



IT Solutions Life Cycle Management Framework (ITSLCM) Handbook



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1.0 Introduction

1.1 Handbook Purpose

The Information Technology Solutions Life Cycle Management (ITSLCM) Framework Handbook is a resource to assist Pension Benefit Guaranty Corporation (PBGC) employees and contractors in navigating PBGC's ITSLCM Framework. This document presents an overview of the ITSLCM Framework phases, streams, gates and reviews, tasks, standards, deliverables, external processes, and corresponding roles required to properly execute the Framework. This document is developed and maintained by the Program Management Office (PMO), within the Office of Information Technology's (OIT) IT & Business Modernization Department (IT&BMD). Additional detail about the Framework and its components may be obtained by contacting the PMO.

It is important to note that while the ITSLCM Framework and this Handbook does not call out standard project management practices (e.g., scope management, time management, cost management, quality management, human resource management, communications management, risk management, procurement management, stakeholders management), it is expected that individuals will leverage project management industry best practices (e.g., Project Management Institute (PMI)). Additionally, much of the project management documentation may be leveraged directly from the program documentation and other artifacts that are not called out (e.g., Project Management Charter) may be created and used, as appropriate.

1.2 Scope

This Handbook is divided into three sections: *Section 1: Introduction*, *Section 2: The ITSLCM Framework – High Level Concepts*, and *Section 3: ITSLCM Framework Phases – Detailed Information*. *Section 1: Introduction* offers insight into the history and background of the ITSLCM. Section 1 also provides an overview of the key partners that provide input into the ITSLCM and the requirements that govern it. *Section 2: The ITSLCM Framework – High Level Concepts* describes PBGC's IT Portfolio, IT Programs, and IT Projects and steps through the ITSLCM Framework components, roles, and phases. *Section 3: ITSLCM Framework Phases – Detailed Information* describes what happens during each stream of each phase.

Key Concepts: Identify important concepts



Breadcrumbs: Highlight ITSLCM sections



Throughout the Handbook there are Key Concept Callouts (central concepts that contribute to ITSLCM understanding) and ITSLCM Breadcrumbs (highlight the section of the ITSLCM that is being discussed).

1.3 Background

The ITSLCM Framework is a governance-based framework designed to manage IT programs and projects through the identification, planning, implementation, maintenance, and disposition of IT solutions at PBGC. The ITSLCM, a component of the PMO's program, integrates the federally mandated requirements of Enterprise Architecture (EA), IT Portfolio Management (ITPfm), Program and Project Management, Infrastructure, and Cybersecurity.

The Framework is a streamlined way for PBGC to fulfill IT needs, while balancing the challenges of pension regulatory changes, emerging technologies, doing more with less (reducing duplication of technology and having better stewardship of IT costs), and securing data and systems.

There are several benefits to using the Framework:

- ✓ **Communication** – Business and IT roles are identified as partners to work collaboratively throughout a program's life cycle.
- ✓ **Simplification** – Artifacts are carefully selected to capture outcomes of tasks performed and bring value. IT Program Management artifacts can be leveraged to avoid creation of unnecessary documents.
- ✓ **Flexibility** – Enables use of various development methodologies (e.g., Iterative, Agile) and types of solutions

(e.g., Cloud, COTS, Hosted, new solutions and enhancements to existing ones).

- ✓ **Clarity** – “Streams” establish logical groupings of related tasks to be performed by the experts of the respective stream.
- ✓ **Transparency** – Clear communication of budget, risk & schedule from the program level through to individual projects.
- ✓ **Compliance** – Facilitates compliance with federal IT laws, regulations, and PBGC standards.

PBGC issued its first Systems Development Life Cycle (SDLC) methodology on March 30, 2001 and it provided guidance for all system development efforts and major enhancements to existing systems. Since that time, PBGC has implemented a number of updates and enhancements (e.g., name change, key concepts) to ensure that the Framework continues to support the evolving industry best practices, federal mandates, and PBGC IT and business needs.

The current version is a result of the collaborative efforts of the following CIO Programs: Enterprise Architecture (EA), IT Portfolio Management (ITPfm), Enterprise Cybersecurity, and PMO. The current version evolves PBGC’s approach from a process-oriented methodology to a flexible framework of requirements; and moves the ITSLCM from project management and solution delivery to a higher level of governance of program management and program planning.

The Framework includes cybersecurity and infrastructure requirements as well as ITSLCM Change Control Board (CCB) member input. The Framework supports PBGC’s efforts in planning for, acquiring, delivering, and managing information technology—from developing new solutions, to modernizing, enhancing, maintaining, and operating existing solutions, through disposition of the solutions. The table below offers insight into the history and background of the ITSLCM. For more information on federal statutes and requirements see Appendix A.

Date	Description
July 1996	The Clinger-Cohen Bill is signed into law. It streamlines IT acquisitions and emphasizes life cycle management as a capital investment.
March 1999	An audit report from the Office of Inspector General’s Financial Statement finds that the lack of a formal SDLC methodology impacts the consistency of systems development initiatives.
March 2001	The PBGC SDLC methodology is issued to meet the requirements identified in the March 1999 Office of Inspector General’s Financial Statement Audit.
March 2002	The SDLC is renamed the Systems Life Cycle Methodology (SLCM) and the scope is expanded to include all acquisition, development, and enhancement efforts related to information systems.
July 2003	The SLCM is redefined to align with the Business Planning Framework. The Business Planning Framework, established in late 2002, defined the relationship between Strategic Planning and Corporate Initiatives that meet the agency’s goals and objectives.
FY 2004	The Office of Inspector General’s Fiscal Year 2004 Financial Statement Audit by PricewaterhouseCoopers states: “Approval Process for accepting internally developed software should be improved.”
FY 2005	The SLCM is updated to incorporate standard industry models such as the Software Engineering Institute’s (SEI) Capability Maturity Model Integration (CMMI®), and the Project Management Institute’s Project Management Body of Knowledge (PMBOK®).
October 2005	The Chief Technology Officer (CTO) signs the SLCM Corporate Policy.
March 2006	SLCM v2006.1 is released and training is conducted throughout PBGC. This release includes a detailed Requirements Development (RD) process, Requirements Management (REQM) process, and their supporting sub-processes (Business Process Model process, Peer Review process, Submit Artifacts for Approval process).
Summer 2006	The SLCM is updated in conjunction with the creation of the Project Management Life Cycle (PMLC). The SLCM was re-designed to separate the project management and solutions delivery processes to create a more flexible and tailorable structure. During the SLCM modernization activity, the SLCM is renamed the Information Technology Solutions Life Cycle Methodology (ITSLCM).

