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SUBTASK 4.7 REPORT

EVALUATION OF PIMS MODEL DEVELOPMENT, MODIFICATION AND REFINEMENT

One of Three 12-Month Reports

IN-DEPTH TECHNICAL REVIEW OF PENSION BENEFIT GUARANTY CORPORATION'S MULTIEMPLOYER AND SINGLE-EMPLOYER PENSION MODELS

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Contents

Introduction

In July 2015, the Social Security Administration (SSA) engaged the FTI Consulting team (FTI) to conduct an 18-month, in-depth technical review of the Pension Benefit Guaranty Corporation's (PBGC) single-employer (SE) and multiemployer (ME) Pension Insurance Modeling System (PIMS). Task 4 of the Statement of Work (SOW) consists of 10 subtasks required for this in depth review - nine specific areas of review and a final report.[1] Three of the subtask reports are due at the end of each of the six, 12- and 18-month periods. This report for Subtask 4.7, along with those for Subtasks 4.2 and 4.3, is one of the three reports due at the end of the 12-month period (with approved extension). As a part of our review of PIMS, this report documents our evaluation of the process of model development, modification, and refinement.

The process of model development, modification and refinement (which we will refer to as "program change management") is important because it enables PIMS to evolve and improve over time in response to trends in pension plans, additional data sources, federal regulations, and premium increases. A defined program change management process is also critical to enforce adherence to organizational policies intended to provide reasonable assurance that changes to information system resources are authorized, tested and approved to mitigate the risk of unauthorized or unintended changes. This report presents FTI's review of the PIMS program change management process which encompassed how PIMS changes are identified, evaluated, prioritized, developed, tested, monitored and approved for implementation to production.[2]

As part of documenting our evaluation of the program change management process for PIMS, this report also addresses the following key questions raised in Subtask 4.7:

1. Is there a process in place for putting priorities on improvements and checking the robustness of the model as corrections are made?
2. When the models are improved, is there an accounting of the effects of the change? For example, how much do the changes affect the current projections report?
3. Are there procedures in place for routinely updating the documentation as the models are refined?
4. What should PBGC learn from the development and refinement process of comparable models?

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[1] Social Security Administration, Evaluation of the Pension Benefit Guaranty Corporation's Pension Models, Description/Specification/Work Statement, page 14.

[2] Based upon our conversation with PBGC personnel, the PIMS program change management process is the same for both the Single-Employer model (SE-PIMS) and Multiemployer Model (ME-PIMS) so the term PIMS will be used collectively for both.

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Findings

During our review of the PIMS change management process and related documentation, we found that not all aspects of the process were formally defined and that evidence to support the process was not maintained. Specifically, we found no formally defined process to capture bug fixes and enhancements needed for PIMS. Meetings are held between the Director of the Policy, Research, and Analysis Department (PRAD), and the Division Manager of the Pension Insurance Modeling Division to evaluate and debate potential changes. However, there is no formal assessment or rationale documented for why certain changes were selected for development above others. Requests for changes are submitted via email, reviewed during the meetings, and are tracked in multiple spreadsheets. Additionally, documentation to support comprehensive system integration testing for PIMS releases did not contain a listing of changes included in the release or formal evidence of sign-off from key stakeholders. Based on our review we recommend the following actions be taken by the PBGC, which we have ordered by priority of correction:

1. PRAD should formally track bug fixes and enhancements by leveraging the existing change control ticketing application and workflow used for other General Support Systems at the PBGC. As this is an existing process and system, the cost should be minimal.
2. Ad hoc report requests that require changes to the PIMS code should be included in the change management process, even if those changes are not implemented with the next release.
3. The PBGC should consider including the Statistical Analysis Software (SAS) pre/post processing code in the PIMS change management and security process to ensure that there are no unauthorized changes.
4. Documentation to support release management and system integration testing should be enhanced so that an independent reviewer should be able to determine what changes are included in the release, what system integration testing was performed, and who from PBGC provided formal approval for migration to production.
5. The PBGC should perform a periodic formal assessment of the legislative changes, economic factors, and actuarial assumptions that apply to PIMS to determine if /how they should be reflected within PIMS.

