of weeks in a product increment. The Project Management Institute⁸ defines six basic model inputs required to effectively manage project estimates. Figure 2 lists the six basic inputs with their descriptions and how the Trajectory Model accounts for each.

Figure 2: Trajectory Model Inputs

Inputs From Project Management Institute Standards	Input Description	How Inputs Were Applied in the Trajectory Model
Baseline Estimates	An approved plan for the project.	The ITPE team developed the baseline estimate. The Trajectory Model compares the projected and actual output with the baseline estimate.
Approved Changes To Baseline	Approved changes to project scope, modify budget, revise schedules, or change project team.	The Chief Information Officer approves baseline changes and the ITPE project team updates the assumptions and resources in the Trajectory Model.
Resource Plan	How human resources are defined, staffed, managed, controlled, and released.	The Trajectory Model maintains the ITPE project resources and their associated skill levels and projected outputs.
Work Performance Information	The actual amount of time and costs associated with achieving the project objectives.	Actual output is recorded in each update to the Trajectory Model.
Organizational Process Assets	The knowledge base or process asset library that contains the approved methodologies, processes, procedures, and templates used for managing the scheduling, costs, and resource estimates.	The Trajectory Model's assumptions contain the reference data used to create the ITPE velocity projections and the impact that resources will have on LOC conversions.

⁷ Pub. L. No. 116-136, 134 Stat. 281 (2020).

⁸ Project Management Institute, *Project Management Institute Practice Standard for Project Estimating* (2011).

The Individual Tax Processing Engine Project's Estimation Methodology Aligns with Best Practices and the Project Addressed the Independent Verification and Validation Recommendations

Inputs From Project Management Institute Standards	Input Description	How Inputs Were Applied in the Trajectory Model
Project Estimating Approach	Defines the approach for managing and monitoring the project estimates and forecasts.	This occurs outside the Trajectory Model. The CADE 2 ITPE project team meets to assess the impact of legislation, reallocation of resources, and other events on the ITPE project.

Source: Treasury Inspector General for Tax Administration analysis based on Project Management Institute guidance, discussions with CADE 2 and ITPE project management, and information contained in the Trajectory Model.

The standards also describe three activities that should be applied to initial and revised estimates:

- Apply actuals.
- Review and control.
- Re-estimate.

These activities are accomplished in the Trajectory Model updates that are completed after every product increment. The CADE 2 Program Management Office updates the actual outcomes for each product increment and the current resource list and skill level and validates the assumptions used to estimate the project trajectory.