Date	Description
February 2007	The ITSLCM 2007.1 is released. This release is the first iteration of an overall IT Investments Framework including Enterprise Architecture, Security, and Capital Planning – designed for managing, developing, maintaining, and decommissioning solutions. It incorporates detailed processes embedded within a Project Management Life Cycle (PMLC) and Solutions Development Life Cycle (SDLC). PBGC’s first ITSLCM Directive (IM-05-7) is published.
April 2007	The Chief Management Officer (CMO) signs the Order (Directive), which requires that all PBGC federal and contract employees adhere to the ITSLCM for delivering and managing the delivery of new and existing IT solutions. This Order replaces the SLCM Corporate Policy, dated October 7, 2005.
March 2010	A PBGC Corrective Action Plan (CAP) is delivered in response to OIG information security audit findings. This CAP serves as a key driver for modernizing the ITSLCM to ensure continued compliance with the National Institute of Standards and Technology (NIST) 800-53 Rev. 3 (specifically, Controls SA-3 and SA-5). The CAP’s implementation schedule identifies January 2011 to initiate an ITSLCM modernization effort.
April 2011	Based on the FY2011 PBGC Security CAP, an initiative to modernize the ITSLCM begins. This results in the release of the ITSLCM Framework (v1.0). The Framework incorporates federally mandated requirements of EA, Capital Planning, Cybersecurity, and external IT processes, including IT Governance Gates and Reviews, and IT Standards, and it defined key roles and deliverables. The ITSLCM encourages SDLC Agile and no longer endorses the Waterfall approach.
September 2014	ITSLCM Framework (v2.0) is updated to incorporate improvements based on the IT Portfolio Maturity effort; integrate requirements from Office of Management and Budget’s (OMB’s) Architect, Invest, Implement paradigm; incorporate NIST controls, and better achieve agency goals by closing gaps.

Table 1: ITSLCM History and Background

1.4 Key Partners

As an IT solution navigates the ITSLCM Framework, it is important to leverage available assistance provided by key partners that provide input into the lifecycle process and the requirements that govern it. This assistance is critical to ensuring the successful development and implementation of an IT solution. Among these key partners are four CIO programs: Program Management Office (PMO), Enterprise Architecture Division (EAD), IT Portfolio Division (ITPD), and the Enterprise Cybersecurity Division (ECD). A brief description of each is provided in the following sections.

In addition to the CIO programs listed below, there are a number of primary and supporting roles that help to facilitate and execute the ITSLCM Framework, as described in Section 2.4: ITSLCM Roles.

1.4.1 Program Management Office (PMO)



The PMO mission is to establish and manage consistent approaches to managing IT programs/projects and creative implementation approaches to enable business agility. The PMO is also responsible for the following functions:



1. Establish and tailor a Program Management Office in accordance with federal mandates, best practices in government and industry.
2. Develop, implement and ensure adherence to IT program/project management policies, processes, procedures, standards and guidelines for practitioners and stakeholders to comply with PBGC and federal mandates.
3. Promote the use of best practices and adherence to policies and procedures by establishing an IT Program/Project Management Community of Practice and conduct reviews of IT programs/projects to affect course corrections early for a successful completion of projects.

4. First point of contact for new projects to guide the corporation’s customers to the appropriate IT organizations for delivering solutions.
5. Govern execution of IT programs/projects by providing transparency into performance using dashboard reporting to the CIO and appropriate governance boards.

More information is posted at the [PMO website](#).

1.4.2 Enterprise Architecture Division (EAD)



The EAD mission is to establish and manage an Enterprise Target Architecture for PBGC and govern application of Information Technology to achieve cost-effective solutions. EAD establishes the Agency-wide roadmap to achieve PBGC's mission through optimal performance of its core business processes within an efficient IT environment.



The BNA provides content for concept proposal and business cases to justify funding.

The TRB ensures business stakeholders contribute to technical decisions.

EAD fulfills its mission by completing the following functions:

1. Establish and tailor an Enterprise Architecture Program in accordance with federal mandates, best practices in government and industry.
2. Develop, implement and ensure adherence to Enterprise Architecture policies, processes, procedures, standards and guidelines for practitioners and stakeholders to comply with PBGC and federal mandates.
3. Represent the CIO on Federal Enterprise Architecture (FEA) Committees and Working Groups to tailor mandates for PBGC and report effectiveness metrics.
4. Guide the Corporation through business needs analyses, choices of technology and securing funding for implementation by leveraging shared/managed services, and cloud solutions.
5. Govern technology presence by integrating with other CIO Programs and governance boards.

More information is posted at the [EAD website](#).

1.4.3 IT Portfolio Division (ITPD)



ITPD’s mission is to establish and manage PBGC’s IT Portfolio of IT Programs that yield the best benefits for PBGC’s business operations.



ITPfm supports an effective IT Portfolio analysis, selection, and decision-making environment at PBGC.

ITPD’s functions include:

1. Establish and tailor an IT Portfolio Management Program in accordance with federal mandates, best practices in government and industry.
2. Develop, implement and ensure adherence to IT portfolio management policies, processes, procedures, standards and guidelines for practitioners and stakeholders to comply with PBGC and federal mandates.

3. Represent the CIO on Federal IT Portfolio Committees and Working Groups to tailor mandates for PBGC and report effectiveness metrics.
4. Guide the corporation in developing, managing and submitting quality business cases that secure IT funding.
5. Govern selection, management (execution) and evaluation (business value) of IT Programs technology presence by integrating with other CIO Programs and governance boards.

More information is posted at the [ITPD website](#).

1.4.4 Enterprise Cybersecurity Division (ECD)



ECD's mission is to coordinate the protection and security of PBGC IT and information resources. In order to ensure that security policies, standards, processes, and procedures are followed, ECD maintains the IT Security Framework, and Information System Security Officers (ISSO) serve on the IPgTs and IPTs.



ISSOs are available to help navigate through security policies, standards, processes, and procedures.

Anything related to cybersecurity, please see ISSO.

More information is posted at the [ECD website](#).

2.0 The ITSLCM Framework – High Level Concepts

2.1 PBGC's IT Portfolio, IT Programs, and IT Projects

In order to comprehend how programs and projects relate to each other throughout a solution lifecycle, it is first important to understand the IT Portfolio Management (ITPfm) process and how the IT programs are organized to relate to the process.

The purpose of PBGC's ITPfm program is to establish, maintain, and support an effective IT Portfolio analysis, selection, and decision-making environment at PBGC. The ITPfm program works in conjunction with Enterprise Architecture (EA) and PMO to facilitate the Architect, Invest, and Implement paradigm. PBGC's ITPfm program embodies OMB's Capital Planning and Investment Control (CPIC) guidance to achieve the aforementioned goals. The CPIC Cycle includes the Prioritize, Control, and Evaluate reviews and is intended to ensure the success and overall health of the PBGC IT Portfolio. The Appendix includes an overview of IT portfolio governance at PBGC.



Figure 1: IT Portfolio Management

The Prioritize Review assesses the IT programs and projects and validates the budget, scope, and schedule to recommend prioritization for budgetary decision-making. Prioritization criteria includes alignment with Corporate and IT Strategic goals and objectives, alignment with the EA Roadmap, and implementation readiness.

The Control Review assesses program and project performance resulting in recommendations on continued funding and ensuring that the project is continuing to fulfill the Corporation's strategic IT needs in a timely and cost-efficient manner. Program control criteria includes cost performance index (CPI), schedule performance index (SPI), and progress against program measures. Project control criteria includes PM qualifications and certifications; CPI; SPI; and an assessment of reliability, sustainability, and executability.