There are parts of the PIMS change management process that are well defined and documented. For example, the testing and documentation of individual code changes is very clear and well documented. Additionally, the PBGC has periodic meetings to discuss the status of changes and to communicate issues internally and with the third party contractor, Lynchval. However, there are processes that, while in place and followed, are not evidenced by formal documentation. For example, analyses and reviews are performed to determine what changes should be implemented into PIMS; however, there is no formal documentation maintained to evidence why a certain change was selected over another. As another example, HP Service Manager Tickets are created to evidence testing and approval for SE- and ME-PIMS releases. These tickets are well documented, contain an email log between the business and IT, and contain attachments related to testing and approval. However, for some of the program change samples selected, no evidence was provided detailing that the sample related to a specific ticket.

Scope and Methodology of Our Evaluation

This report addresses the controls in place for PIMS model development, modification and refinement. Our recommendations are directed towards PRAD as well as the PBGC Office of Information Technology (OIT) with the goal of ensuring that changes to PIMS are being appropriately evaluated and that controls are in place to protect against unauthorized or unintended changes to the PIMS code or database. This report does not address the adequacy of PIMS modeling techniques, model assumptions, model documentations and model implementations, which will be covered in other reports in our in-depth technical review.

Additionally, FTI did not evaluate the specific policies and procedures for third party vendors since the responsibility for all changes resides with PRAD and the PBGC, nor did we review security settings or user access rights to ensure that segregation of duties was enforced between development and testing environments. Further, when evaluating the testing documentation for specific PIMS changes, FTI performed a review of the documentation and did not attempt to recreate the testing scenarios or comparisons detailed in the testing documentation. For example, if the testing documentation contained a comparison to the prior year Projections Report, FTI did not rerun that comparison.

As part of this evaluation we identified and reviewed the following documents provided by PBGC:

1. Configuration Management Process Overview
2. Patching Windows Servers Using IEM
3. PBGC Patching and Maintenance Window Proposal_2014_08_29
4. Quarterly Server Maintenance Checklist v4.0
5. Quality Assurance Procedures for Formal PRAD Reports Utilizing the Pension Insurance Modeling System (PIMS)
6. Reports issued by the Office of Inspector General on Internal Controls Related to the PBGC's Fiscal Year 2015 and 2014 Financial Statement Audits, and the 2014 Federal Information Security Management Act Report

FTI evaluated objectives relating to the proper authorization, testing, monitoring, and approval of program changes related to PIMS. A program change includes any configuration or code change made to PIMS, SAS, or supporting database structure. We did not evaluate changes to the supporting operating system, such as patching, or hardware because those types of changes are managed by processes developed and administered by the OIT. Additionally, those types of changes are by nature categorized as low risk.

Our approach was developed using guidance from the National Institute of Standards and Technology (NIST), the Federal Information System Controls Audit Manual (FISCAM) published by the Government Accountability Office (GAO), and GAIT Framework published by the Institute of Internal Auditors. Our procedures included interviews with members of PRAD and OIT, review of documentation, and testing a sample of model changes.

Our approach to evaluating the program change management process had three components:

1. A review of relevant policy and procedural documentation
2. Interviews with PRAD and OIT to gain an understanding of the PIMS change management process, including the process for identifying and evaluating changes for implementation

3. Selecting a sample of changes made to PIMS over the past two years to ensure that documentation exists to support the authorization, development, testing, and approval for migration to production for each

General Review of PIMS Program Change Management Process

Background

This section provides a narrative of how PIMS program changes are evaluated, selected, developed, tested, and approved for migration to production. The PBGC utilizes a third party contractor, Lynchval, to develop code changes for PIMS while PRAD is responsible for testing and approving changes before migration to the production environment. Changes are required to adhere to the OIT processes, which are a set of disciplines and policies used for controlling and managing configuration items that could affect the IT infrastructure and the quality assurance procedures for formal PRAD reports.

PIMS was not a PBGC General Support System (GSS) until 2015 when it was migrated from being hosted on a desktop machine located in the Washington, DC office to dedicated servers in the PBGC data center run by OIT. This change was initiated after the FY (Fiscal Year) 2014 Federal Information Security Management Act (FISMA) Report issued by the Office of the Inspector General noted that PIMS was not being considered a GSS and did not fully inherit common controls used by other GSS applications (e.g., access controls, contingency planning, etc.).[3] The report recommended that PIMS be recognized as a GSS, be supported by PBGC's common controls, the PBGC Life Cycle Security Standard be adopted and implemented in its maintenance, and technical controls to separate incompatible duties be implemented.