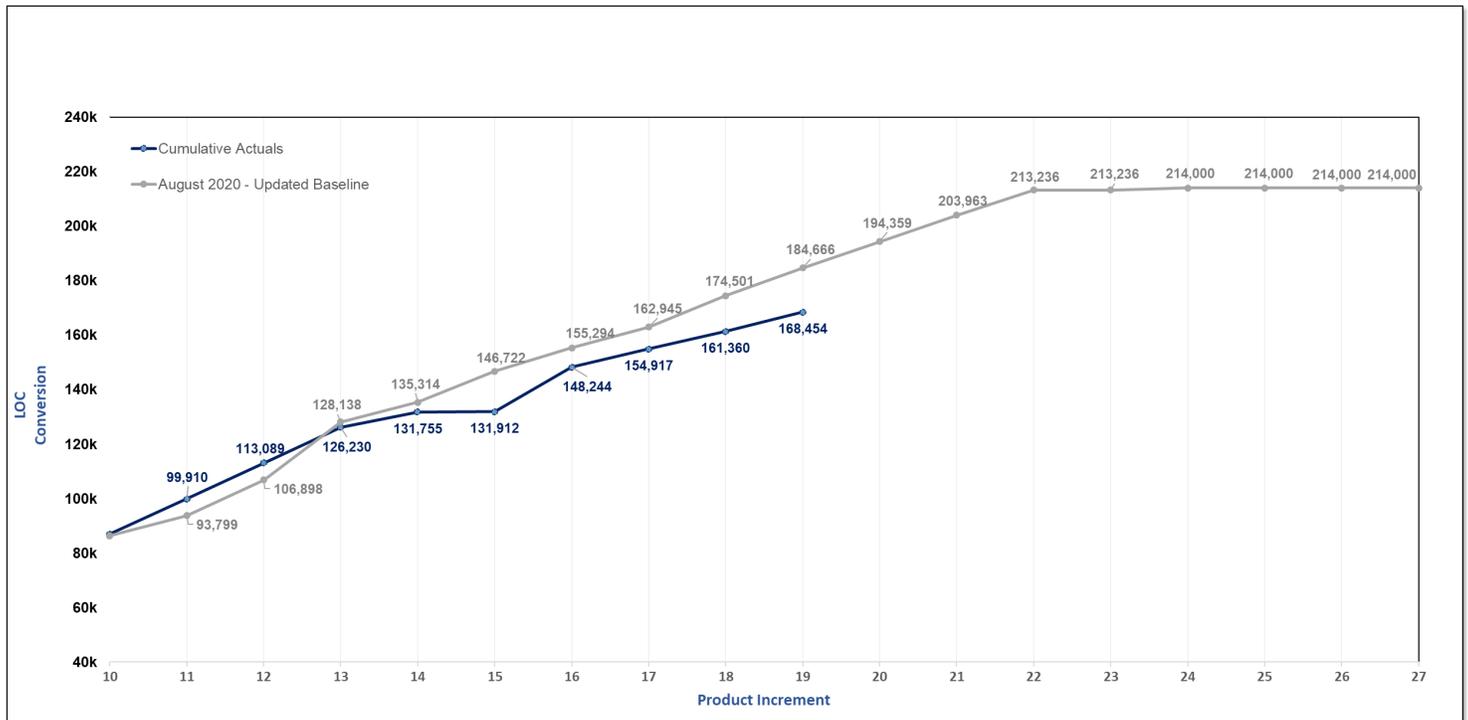
We reviewed the models for Product Increment-14 through Product Increment-19⁹ and found that an incorrect formula was used to calculate the work to be completed. We discussed the issue with the IRS and determined that the incorrect formula was used due to a copy and paste error.

Management action: The IRS performed a comprehensive review of all formulas in the Trajectory Model and corrected the errors. The IRS stated that going forward it will have a secondary reviewer validate the formula updates.

Despite the error and the corrections made, the overall project development end date was not affected. In addition, according to the Trajectory Model, at the end of Product Increment-19, the ITPE project team had converted 168,454 (78.7 percent) of 214,000 total LOC. Figure 3 shows the comparison of the cumulative actuals to the current baseline projection.

⁹ August 19, 2020, through October 12, 2021.

Figure 3: Comparison of Cumulative Actuals to Baseline Projection



Source: IRS Trajectory Model dated October 15, 2021, for Product Increment-19 (August 4, 2021, through October 12, 2021).

We interviewed the IRS to determine why the project is falling short of meeting the baseline LOC target since Product Increment-13.¹⁰ According to the IRS, the gap between the projected baseline LOC and actual cumulative LOC exists due to the reprioritization of resources to support Coronavirus legislation, filing season activities, and preparation for High Volume Functional Testing (HVFT). The chart was intended to highlight significant gaps so that the IRS can apply mitigating efforts to meet the project development end date. The IRS further stated that it is confident that the gap will close based on several adjustments being worked. The mitigating efforts include adding additional contractor support to the ITPE project, the reprioritization of resources that were reassigned from the ITPE project to support other priorities, and the continuing development of current staff.

Two of the Independent Verification and Validation Recommendations Were Addressed and One Is in Progress

In response to the Taxpayer First Act, the IRS contracted a third party to conduct an independent review of the CADE 2 Program's ITPE project. In July 2020, the independent contractor completed its review and made the following three recommendations in the IV&V report to reduce risk and increase the likelihood of success for the ITPE project:

- Implement a more rigorous strategy around unit test coverage and data.
- Make a concerted effort to externalize business rules where possible.

¹⁰ June 10, 2020, through August 18, 2020.

- Resolve the disconnected approach between the Applications Development and the Enterprise Systems Testing functions for scenario testing.

The IV&V report stated that, if these recommendations were not addressed, the ITPE project will carry significant cost and timeline risk into the final stages of parallel validation.