The Evaluate Review assesses the steady state or managed service performance. It also notes changes in the business or technology drivers that may result in recommendations to continue funding or initiate a new planning phase. Evaluate criteria includes program performance measures, business drivers, technology drivers, and O&M costs.

[PBGC's Strategic Plan](#) and [IT Strategic Plan](#) communicate PBGC's goals and objectives. IT programs use information technology resources to achieve efficient and effective business operations to meet PBGC's strategic goals, performance goals and priorities, and strategies. IT Programs include the planning, development, modernization, enhancements, operations, and maintenance of IT projects and managed services. IT projects are temporary endeavors, with a defined start and end date, to develop, modernize, and/or enhance an IT solution that contributes to the IT Program's measurable benefits. An IT project may be delivered in one or more releases using various development approaches (see Appendix for more information) enabling modular development. The collection of IT programs managed as a group to achieve PBGC strategic goals and objectives comprises the PBGC IT Portfolio. Below is a representation of the PBGC IT Program structure.

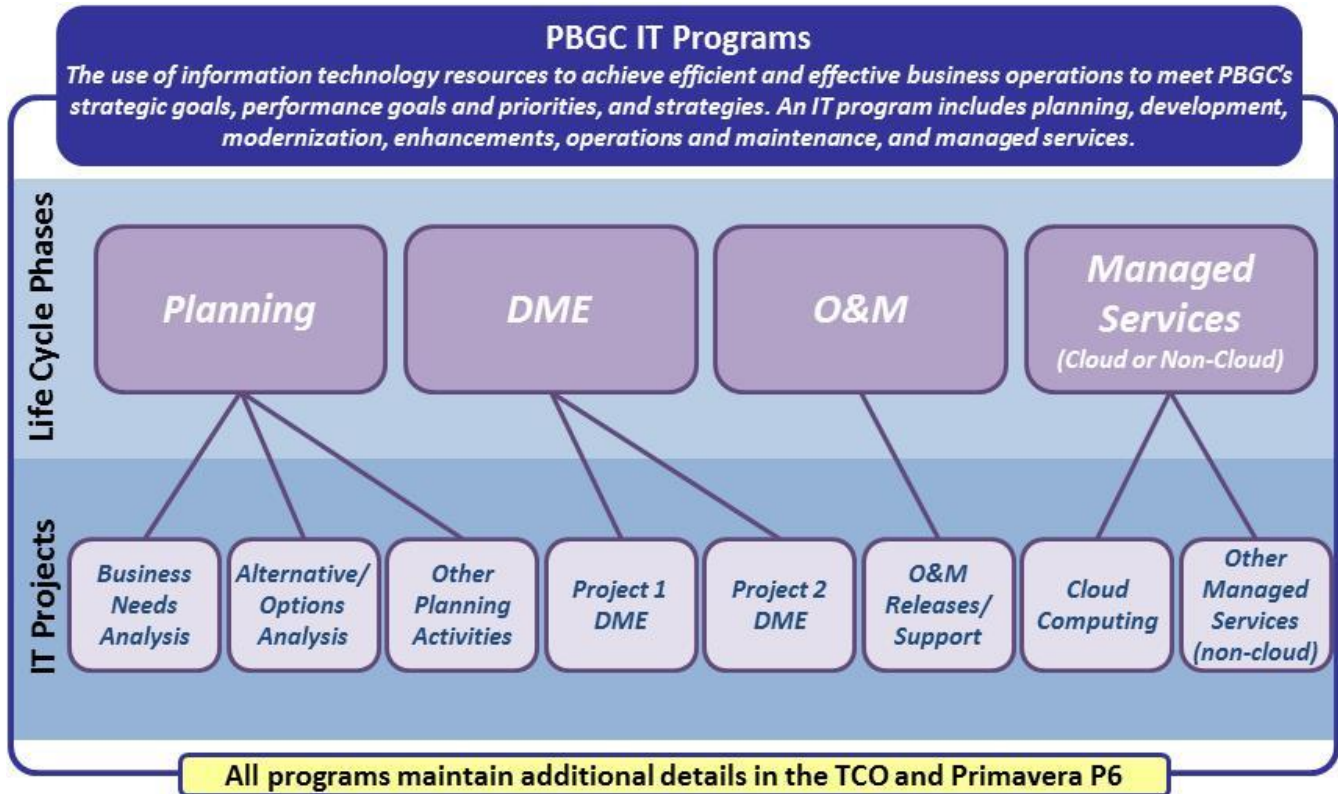


Figure 2: PBGC IT Program Structure

The IT programs are grouped logically by functionality and service affinity to ensure ease of organization and understanding. Additionally, the IT Program structure ensures an optimal amount of alignment and compliance with reporting requirements. This optimization enables greater integration throughout the enterprise and an increased capacity to leverage common resources, documentation, and lessons learned. This increased capacity is important as federal requirements increasingly encourage IT integration, data sharing, and cloud-based solutions. For these efficiencies to be fully realized it requires open and continuous communication between projects and their sponsoring programs and then among the programs within the portfolio.¹ IT Programs are reported at the OMB Agency IT Portfolio Summary level and are tracked by lifecycle phase to support consistency, transparency, and ease.

2.2 ITSLCM Framework Overview

The ITSLCM Framework is a cradle-to-grave IT management framework that provides for the identification, planning, implementation, maintenance, and disposition of IT solutions throughout their life cycle. It provides governance and direction by highlighting governance gates and reviews; standards and deliverables; roles and responsibilities (defined in the IT Management Directive); external IT processes; and required tasks across five phases: Need/Concept, Planning, Solution Implementation, Operations & Maintenance, and Disposition.

The ITSLCM Framework is designed to align with the OMB Performance Improvement Life Cycle (PILC), which establishes a framework for aligning goals to results. The OMB's PILC is a business-outcome-driven approach used to analyze and determine the necessary improvements to business processes and IT assets; then to determine where to invest to ensure every



The ITSLCM Framework is designed to provide programs with the information needed for the successful implementation of IT solutions that meet business needs and close performance gaps.

¹ For more information on the PBGC IT Portfolio, please visit the [ITPD website](#).

dollar invested in implementing changes to processes and/or IT assets provides the best possible return on investment in terms of business outcomes.

OMB’s PILC is comprised of three phases:

- The **“Architect”** phase focuses on the identification of both enterprise performance gaps and the capabilities needed to fill the gaps.
- The **“Invest”** phase focuses on defining the implementation and funding strategy for individual gaps identified during the “Architect” phase and ensures the alignment of project selections to the goals and objectives set forth.
- The **“Implement”** phase focuses on ensuring the design for the solution is executed to close the performance gaps and that the initiatives are executed and operating according to plan.

Figure 3 below depicts how the CIO’s Program components map to the ITSLCM framework phases, and align with OMB’s PILC.