These issues were further emphasized by the Supplemental Report on Internal Control contained in the 2015 PBGC Annual Report, which noted that "Access Controls and Configuration Management" was a significant deficiency. In response to that significant deficiency, "new IT security leadership implemented various tools and processes to establish a more coherent environment for implementing access control and configuration management security controls at the root cause level."[4] These changes included the classification of PIMS as a GSS, and all infrastructure components supporting PIMS (i.e., hardware, operating system, and database platforms) were moved to the PBGC data center supported by OIT.

PIMS Program Changes

There are two types of program changes that can be made to PIMS: 1) program changes that are enhancements or fixes that could impact the PIMS Projections Report and 2) ad hoc report requests/inquiries.

Program changes include updates to the PIMS code, underlying databases, or SAS code, either to correct an identified error or to implement new design features. Ad hoc report requests and inquiries can include modeling of proposed legislative changes, estimation of budget effects from changes to PBGC premiums, or demonstration of effects on various plans/populations from changes to pension plan funding rules. These changes may require code updates to satisfy the request. However, code changes are made and reports are generated in the QA environment and are never implemented into

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[3] Fiscal Year 2014 Federal Information Security Management Act Report (issued by Office of Inspector General).

[4] Report on Internal Controls Related to the PBGC's Fiscal Year 2015 and 2014 Financial Statement Audits (issued by Office of Inspector General).

production. A detailed overview of the processes for both types of changes is below. Changes outside of PIMS, such as operating system or database application patches, are applied by OIT through a standardized process and are outside the scope of this report.

Initiation

While there is no formally defined process to capture bug fixes and enhancements needed for PIMS, requests for changes that would impact the Projections Report and Net Position can be submitted by PBGC employees and Lynchval. Changes are captured during status meetings, annual assessments or emails to PRAD staff and then tracked in separate ME-PIMS and SE-PIMS Planner Bugs and Enhancement spreadsheets maintained on a PRAD network folder. Within the tracking spreadsheets, changes are categorized based on area of impact. For example, the SE-PIMS has changes related to Airline Processing, Contributions and Excess Balances, Setting Salaries/Scale, and Mortality. Each change record includes a description, date submitted, impact (low, medium, or high), and level of effort (low, medium or high). There are no formal definitions around the impact and level of effort; those are set based on the amount of code and expected impact to the Projections Report.

PRAD meets with Lynchval on an annual basis to discuss outstanding bug fixes and potential enhancements to PIMS that have been identified. The Director of PRAD and Division Manager of the Pension Insurance Modeling Division will then meet to discuss and prioritize changes for the current Projections Report. The final population of SE- and ME-PIMS changes is maintained in a MS Word document titled PIMS Enhancements – PIMS <YEAR> Planning. That document includes a priority category, impacted tracking numbers, and a brief description of the change. Once a list of changes is identified for the current year, Lynchval is required to document the Level of Effort (LOE) and provide a cost estimate for each change and enter that information into the PBGC Project Management System, Primivera P6. This information is then reviewed by the Office of Management and Budget (OMB) for compliance with existing policies. The Director of PRAD and Division Manager of the Pension Insurance Modeling Division will make the final decision on changes after the LOE and cost estimates have been evaluated.

The Division Manager of the Pension Insurance Modeling Division then communicates the current year changes to Lynchval via email. Lynchval then begins to develop a Software Change Request form (referred to as a "TN") for each change. The TN document is maintained by Lynchval in an online portal and is used to track requirements, development, testing, and other updates over the lifetime of the change, though no ticketing system is used by PRAD to track changes. Additionally, PRAD meets with Lynchval developers on a weekly basis to discuss the status of each change. Meeting minutes are formally documented. All correspondence related to PIMS changes are tracked via email and documentation is stored on network folders and in Lynchval online portals.

Development

As the programming contractor, Lynchval is responsible for the development of program changes and maintains an overview of each change, including the design, coding updates, and unit testing results, within the TN document, which is stored in an online portal. All changes are sourced to the most recent version of PIMS used to create the prior year Projections Report (including the inputs). It is a PBGC best practice not to "stack" multiple changes into a single TN. This means that even if two changes are interrelated, Lynchval starts working off the same version of the code and developers communicate periodically to ensure both changes have the intended impact. The majority of changes are coded by one developer, though more complex changes can be supported by multiple developers. Unit testing is performed by Lynchval during development, leveraging inputs from the prior year Projections Report.