Unit test coverage and data

According to the IV&V report, parallel validation and final performance testing occur at the end of the program; therefore, rigorous unit testing is imperative to prevent scheduled production date slippage. Identifying defects during unit testing is crucial to avoid a strain on the schedule at the end of the program. For the ITPE project, in early Calendar Year 2020, unit testing coverage was below industry standards (approximately 45 percent versus 80 percent). As of April 2020, unit testing relied on developer-simulated data rather than disguised real data. The independent contractor suggested the following actions to address the recommendation:

- Chart a path to sufficient unit test coverage by making increasing code coverage a priority in sprint planning.
- Continue regular testing coverage checks.
- Escalate the decision surrounding the use and storage of live data for unit and block-level testing (following Cybersecurity function guidelines).

We determined that the IRS addressed this recommendation. ITPE project management established a goal to unit test 80 percent of the code. The ITPE project began meeting the goal in May 2021 and last reported in an ITPE status report dated October 4, 2021, that the project has continued to meet or exceed the 80 percent test code coverage goal.¹¹ Test code coverage is no longer reported in ITPE status reports. However, the CADE 2 Program Management Office stated that the Applications Development function implemented a process to regularly review the test code coverage percentages. If the test code coverage drops below the goal, the Applications Development function will notify the CADE 2 Program Management Office. The IRS provided evidence supporting that the ITPE project met or exceeded the 80 percent test code coverage goal from November 2021 through January 2022. ITPE project management also requested permission to use live taxpayer data in their test software; however, that request was denied due to insufficient controls to protect live taxpayer data in the test software.

We also reviewed information about the software used to determine and report unit testing code coverage and found that it is compatible with the Java programming language. The software is also included in a repository of information technology products approved for use by the Information Technology organization.

Externalizing business rules

The IV&V report stated that the complex code architecture will make interpreting, changing, and tracing rules nearly as cumbersome as it is today in the current legacy system. With business rules embedded in Java, the system is highly complex and will be difficult to maintain in the long term without some way to reduce the complexity of the solution architecture. To address this concern, the IV&V report recommended that the ITPE project expand on the early experiment

¹¹ As of January 4, 2022, the October 2021 report was the most current available.

externalizing business rules.¹² The IRS decided to continue the experiment and determined that there was a need for requirements documentation for both short- and long-term ITPE maintainability.¹³ The short-term focus is on converting IMF Runs 12 and 15¹⁴ from Assembly Language Code to Java.

The ITPE project documented a risk report in the Item Tracking Reporting and Control system to address the short-term maintainability concerns that were identified in the IV&V report. The risk report stated that, if the ITPE project does not have sufficient requirements management documentation in time to support parallel validation and deployment into Production, then the IRS will not be prepared to effectively implement system changes (*e.g.*, Filing Season, legislative changes) and manage production system incidents for the short-term ITPE maintainability.

Figure 4 lists six actions to address this risk and their status.

Figure 4: Action Items to Address ITPE Short Term Maintainability

ID	Action/Management Plan	Status	Scheduled Start	Actual Start	Scheduled Completion
1	Identify documentation use cases and perform an environmental scan of current and planned artifacts.	Complete	9/1/2020	9/1/2020	10/5/2020
2	Conduct an analysis to identify the documentation needs and proposed approach to support maintenance of ITPE in parallel validation and Production.	Complete	10/7/2020	10/7/2020	5/18/2021
3	Finalize recommendation on the ITPE maintainability approach and how to resolve documentation gaps (if applicable) to support parallel validation and Production and update project requirements plan.	Complete	5/14/2021	5/14/2021	8/30/2021
4	Stand up a team dedicated to work with IMF to learn/practice the Unified Work Request implementation process beginning with Filing Season 2022 and conduct Table Top to identify any gaps.	In Progress	5/3/2021	5/3/2021	4/15/2022
5	Implement/incorporate traceability to the requirement documentation to support ITPE maintainability (<i>e.g.</i> , Program Requirements Package).	Work started	8/2/2021	8/2/2021	3/18/2024

¹² Externalizing business rules means that instead of including the business rules in the Java program code, the business rules would be written as a separate program or described in a way that can be understood and managed by non-Java developers.

¹³ The ease with which software code can be repaired, improved and understood.

¹⁴ These are programs that perform the core IMF business functions of Posting, Settlement, and Analysis, and are the most complex IMF programs.