Figure 3: Mapping to OMB’s Performance Improvement Life Cycle

By leveraging the PILC as a basis for the ITSLCM, PBGC is enabling the IT solution management infrastructure to effectively select, implement, manage, and monitor IT initiatives. When the ITSLCM is executed properly and consistently, IT programs address capability gaps and deliver the performance improvements that are being sought. Further, the ITSLCM Framework is structured in a way that easily demonstrates the tasks and responsibilities from the perspective of program management, project management, and information security. The ITSLCM balances governance with an appropriate amount of flexibility to allow program and project managers to complete and implement tasks in the order that aligns to their individual needs within each phase. The Framework also streamlines documentation requirements by reducing duplicative artifacts at the program and project level.

PBGC’s IT Management Directive (IM 05-7) applies to all PBGC Information Technology, throughout its lifecycle, regardless of the source of funding or resources owned and operated on behalf of PBGC.

2.3 ITSLCM Framework Components


The ITSLCM is comprised of five phases which incorporate tasks that satisfy requirements of applicable federal mandates and regulations related to enterprise architecture, CPIC, IT security, program and project management, infrastructure, and federal acquisition:







1. **Need/Concept:** Requests are submitted and guided through a structured IT Program Authorization Review to determine if it should be classified as IT and if so, how it might impact PBGC’s IT Portfolio. The Enterprise Target Architecture (ETA) for current and planned systems and technologies in comparison to planned projects is reviewed
2. **Planning:** Detailed program and project planning tasks are conducted and documented. Planning elements, such as the establishment of the Program Management Plan (PgMP), IT Program Release Plan, Project Management Plan (PMP) (if needed), product selection, and selection of development methodology, are all completed in this phase. The tasks and deliverables in this phase are produced to ensure that a budget, scope, and schedule are in place so the solution meets the intended business need, as well as to ensure that IT resources are being planned and managed in accordance with all applicable federal policies and mandates and internal PBGC policies and directives.
3. **Solution Implementation:** The IT solution is developed, implemented, and deployed with an Authority to Operate. Programs and projects are monitored and reported on.

4. **Operations & Maintenance (O&M):** Operating and maintaining an IT solution in a production environment per the last set of approved requirements. O&M includes tasks associated with operation (service desk, backups, disaster recovery/Continuity of Operations Plan [COOP]) and maintenance changes (patching, vendor-supported versions, and defect correction) needed to sustain the IT solution at the current capability and performance levels. It includes corrective hardware and software maintenance, voice and data communications maintenance and service, replacement of broken or obsolete IT equipment, and disposal of an IT solution. The ITPRB conducts quarterly project control reviews to assess project manager qualifications and certifications, Cost Performance Index (CPI), Schedule Performance Index (SPI), reliable/sustainable/executable. The ITPRB leverage Post-Implementation Review (PIRs) and Operational Analysis (OA) results to recommend whether to continue funding or stop work.
5. **Disposition:** Destroying, recycling, or repurposing IT solutions.

Each phase incorporates tasks that satisfy requirements of applicable federal mandates and regulations related to enterprise architecture, CPIC, IT cybersecurity, program and project management, along with external-related processes (e.g. infrastructure, IT risk management, federal acquisition, etc.). The tasks, across the five phases, are separated into three streams:

1. **Program Management:** Identifies tasks associated with providing centralized, coordinated management of an IT program (which may consist of multiple IT projects or IT-related initiatives) to achieve business goals and objectives. Program planning also includes all tasks associated with both the IT Portfolio Process (Prioritize, Control, and Evaluate reviews) and EA requirements. It focuses on achieving defined benefits (closing performance gaps), aligning to the corporate and IT Strategic Plan, and managing program resources. This objective is achieved by promoting these goals along with best practices and guidance on IT program management to business and IT program managers. 
2. **Project & Technology Management:** Identifies tasks associated with applying knowledge, skills, tools, and techniques to project tasks in order to plan, execute, monitor, and control IT projects effectively by achieving cost, schedule, and/or performance goals. Focuses on planning and implementing solutions. This objective is achieved by leveraging project management best practices.
3. **Cybersecurity:** Identifies information security-related tasks. This includes tasks associated with ensuring: (1) that security aligns with and supports business objectives; (2) compliance with information security related laws, regulations, and federal policies; and (3) internal controls and security risk management exist. Since the Enterprise Cybersecurity Division (ECD) has its own process, ITSLCM users should contact the project ISSO for assistance.

Each stream reflects the following:

-  1. **Gates and Reviews:** IT governance gates (represented by the diamond) and project reviews (represented by an oval) ensure that the solution conforms to IT standards and federal/agency requirements. These are identified for each stream.
- 
 2. **Streams:** Visual element that distinguishes tasks by program management, project & technology management, and cybersecurity.
-  3. **Roles:** Individuals or groups responsible for performing the tasks identified.
- N/A 4. **Tasks:** Required tasks to satisfy federal mandates and regulations, resulting in an outcome or deliverable, are identified by phase and stream.



5. Deliverables: Deliverables are identified by phase and stream.



6. Standards: Applicable IT Standards to be addressed in phase deliverables are identified by phase and stream.



7. External processes: Critical applicable external processes are identified by phase to achieve successful development and implementation.



8. Circular Arrow: Recurring task

The following page provides a snapshot of the ITSLCM Framework with the aforementioned components highlighted and the remainder of Section 2 explains each of these components.