OIT maintains a logically separated PIMS development and quality assurance (QA) environment, which is maintained on a separate domain from the PIMS production environment. Access to the environments is authenticated using Windows Active Directory (AD) and OIT uses AD groups to segregate individuals who develop and test the changes. Additionally, OIT maintains segregation of duties rules to mitigate the risk of unauthorized access; for example, production PIMS users do not have access to the development environment.

PIMS code is maintained in a source code versioning tool called PVCS Version Manager that keeps a log of individuals who check out and check in the code. There is a formal process in place to monitor the versioning tool, and Lynchval also requires that all coding changes be peer reviewed.

Testing

Once development is complete, testing is performed by the PRAD team in the QA environment. The inputs from the prior year Projections Report are used for User Acceptance Testing (UAT) to evaluate the results for each individual program change on the Net Position. The Division Manager of the Pension Insurance Modeling Division and his team will review the test Projections Report and make a determination that the change has the intended results based on the output of the model. During UAT, the Division Manager of the Pension Insurance Modeling Division also performs a peer review of the TN and code. If issues are identified during UAT, PRAD instructs Lynchval to review and update the code. Upon completion of UAT, PRAD provides approval for the change to be included in the next scheduled PIMS production release.

### System Integration Testing & Migration to Production

Changes are implemented to PIMS production through a release process that is managed by OIT. There are typically two release windows in a calendar year (one release for SE-PIMS and one for ME-PIMS). All changes required for the current year Projections Report must be implemented during a release window. All change requests are tracked in the current release spreadsheet that is maintained by PRAD and, prior to each release window, PRAD and Lynchval will meet to discuss the status of each change as well as the individual UAT results.

The prior year Projections Report is run in the QA environment and encompasses all changes scheduled for the upcoming release. A system integration test is performed to verify that all changes work as intended. The Director of PRAD and Division Manager of the Pension Insurance Modeling Division review the test Projections Report in detail to ensure that the figures are accurate based on their assessments for each change. Once the changes are ready to be migrated to production a required Request for Change (RFC) form is submitted to OIT. OIT performs its own required testing and sign-off as part of its processes. The Director of PRAD must sign off on the release via email before the change can be implemented into the PIMS production environment.

Monitoring

The Director of PRAD conducts regular meetings with stakeholders to assign development milestones, set schedules, ensure that timelines are being met, and allocate resources as needed for each project. There is a weekly "PIMS Technical Meeting" that is attended by PRAD and relevant contractors to discuss project deadlines, address problems, allocate resources, and monitor "bugs" and program enhancements for PIMS. There is also a periodic "PIMS IT Management Meeting" that is attended by PRAD, OIT, and relevant contractors. The group discusses higher level project deliverables, deadlines and upcoming enhancements.

The flowchart below illustrates the program change management process.
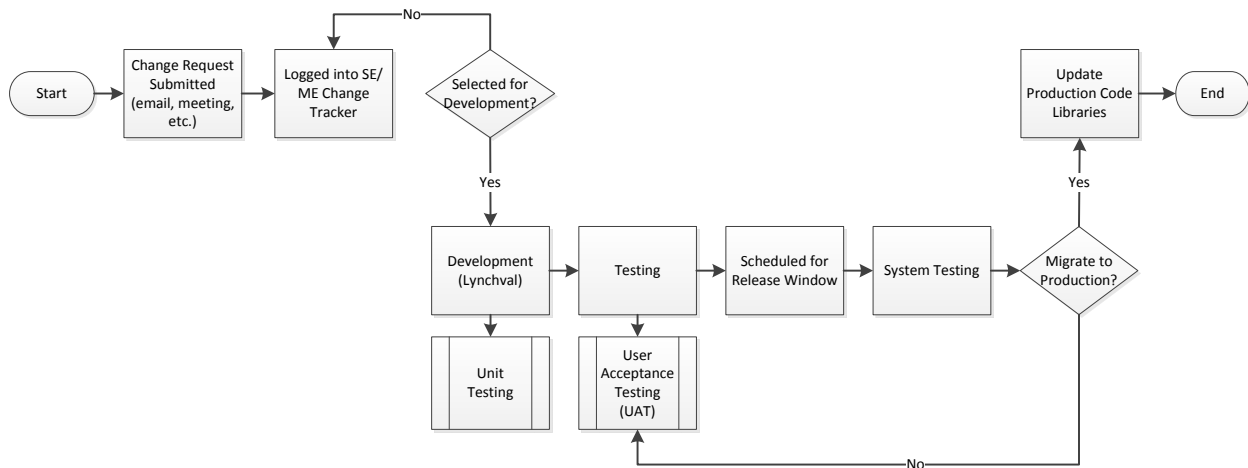
PIMS Ad Hoc Report Requests