The Individual Tax Processing Engine Project's Estimation Methodology Aligns with Best Practices and the Project Addressed the Independent Verification and Validation Recommendations

ID	Action/Management Plan	Status	Scheduled Start	Actual Start	Scheduled Completion
6	Conduct checkpoint to measure development progress of implementing the requirements traceability in preparation for parallel validation and confirm CADE 2 Requirements Engineering team documented the approach in the ITPE Requirements Management Plan.	Not started	8/28/2022	To Be Determined	9/27/2022

Source: Risk report information provided by ITPE management and the Item Tracking Reporting and Control system report for Risk #35856 dated November 5, 2021.

We met with ITPE project management and reviewed the Item Tracking Reporting and Control system risk report, and we determined that the actions to address this recommendation are in progress. We reviewed the project documentation and confirmed that three of the six planned actions to address this recommendation are completed.

Functional coordination for scenario testing

The IV&V report stated that the Applications Development and the Enterprise Systems Testing functions are working in two different ways. The Enterprise Systems Testing function uses a waterfall approach¹⁵ and requires upfront information on scenarios to prepare for scenario testing (*e.g.*, ensure adequate resources, prepare data) prior to performing scenario testing. However, the Applications Development function's code conversion process is based on an iterative development approach whereby scenarios are defined throughout the program.

When the IV&V report was issued in July 2020, it stated that mitigations for this risk were in process but not yet complete. For example, the ITPE team, including the CADE 2 Program Management Office and the Applications Development and Enterprise Systems Testing functions, started building a scenario test roadmap for all the scenarios that need to be tested. The August 17, 2021, ITPE Chief Information Officer Briefing stated that the ITPE project planned to transition from a pure scenario-based testing approach to a more robust HVFT approach. The HVFT approach is a new test type that combines functional and high-volume testing to test code quality and collect performance benchmark metrics. The HVFT is a compare-based approach (*i.e.*, IMF Assembly Language Code and Java outputs are compared) to test system functionality and performance that is more in line with what is needed for parallel validation in the future.

The planning and preparation phase of the HVFT is underway. This new approach should address many of the concerns raised during the IV&V review regarding differing expectations for scenario testing.

The HVFT is conducted in two stages:

- Stage I – Preparation and Validation is the initial test validation of low-volume data to help establish testing procedures and discover methods for reporting metrics in the next stage.

¹⁵ A sequential development of a solution with planned reviews and formal approvals required before continuation of work; evolves through a planned progression of successive levels from logical design to development, and then solution components are developed.

The Individual Tax Processing Engine Project's Estimation Methodology Aligns with Best Practices and the Project Addressed the Independent Verification and Validation Recommendations

- Stage II – Formal Execution is the execution and comparison of Assembly Language Code Run 12 and Java Run 12. It is planned to begin when the established entry criteria are met.

For Run 12, HVFT Stage I (Preparation and Validation) began on October 5, 2020. Stage II began November 1, 2021.

To achieve this goal and address the IV&V recommendation, ITPE project management stated that the following activities were completed:

1. The IRS conducted collaboration and testing workshops to align the Applications Development and the Enterprise Systems Testing functions' expectations for scenario testing. They formed a working group to analyze three approaches to improve the collaboration between the Applications Development and the Enterprise Systems Testing functions. This working group identified HVFT as the best approach to streamline testing processes and maximize use of resources.
2. The ITPE project developed a Run 12 Scenario Delivery Roadmap to provide more insight on planned drops from the Applications Development function to the Enterprise Systems Testing function and to facilitate the Enterprise Systems Testing function's planning and scheduling of scenario testing. In September 2020, the ITPE team also developed a Run 15 Scenario Delivery Roadmap to provide an understanding of the execution plan, including user story¹⁶ generation, sequencing of capabilities and functional grouping, and initial testing of identified scenarios.
3. The ITPE project transitioned on November 1, 2021, to HVFT to address the approach for testing more complex scenarios.

We met with ITPE management and reviewed the Roadmaps and ITPE status reports. The ITPE status reports state that HVFT Stage I for Run 12 was implemented and that the Applications Development and the Enterprise Systems Testing functions participated in the testing workshops and collaborative meetings. The Roadmaps included the methodology, assumptions on how they were created, purpose, and/or intended outcomes. Based on the actions taken and processes implemented, we determined that the IRS addressed this IV&V recommendation.

¹⁶ Short, simple descriptions of a need told from the perspective of the person who desires the new functionality, usually a user or customer of the system.