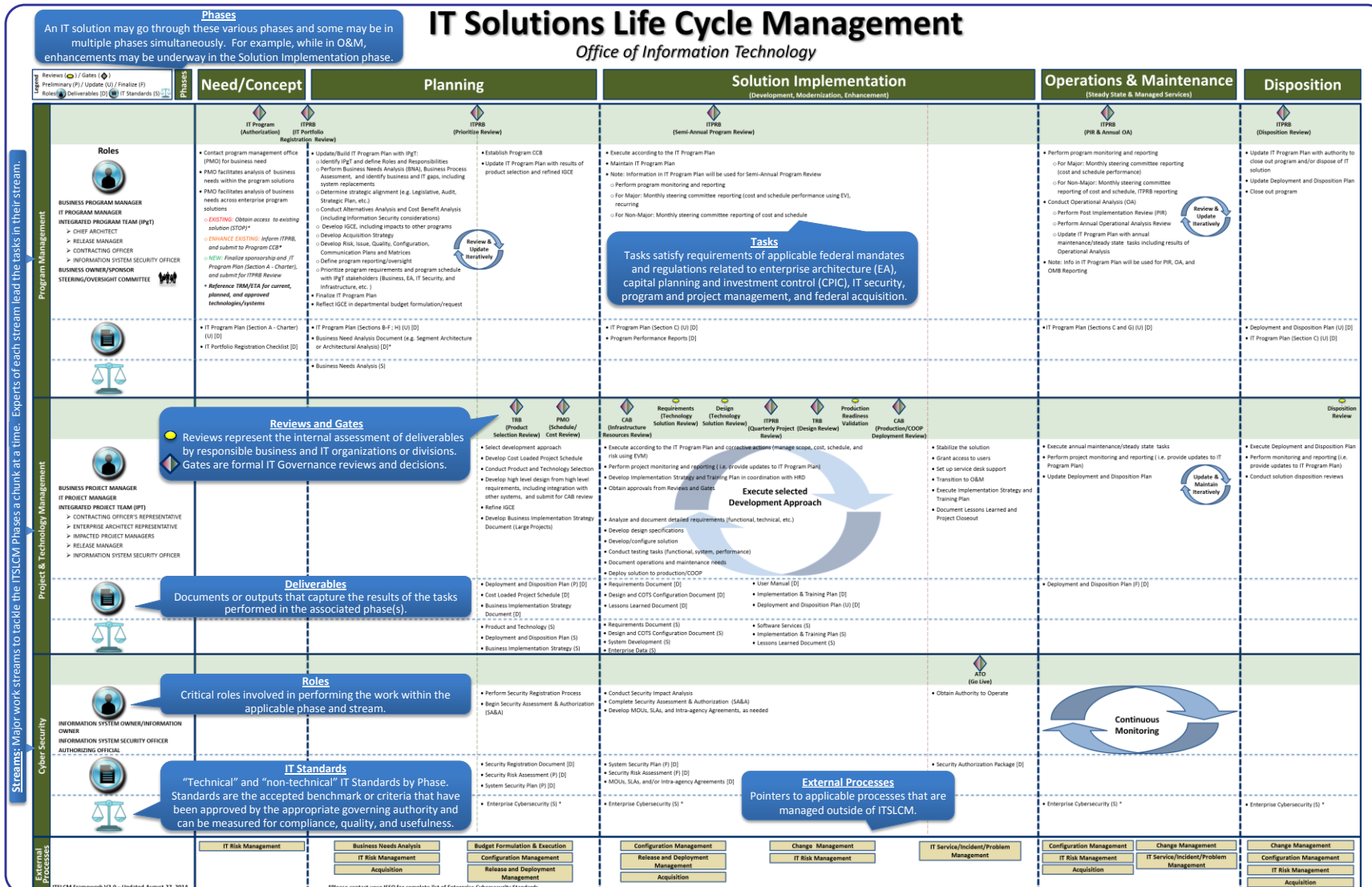


Figure 4: ITSLCM Framework

2.4 ITSLCM Roles

Before describing the ITSLCM phases, it is important to understand the other roles that play a part in the ITSLCM. The graphic below provides an overview of the roles and how they relate to others – more detailed descriptions of the roles is included in the IT Management Directive. The next section provides the phases and corresponding roles.²

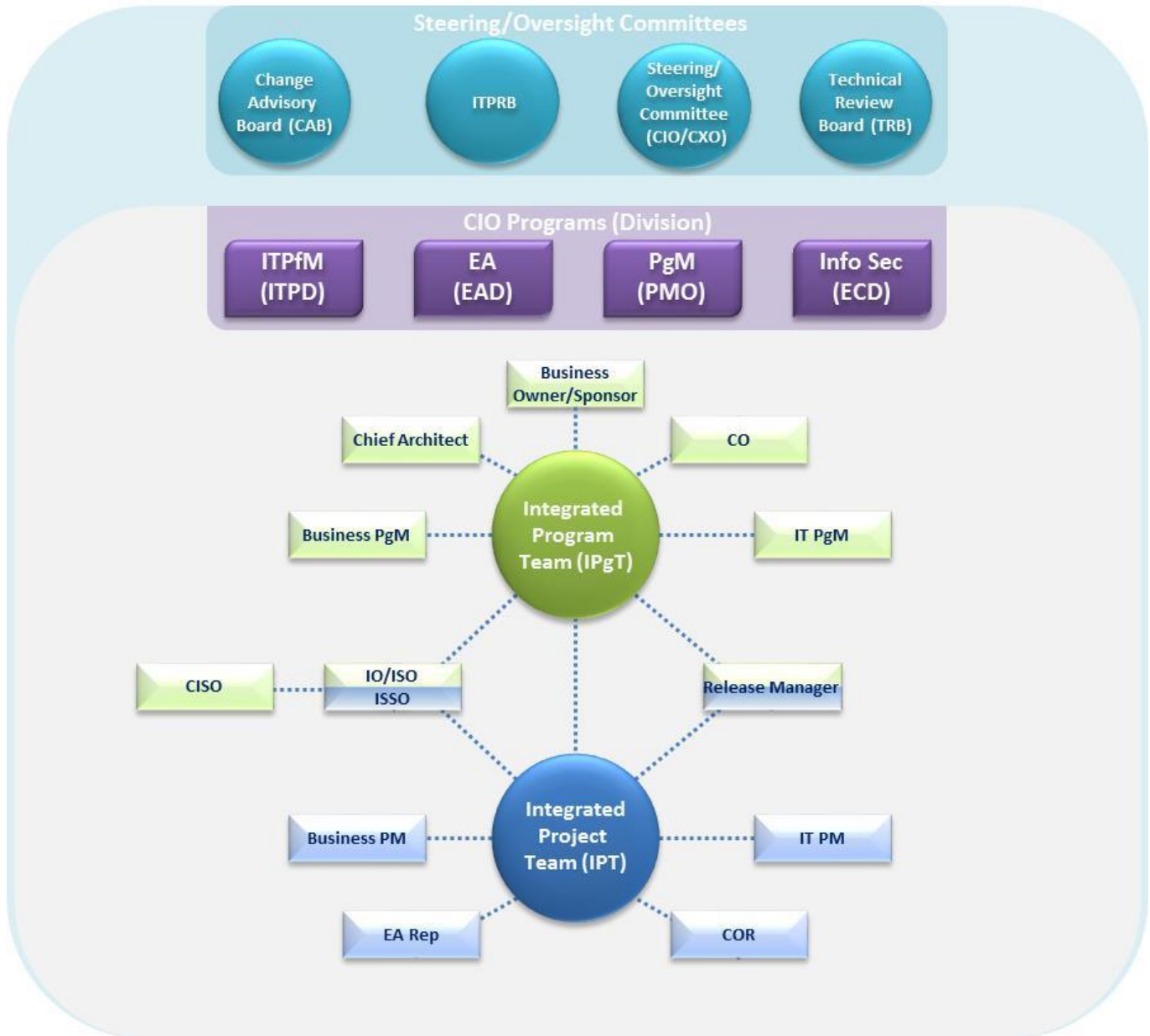


Figure 5: ITSLCM Roles

² In addition to those shown in the graphic, there are a number of roles that support and/or influence ITSLCM activities. Such roles may include Subject Matter Experts (SMEs) from organizations such as: Procurement Department (PD), Budget Department (BD), Workplace Solutions Department (WSD), Human Resources Department (HRD), and technical/infrastructure SMEs. These SMEs may participate in an as needed and consultative manner, depending upon the nature of the IT program/project and its maturity in the ITSLCM Framework.

3.0 ITSLCM Framework – Detailed Walk Through

The five phases of the ITSLCM each have a distinct purpose. These phases encompass the full lifecycle of an IT solution from its origination as a business need to its final disposition. The phases and related tasks may happen in a linear order and some may occur simultaneously in a mixed life cycle program. The following is an overview of each of these five phases.