As previously mentioned, PIMS code can also be changed due to an ad hoc report request, typically coming from Congress, the OMB, or the White House. The request will frequently ask for an analysis which leverages different assumptions or alternate specifications of law than those used in the prior year Projections Report. Updates to assumptions may require changes to the code; however, because these requests will not affect the production environment, they do not involve a formal TN. When responding to an ad hoc request, a member of PRAD or Lynchval will check out the copy of the appropriate PIMS code into the QA environment and work on the request. Once the request is completed, the results are reviewed by the Director of PRAD and Division Manager of the Pension Insurance Modeling Division before being submitted to the requestor. The documentation of the request, code updates, and results are maintained on an internal PBGC network folder in the event they receive a similar request in the future. However, changes to code from an ad hoc report request are not implemented into production.

Evaluation of Program Change Management Process

To evaluate the effectiveness of the PIMS program change management process, FTI selected two SE-PIMS changes and two ME-PIMS changes that were implemented in production over the past two years, as well as one ad hoc report request. These samples were selected based upon a review of the ME- and SE-PIMS Planner Bugs and Enhancement spreadsheets provided by the PBGC. FTI reviewed all relevant documentation the PBGC provided to support the authorization and testing of these changes and documented our findings and observations for each below.

Sample #1

Tracking Number	Description	Model	Impact / Risk	Level of Effort
SE 128 (formerly 132)	Reflect actuary's interest credit rate when determining the Normal Cost for Cash Balance Plans.	SE	Low	Medium

FTI reviewed the TN file and noted the following:

- The enhancement description was completed. The main requirement specified was that a field be added to the plan table to reflect the actuary's assumption for the interest credit rate for the valuation.
- There was one requirement documented for Inputs and one documented for Aggregations of Computations.
- The code impacted was included in the document.
- The Level of Effort was documented by the Technical Analyst, Yevgeniy Guseynov and confirmed by the Peer Reviewer, Rajesh Reddy.
- The Unit Test Definition was completed.
- The Functional Testing and Efforts were signed off on by Jeff Lane, Actuary, and Lloyd Wang, Reviewer on 10/25/2015.
- Jeff Lane sent the test results via email to Jensen Chan for additional review on 11/2/2015.
- The testing data contained outputs of the SE-PIMS executable and spreadsheets summarizing the results.

FTI reviewed the following documentation related to testing completed by PRAD:

- Jensen Chan completed a review of the code, specifications and unit testing and documented his review on 1/27/2016.
- Jensen Chan also approved the changes in an email to Jeff Lane and Mark Baba on 1/27/2016.
- The testing data contained outputs of the PIMS executable spreadsheets comparing the before and after results.

FTI reviewed the following documentation to support system integration testing and approval for migration to production:

- No evidence was provided to support the release to production. There was no information related to system integration testing or approval for migration to production. There were several HP Service Manager Change forms and emails provided, but none had a reference to TN 128.

Sample #2

Tracking Number	Description	Model	Impact / Risk	Level of Effort
SE 113	The FoxPro database is outdated technology and in need of modernization. The last stable release of FoxPro was in 1998 and is no longer supported by Microsoft. A full-featured Relational Database Management System (RDBMS) such as MS SQL Server is recommended for enterprise applications and serve a critical function for PBGC (AA Recommendation 4.1.3).	SE	N/A	N/A

In 2014, PRAD and OIT migrated the underlying PIMS database from FoxPro to the MS SQL Server. The PBGC provided an email and spreadsheet to support this change. The email, from Jeff Lane to Jensen Chan in August 2014, contained information on testing the Pre-SQL PIMS executable versus the Post-SQL Executable for SE-PIMS. A table was included that compared the Projections Report from the different run IDs using FoxPro and SQL.