Appendix I

Detailed Objectives, Scope, and Methodology

Our overall objectives were to determine whether the methodology to estimate the ITPE project's velocity and delivery dates was effective and to follow up on the implementation of the IV&V recommendations. To accomplish our objectives, we:

- Compared the Trajectory Model inputs to the Project Management Institute Standard for Estimating inputs, interviewed IRS personnel to gain an understanding of the formulas and identify the factors that affected the estimated development end date, and recalculated the Trajectory Model formulas to verify their accuracy to determine the effectiveness of the methodology to estimate the ITPE Project's velocity and delivery dates.
- Interviewed IRS personnel and reviewed documents such as ITPE status reports, test code coverage reports, plans for scenario testing, and plans for documenting business rules to determine the status of corrective actions to the independent contractor's IV&V report recommendations and the extent to which those actions are sufficient and complete.

This review was performed with information obtained from the ITPE Project Management Office in New Carrollton, Maryland, and Austin, Texas, during the period April 2021 through February 2022. We conducted this performance audit in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Major contributors to the report were Danny Verneuille, Assistant Inspector General for Audit (Security and Information Technology Services); Jena Whitley, Director; Khafil-Deen Shonekan, Audit Manager; Tina Wong, Lead Auditor; and Jamillah Hughes, Senior Auditor.

Internal Controls Methodology

Internal controls relate to management's plans, methods, and procedures used to meet their mission, goals, and objectives. Internal controls include the processes and procedures for planning, organizing, directing, and controlling program operations. They include the systems for measuring, reporting, and monitoring program performance. We determined that the following internal controls were relevant to our audit objectives: the policies, procedures, and best practices related to estimating information technology projects and addressing recommendations from prior reviews. We evaluated these controls by interviewing IRS employees and a contractor and reviewing project documentation and executive status reports. We also reviewed and analyzed multiple iterations of the Trajectory Model.

Appendix II

Glossary of Terms

Term	Definition
Block-Level Testing	Determines whether the programming code meets its intention during unit testing.
Data-Centric	An architecture where data is the primary and permanent asset, and applications come and go. In the data-centric architecture, the data model precedes the implementation of any given application and will be around and valid long after the application is gone.
Individual Master File	The IRS database that maintains transactions or records of individual tax accounts.
Item Tracking Reporting and Control System	Used to track and report on issues, risks, and action items.
Iterative Development Approach	An adaptive development approach in which projects start with initial planning and end with deployment, with repeated cycles of requirements discovery, development, and testing in between. It is a more flexible and adaptable process than traditional sequential development approaches.
Legacy	In the context of computing, it refers to outdated computer systems, programming languages, or application software that are used instead of more modern alternatives.
Parallel Validation	Compares legacy IMF output with the output generated by the Java code for Runs 12 and 15 and will occur prior to the ITPE moving into production.
Product Increment	The ITPE project is broken down into product increments. Each product increment is comprised of five two-week sprints, totaling 10 weeks in duration.
Relational Database	A collection of data items organized as a set of formally described tables from which data can be accessed or reassembled in many different ways without having to reorganize the database tables.
Scenario	Defines an end-to-end set of building blocks that implement a business result.
Trajectory Model	Captures the progress on the LOC and framework that need to be completed and projects future conversion velocity based on factors that affect development.
Unit testing	Ensures that program modules perform in accordance with requirements.
User Story	Short, simple descriptions of a need told from the perspective of the person who desires the new functionality, usually a user or customer of the system.
Velocity	Measurement of how much work can be completed in each product increment iteration.

**The Individual Tax Processing Engine Project's Estimation Methodology Aligns with Best Practices
and the Project Addressed the Independent Verification and Validation Recommendations**

Term	Definition
Waterfall Path	A sequential development of a solution with planned reviews and formal approvals required before continuation of work; evolves through a planned progression of successive levels from logical design to development, and then solution components are developed.

Appendix III

Abbreviations

CADE	Customer Account Data Engine
HVFT	High Volume Functional Testing
IMF	Individual Master File
IRS	Internal Revenue Service
ITPE	Individual Tax Processing Engine
IV&V	Independent Verification and Validation
LOC	Lines of Code



**To report fraud, waste, or abuse,
call our toll-free hotline at:**

(800) 366-4484

By Web:

www.treasury.gov/tigta/

Or Write:

Treasury Inspector General for Tax Administration

P.O. Box 589

Ben Franklin Station

Washington, D.C. 20044-0589

Information you provide is confidential, and you may remain anonymous.