3.1 Need/Concept Phase



The Need/Concept Phase is the first phase of the ITSLCM and occurs only in the Program Management Stream. During this phase, new business needs are analyzed within individual program areas and across the enterprise to determine if the business need can be met using an existing IT solution, through enhancing an existing IT solution, or through establishment of a new IT solution or program.

3.1.1 Program Management Stream

3.1.1.1 Gates & Reviews

There are two gates in the Need/Concept Phase:

- **IT Program Authorization:** The Business Owner/Sponsor reviews the program charter to ensure completeness, accuracy, validate documented need, and finalize sponsorship.
- **ITPRB IT Portfolio Registration Review:** IT Portfolio Review Board (ITPRB) decisions about whether to classify a request as IT/non-IT and helps determine potential impact to PBGC's IT Portfolio. Additional input may be provided by select SMEs for the review.

3.1.1.2 Roles

The most critical participants include:

- **Requestor:** Identifies business need
- **PMO:** Facilitates meetings with SMEs to determine if the business need can be accommodated by an IT Solution
- **EAD:** Provides perspective and insight
- **ECD:** Provides perspective and insight
- **Infrastructure:** Provides perspective and insight
- **ITPD:** Facilitates ITPRB processes
- **ITPRB:** Determines whether request is IT and impacts to IT portfolio

3.1.1.3 Tasks

During the Need/Concept Phase, requests are submitted and guided through a structured IT Portfolio Registration Review to determine if it should be classified as IT and, if so, how it might impact PBGC's IT Portfolio. The IT Portfolio Registration Checklist supports ITPRB decisions about whether to classify a budget request as IT/non-IT and helps determine potential impact to PBGC's IT Portfolio. The Checklist is divided into 2 parts:

- Part 1: ITPRB reviews and determines whether a request is IT and if so how it might impact the IT Portfolio
- Part 2: ITPRB records its decision about whether the request is IT/not IT and placement within the IT Portfolio

The following table provides an overview of the steps associated with this process.

Step	Description
1.	Requestor communicates an identified unmet business need to the PMO.

Step	Description
2.	PMO facilitates a meeting with the Program Manager(s) & EAD to determine if the business need can be accommodated by an IT Solution (e.g., Does the current architecture include an existing/planned solution to meet this need?) a) If not, improve business process. b) If so, proceed to the following steps.
3.	PMO facilitates a meeting with OIT SMEs and business representatives to discuss if the business need can be addressed by an existing IT solution or whether it requires development of a new IT solution and pre-populate the IT Portfolio Registration Checklist. Review additional information, as necessary, to support the responses in the Checklist.
4.	PMO submits the pre-populated Checklist and supporting materials, as needed, to ITPD. ITPD adds an agenda item for an upcoming ITPRB meeting to review the Checklist and distributes read-ahead materials to ITPRB.
5.	The ITPRB reviews the Checklist and materials to determine whether a request is IT and if so how it might impact IT Portfolio. The ITPRB then records its decision about whether the request is IT/not IT and placement within the IT Portfolio. If the ITPRB is unsure, they have the option to engage the CIO, SAISO, ITIOD Director, EAD, ITPD, PMO, information owner, the proposing sponsor/entity, Department Director of that sponsor, and others, as necessary.
6.	ITPRB notifies BPIT of the outcome from the IT Portfolio Registration Process and provides recommendations for funding of the proposed solution, as applicable.

Table 2: IT Portfolio Registration Review

The results of the above process will establish the applicability of proceeding through the ITSLCM:

- **If the business need can be met using an existing IT solution:** Where an IT solution already exists that will fulfill the business need, a request to obtain access to the IT solution is submitted. No subsequent ITSLCM tasks are required.
- **If the business need can be met through enhancing an existing IT solution:** Where an IT solution exists, but needs to be modified or enhanced, the business requirements will be identified and preliminary analysis and market research conducted on the resources required. Cost, schedule, and scope changes are submitted to the program area's designated CCB for review and approval. When a budget request is being made, the changes are then submitted with the IT Portfolio Review Board (ITPRB) to update PBGC's IT Portfolio to reflect the appropriate changes. The IT Program Plan for that respective program will also then be updated.
- **If the business need requires establishing a new IT Solution:** Where no IT solution exists within the organization, and a new solution or program is needed to fulfill the business need, sponsorship for the new program will be finalized and a new IT Program Plan will need to be created and the new program added to PBGC's IT Portfolio.

If a new IT program is established, the Sponsor assumes responsibility for the program and a new IT Program Plan is developed. The IT Program Plan includes the following eight sections:

- **Section A: IT Program Charter/Authority** – This section includes general information about the program (e.g., program name, unique investment identifier, program size, establishment data, end date, approximate annual cost range, current program state, program scope, relationships/dependencies, legislative authority, and business owner/sponsor names).
- **Section B: IPgT** – This section includes information on the IPgT and the Full-Time Equivalent (FTE) Calculations.
- **Section C: IT Program Measures (Monitoring & Reporting)** – This section includes information on performance measures (e.g., EA alignment and status, accomplishments by fiscal year, program oversight, program change and communications management, quality management, configuration management, and ROI on DME).
- **Section D: Total Cost of Ownership (TCO)/Summary of Spending** – This section provides TCO information for planning, DME, O&M, and Managed Services.

- **Section E: Acquisition Strategy** – This section includes information on acquisition/contract strategy.
- **Section F: Program Risks** – This section includes information for the IT Risk Register.
- **Section G: Operational Analysis** – This section includes information related to the operational analysis (e.g., program performance measures, cost assessments, business drivers, technology drivers, and overall program recommendation).
- **Section H: Artifacts** – This section provides additional artifacts such as IT Program Oversight Briefings, Business Needs Analysis documentation, and Alternatives Analysis information.

While the IT Program Plan includes the eight sections listed above, only the Charter Section is completed with sign-off by the Sponsor or IT Program Authorization during the Need/Concept phase.

3.1.1.4 Deliverables

The following table provides the minimum deliverables required as well as a recommended approach to assigning roles and responsibilities using a Responsible-Accountable-Consulted-Informed (RACI) matrix. It also notes organizations that, while not required on the Framework, may add value to the process. It is important to note that program and project managers have the authority to negotiate roles and responsibilities as well as create roles and responsibilities as they deem necessary and appropriate. Responsible roles own the deliverable in that they are responsible for completing it. Accountable roles must sign off or approve of the deliverable. Consulted roles have information that may be necessary to complete the deliverable. Informed roles must be notified of resulted, but need not be consulted.