The PIMS PY14 Requirements document included detailed and well documented information related to the following areas: Project Scope, Assumptions and Constraints, System Diagram and Data Model, Interfaces, Technical Specifications, Business Process and Detailed Requirements, and Operational Requirements. There were multiple TNs associated with the database upgrade. The document noted that the following individuals needed to provide sign-off for the project:

- Jensen Chan, Business Representative
- Badar Awan, Federal Project Manager
- Peter Nguyen, Enterprise Architecture Representative
- Phil Murphy, Release Manager
- Noel Briscoe, Enterprise Information Security Representative
- Marvin Davis, IT Specialist (Security), ITIOD
- Michael Zaky, IT Specialist, ITIOD
- Partha Banerjee, Contract Project Manager
- Johnnie Garcia, Release Manager
- Jay Danielski, PM ITIOD

The document provided by PBGC had not been signed by any of those individuals referenced above to evidence that they had read and approved the requirements. Additionally, insufficient documentation was provided to support system integration testing or approval for migration to production.

Sample #3

Tracking Number	Description	Model	Impact / Risk	Level of Effort
ME 235	MPRA changes (a) allow plan specific suspension take-up percentage and plan specific take-up rates, (b) allow set suspension and partition rates for existing plans.	ME	N/A	N/A

FTI reviewed the TN file and noted the following:

- The enhancement description was completed. The main requirement specified was to create a new table "mpratakeup" which could be linked to the run table and allow each plan to have a specific suspension take-up percentage and partition take-up percentage that could vary by year.
- There were requirements documented for the following areas
  - Inputs
  - Aggregations or Computations
  - Outputs – Intermediate &/or Final
  - Reports – Standard or Custom
- The code impacted was included in the document as was the schema for the new table requested.
- The Level of Effort was documented by the Technical Analyst, Gerald Gaboury, and confirmed by the Peer Reviewer, William Deitz .
- The Unit Test Definition was completed.
- The Functional Testing and Efforts were signed off on by Louis Weintraub, Actuary, and Lloyd Wang, Reviewer on 10/9/2015.
- Gerald Gaboury sent the test results via email to Marcus Cleary for additional review on 10/13/2015.

FTI reviewed the following documentation related to testing completed by PRAD:

- Marcus Cleary completed a review of the code, specifications and unit testing and documented memo of his review on 11/3/2015.
- Marcus Cleary also approved the changes in an email to Gerald Gaboury on 11/3/2015.
- The testing data contained outputs of the PIMS ME executable and spreadsheets comparing the before and after results.

FTI reviewed the following documentation to support system integration testing and approval for migration to production:

- Partha Banerjee requested a listing of TNs for the SE- and ME-PIMS FY15.0 release via email on 3/14/16. Included in the response from Louis Weintraub was TN 235.
- The HP Service Manager Change Form is the GSS change control tool used by OIT. Form C002781 is the release for changes related to the ME-PIMS FY15 Projections Report and was intended to document system integration testing and approval for migration to production. Form C002781 contained approval from the Johnnie Garcia, IT release manager on 3/24/2016.
- There was no evidence to support final migration to production by PRAD.

Sample #4

Tracking Number	Description	Model	Impact / Risk	Level of Effort
ME 169	A plan's assets as shown on the PLN can have a very small negative or positive amount when the plan is receiving assistance. This may impact the insolvency year calculated. The assets should be zero. This is probably due to a disconnect between how the assistance is calculated in CFM forecast and the assets rolled forward each year in the simulation.	ME	Low	Medium

FTI reviewed the TN file and noted the following:

- The bug fix description noted that PIMS produced a small positive or negative asset value for plans receiving assistance and in PPA terminated status. This was the result of using inconsistent interest rates, benefit, and expense payment amounts. This issue impacted the net position calculation by less than .1%.
- No requirements were documented as this was a bug fix. Information was provided to illustrate the issue at hand.
- The code impacted was included in the document as was the schema for the new table requested.
- The Level of Effort was documented by the Technical Analyst, Gerald Gaboury, and confirmed by the Peer Reviewer, Colleen Chen.
- The Unit Test Definition section was completed.
- Gerald Gaboury sent the test results via email to Jensen Chan for additional review on 10/20/2015.