Deliverable	Description	Responsible	Accountable	Consulted	Informed
IT Program Plan (Section A – Charter)	Serves as the central repository that tracks program and project performance including cost, schedule and scope. Information such as points of contact, acquisition strategy, and relationships/dependencies to other IT programs is also maintained within this tool.	<ul style="list-style-type: none"> • Business & IT Program Manager 	<ul style="list-style-type: none"> • Business Owner/Sponsor 	<ul style="list-style-type: none"> • PMO • ITPD • Enterprise Cybersecurity • Infrastructure • IPgT • IPT 	<ul style="list-style-type: none"> • ITPRB • IPgT • IPT
IT Portfolio Registration Checklist	Supports ITPRB decisions about whether to classify a budget request as IT/non-IT and helps determine potential impact to PBGC’s IT Portfolio. This checklist is completed by the PMO and program managers and then submitted to the ITPRB.	<ul style="list-style-type: none"> • Business Program Manager 	<ul style="list-style-type: none"> • ITPRB 	<ul style="list-style-type: none"> • PMO • ITPD • Enterprise Chief Architect • Enterprise Cybersecurity • Infrastructure 	<ul style="list-style-type: none"> • IT & Business Program Manager • BPIT

Table 3: Deliverables RACI

3.1.1.5 Standards

There are no applicable standards.

3.1.2 Project and Technology Management Stream

There are no gates/reviews, tasks, deliverables, or standards in this phase/stream.

3.1.3 *Cybersecurity Stream*

There are no gates/reviews, tasks, deliverables, or standards in this phase/stream.

3.1.4 *External Processes*

There is one External Process:

- **IT Risk Management:** Focuses on identifying and evaluating the threats and opportunities pertinent to the proposed IT program/project and identifying risk management and mitigation strategies. For more information, visit the [IT Risk Management Process and Procedures](#) in the OIT Policy & Process Library (PPL).

3.2 Planning Phase



During the Planning Phase, detailed program and project planning tasks are conducted and documented. As part of planning, all IT programs and projects are required to establish a baseline for performance, scope, cost, and schedule.

3.2.1 Program Management Stream

3.2.1.1 Gates & Reviews

There is one gate in the Planning Phase:

- **ITPRB Prioritize Review:** The ITPRB reviews the IT Program Plans for all IT programs, assesses them for alignment and implementation readiness, and sends resulting prioritization recommendations to the BPIT and CIO. Additional input may be requested from select SMEs to assist the ITPRB in its recommendations.



During the Planning Phase detailed program and project planning activities are conducted and documented.

3.2.1.2 Roles

The most critical participants include:

- **IT & Business Program Managers:** Updates and maintains the IT Program Plan
- **ITPRB:** Reviews the IT Program Plans for all IT programs, assesses them for alignment and implementation readiness, and sends resulting prioritization recommendations to the BPIT and CIO

3.2.1.3 Tasks

In the Program Management Stream, the IT and Business Program Managers are the key roles, and their primary responsibility is updating and maintaining the IT Program Plan. This means planning the tasks for the program. This consists of, at minimum, annually reviewing and updating the IT Program Plan. The IT and Business Program Managers are responsible for:

- Identifying IPgT roles and responsibilities to ensure appropriate engagement
- Working with Enterprise Chief Architect to conduct a BNA to assess the baseline architecture, target architecture, gaps, and modernization roadmap
- Determining strategic alignment by analyzing the PBGC Strategic Plan and the IT Strategic Plan
- Conducting an alternatives analysis and cost benefit analysis to select the best option (e.g., status quo, COTS, federal line of business)
- Sequencing the program's projects and tasks to achieve the defined program business needs, approved BNA recommendations, and any prioritized O&M tasks that have come up (coordination and management of these tasks at the program level occur during this phase)

The expectation is that the projects will then leverage the plans established at the program level. The documentation of this activity should be included within the IT Program Plan which contains the following, though not limited to, program information:

- Component Projects
- Scope
- Dependencies to other IT programs
- Program/Project Team Members

- EA Alignment
- TCO
- Acquisition Strategy
- Risk Register
- Quality Management
- Performance Measures

All IT programs undergo an annual ITPRB Prioritization Review where they are assessed for alignment and implementation readiness. The results of this review are then submitted as prioritization recommendations to BPIT. The Prioritize Review assesses the IT programs and projects and validates the budget, scope, and schedule to recommend prioritization for budgetary decision-making. Prioritization criteria includes alignment with Corporate and IT Strategic goals and objectives, alignment with EA Roadmap, and implementation readiness.

Program Baseline occurs during the ITPRB Prioritization Review. As per OMB requirements, Business and IT Program Managers are responsible for establishing a Program Baseline. The Baseline is entered into the program and project management tool and reported to OMB (per OMB guidelines). The Baseline contains Planning, DME, O&M and Managed Services. IT Program Baselines must be approved by the CIO and sponsoring CXO.

- Cost Baseline: Costs for DME, O&M, and Managed Services as indicated in TCO section of IT Program Plan
- Schedule Baseline: High-level timeline for the program as indicated in the IT Program Plan
- Scope Baseline: Configuration of systems and functionalities established in the IT Program Plan

3.2.1.4 Deliverables

The following table provides the minimum deliverables required as well as a recommended approach to assigning roles and responsibilities using a Responsible-Accountable-Consulted-Informed (RACI) matrix. It also notes organizations that, while not required on the Framework, may add value to the process. It is important to note that program and project managers have the authority to negotiate roles and responsibilities as well as create roles and responsibilities as they deem necessary and appropriate. Responsible roles own the deliverable in that they are responsible for completing it. Accountable roles must sign off or approve of the deliverable. Consulted roles have information that may be necessary to complete the deliverable. Informed roles must be notified of resulted, but need not be consulted.

Deliverable	Description	Responsible	Accountable	Consulted	Informed
IT Program Plan (Section A –F, G)	Serves as the central repository that tracks program and project performance including cost, schedule and scope. Information such as points of contact, acquisition strategy, and relationships/dependencies to other IT programs is also maintained within this tool.	<ul style="list-style-type: none"> • Business & IT Program Managers 	<ul style="list-style-type: none"> • Business Owner/ Sponsor 	<ul style="list-style-type: none"> • PMO • ITPD • Enterprise Cybersecurity • Infrastructure • IPgT • IPT 	<ul style="list-style-type: none"> • ITPRB • IPgT • IPT
Business Needs Analysis Document	A result of an analysis of a business areas processes and technology to determine how best to meet business requirements, progress towards the enterprise target	<ul style="list-style-type: none"> • Enterprise Chief Architect 	<ul style="list-style-type: none"> • Business Sponsor 	<ul style="list-style-type: none"> • Enterprise Cybersecurity • Infrastructure 	<ul style="list-style-type: none"> • IPgT

Deliverable	Description	Responsible	Accountable	Consulted	Informed
	architecture, and align with the corporate and IT strategic plans. It contains a set of recommendations for business sponsors and IT Professionals which defines a modernization roadmap to reach the target state.				

Table 4: Deliverables RACI

3.2.1.5 Standards

There is one standard in the Planning Phase:

- **Business Needs Analysis Standard:** Defines the architectural approach for conducting a business needs analysis to support the prioritization, investment and planning decisions as well as to establish or confirm the alignment of these decisions to PBGC business plans and strategic goals.

3.2.2 Project and Technology Stream

3.2.2.1 Gates & Reviews

There are two gates in the Planning Phase:

- **TRB Product Selection Review:** The TRB reviews and approves the solution product selection to ensure that the proposed solution is in line with the Enterprise Target Architecture (ETA) and in compliance with federal mandates such as OMB A-130, OMB A-11 and NIST 800-53.
- **PMO Schedule/Cost Review:** The PMO reviews the Cost Loaded Project Schedule baseline to ensure alignment with IT Program Plan and reporting milestones.