FTI reviewed the following documentation related to testing completed by PRAD:

- Jensen Chan completed a review of the code, specifications and unit testing and documented a memo summarizing his results on 11/9/2015.
- Jensen Chan also approved the changes in an email to Gerald Gaboury and Louis Weintraub on 11/4/2015
- The testing data contained outputs of the ME-PIMS executable and spreadsheets comparing the before and after results.

FTI noted that TN 169 was included in the same release as TN 235 documented in Sample 3. Please refer to Sample #3 for observations on system integration testing and approval for migration to production.

Tracking Number	Description	Model	Impact / Risk	Level of Effort
TN 72	Per JCT Request, removal of PPA Sunset Provisions effective December 31, 2014 and December 31, 2015	ME	n/a	n/a

This was an ad hoc reporting request received by the PBGC that did not require a permanent change to the PIMS production library. The request was to run the project report removing the PPA sunset provisions that were effective December 31, 2014 and December 31, 2015. A TN was completed for this change due to the complexity of the code changes that were required. Lynchval documented the TN appropriately, including the requirements, code changes, and reviews completed, and expected impact. After this request was addressed, the code and Projections Report were reviewed by Jensen Chan and Len Jenji. A memo was completed to document their review and findings.

Best Practices

FTI reviewed the publicly available change process documentation associated with the MINT and DYNASIM models and found that what is available is many years old. In the absence of comparable models, we have used as a proxy best practices from our extensive experience auditing complex systems and models. These best practices are applicable to microsimulation models as well.

An important goal of any change management process is to rapidly meet evolving business requirements while minimizing the possibility of service disruption. Based on FTI's interviews and evaluation of evidence provided, we found that actual documentation to support individual changes, including requirements, testing, and approval, was consistent with best practices based on our experience in the public and private sector. However, the documentation to support release management, system integration testing, and approval for migration to production was inconsistent and did not conform to best practices.

It is considered a best practice in both public and private sectors to leverage change management software or ticketing systems to enforce a systematic approach to implementing changes. Most software products have customizable workflows, automated email notification, designated approval, and reporting capabilities. This software enables management to better understand the status of changes, accountability for each change, and supports a clear and transparent approval process. These tools also support documentation repositories that can be backed up so that key information related to changes is not lost.

Many private and public organizations engage in a formal risk assessment for key systems or models on at least an annual basis. This includes the reports of the Trustees of the Social Security and Medicare programs, which regularly undergo external reviews and receive inputs from stakeholders and provides documentation related to demographic assumptions, economic assumptions, long range and short range projections. These risk assessments formally analyze market, economic, IT, and regulatory issues that could impact the model as well as the organization's plan to address each. These assessments are typically documented in memos or appendices to strategic plans that are presented to management. Changes made to the model are clearly defined and cataloged in public reports.

Overall Conclusions

There is no formally defined process to capture bug fixes and enhancements needed for PIMS. All change requests are submitted through email or captured during meetings and tracked in spreadsheets. Based on a review of those spreadsheets, it is difficult for an outside party to determine which changes had been implemented, were in process, or had not yet started in development. Minimal information is provided regarding the amount of effort and priority for each change until the change is actually selected for development. Without formal tracking, it is more difficult to report on development efforts, assign accountability to changes, and enforce change management controls. Additionally, ad hoc report requests that require changes to the PIMS code are not included on the spreadsheet tracker.

The process to identify and select the enhancements and bug fixes to be implemented in each release is not formally documented. There are meetings held between the Director of PRAD, the development contractor (Lynchval), and the Division Manager of the Pension Insurance Modeling Division to evaluate and debate potential changes. However, there is no formal assessment or rationale documented for why certain changes were selected for development above others. Additionally, it was not evident from our review that all relevant stakeholders (e.g., OMB) are engaged in the evaluation of changes for a specific release or if recommendations from other reports were considered for implementation.

We concluded based on our review that the documentation to support the requirements, development, and testing performed for each individual change is robust and clear. However, documentation to support the release management process is not as well defined, and FTI found it difficult to independently trace an individual change to the corresponding release. We were unable to fully trace both the system integration testing performed and the approval for migration to production.

Changes to the SAS code do not fall within the PIMS change management process. SAS is used for preprocessing of data and assumptions and also used to analyze the output. Unauthorized changes to SAS code could impact the model inputs and/or outputs and therefore should be included in the change management process so that they are appropriately tested and approved.