3.2.2.2 Roles

The most critical participants include:

- **IT & Business Project Managers:** Planning at the project level based on the information in the IT Program Plan
- **TRB:** Reviews and approves the solution product selection
- **PMO:** Reviews the Cost Loaded Project Schedule baseline and ensures project is approved per the IT Program Plan

3.2.2.3 Tasks

The IT & Business Project Manager's (and other roles listed above) primary responsibility is planning at the project level based on the information in the IT Program Plan. For the Project Managers, who operate at the tactical level, this phase involves implementing the plans established at the program level. For example, a project can follow the same risk management strategy outlined in the IT Program Plan. The IT and Business Project managers may reference the risks outlined in the IT Program Plan and not have to document them separately in a PMP. Leveraging program-level documentation reduces the amount of artifacts the project team must produce. As appropriate, this may include documentation of quality management, configuration management, communication plans, schedule management, and acquisitions. The IT and Business Project Managers are responsible for the following:

- At the project level, the IPT selects a development approach (e.g., agile, iterative) that will assist in making the project a success. The development approach may be one that is already identified at the program level and documented in the IT Program Plan. If the approach used, however, is specific to the project, it should be documented as part of project management. Additional project-level documentation may be required if there are deviations from the IT Program Plan (e.g., different members of the IPT vs. the IPgT, differences in the management strategies).

- Developing a cost loaded project schedule to ensure appropriate sequencing and inclusion of approved BNA recommendation(s).
- Focusing on selecting the product or technology to fulfill the business need identified and documenting the high-level requirements and design (including integration with other systems). The project managers also provide appropriate documentation which defines solution deployment and disposition as well as a business implementation strategy.
- Completion of the planning phase requires a Product Selection Review by the TRB and a Schedule/Cost Review that is facilitated by the PMO.

Project Baseline occurs during the PMO (Schedule Cost Review) Gate. Business and IT Project Managers must establish a Baseline for all projects (whether part of the IT program or standalone) by entering a detailed schedule in PBGC’s program & project management (PPM) tool. IT Project Baselines are approved by the IT and Business Program Managers (with consultation from CIO and sponsoring CXO), or CIO and sponsoring CXO.

- Cost Baseline: Detailed budget derived from the IT Program Plan obligated to the project and entered into program and project tool
- Schedule Baseline: Approved timeline for acquiring, implementing, operating, and/or disposing of the systems and services
- Scope Baseline: Established scope and/or requirements

3.2.2.4 Deliverables

The following table provides the minimum deliverables required as well as a recommended approach to assigning roles and responsibilities using a Responsible-Accountable-Consulted-Informed (RACI) matrix. It also notes organizations that, while not required on the Framework, may add value to the process. It is important to note that program and project managers have the authority to negotiate roles and responsibilities as well as create roles and responsibilities as they deem necessary and appropriate. Responsible roles own the deliverable in that they are responsible for completing it. Accountable roles must sign off or approve of the deliverable. Consulted roles have information that may be necessary to complete the deliverable. Informed roles must be notified of resulted, but need not be consulted.

Deliverable	Description	Responsible	Accountable	Consulted	Informed
Deployment and Disposition Plan	A consolidated artifact that documents the planning, solution implementation, operations and maintenance, and disposition tasks of new and existing solutions within PBGC managed environments. It is used to facilitate the release management process.	<ul style="list-style-type: none"> • IT Project Manager 	<ul style="list-style-type: none"> • IT Program Manager 	<ul style="list-style-type: none"> • Release Manager 	<ul style="list-style-type: none"> • CAB • IPT
Cost Loaded Project Schedule	Provides a cash flow forecast that indicates how cash will be spent over time on a project. It is a sequenced schedule of project tasks that accounts for cost and project risk.	<ul style="list-style-type: none"> • IT & Business Project Manager 	<ul style="list-style-type: none"> • IT & Business Program Manager 	<ul style="list-style-type: none"> • PMO 	<ul style="list-style-type: none"> • IPT • IPgT
Business Implementation Strategy	Takes a “top-down approach” and helps project teams articulate the	<ul style="list-style-type: none"> • IT Program Manager 	<ul style="list-style-type: none"> • Business Project 	<ul style="list-style-type: none"> • PMO • TBD by 	<ul style="list-style-type: none"> • ITPRB

Deliverable	Description	Responsible	Accountable	Consulted	Informed
Document	expectations for the project (e.g., what will the implementation result in), help maintain focus, and identify expectations for each stage of the implementation.	<ul style="list-style-type: none"> IT Project Manager 	Manager	<i>Project Manager</i>	

Table 5: Deliverables RACI

3.2.2.5 Standards

There are three standards in the Planning Phase:

- The [Product and Technology Standard](#) defines the approach for using a technology component or IT product (and their versions) that is best for PBGC overall and properly documenting the selection decision for input into acquisition processes. This approach is used only after the Business Needs Analysis is complete, a Technical Reference Model (TRM) gap is defined and business requirements are delineated. This standard also integrates the Procurement department throughout the process to ensure compliance with Procurement policy and timely execution of procurement-related tasks.
- The [Deployment and Disposition Plan \(DDP\) Standard](#)'s purpose is to link to required content from select ITSLCM artifacts to facilitate communication throughout the IT solutions lifecycle. Specifically, the information collected in the DDP will be leveraged by board members to make go/no go decisions at planned CAB meetings (1st CAB: Review Infrastructure Requirements; 2nd CAB: Review Readiness for Prod/COOP Deployment). ITIOD IT Assets & Technology Requirements Management (ITA&TR) Team will own and populate the DDP for both IT solutions development and infrastructure projects.
- The Business Implementation Strategy Standard applies to version 1.0 or Large (> \$1M) DME efforts. It requires project teams to articulate the expectations for the project.

3.2.3 Cybersecurity Stream

Since the Enterprise Cybersecurity Program has its own process, ITSLCM users should refer to their ISSO for assistance.

3.2.3.1 Roles

The most critical participants include:

- ISSO:** Responsible for providing guidance on ITSLCM gates, reviews, roles, tasks, deliverables, and standards related to cybersecurity.

3.2.3.2 Deliverables

The following table provides the minimum deliverables required as well as a recommended approach to assigning roles and responsibilities using a Responsible-Accountable-Consulted-Informed (RACI) matrix. It also notes organizations that, while not required on the Framework, may add value to the process. It is important to note that program and project managers have the authority to negotiate roles and responsibilities as well as create roles and responsibilities as they deem necessary and appropriate. Responsible roles own the deliverable in that they are responsible for completing it. Accountable roles must sign off or approve of the deliverable. Consulted roles have information that may be necessary to complete the deliverable. Informed roles must be notified of resulted, but need not be consulted.

Deliverable	Description	Responsible	Accountable	Consulted	Informed
Security Registration Document	Provides the information required to clearly identify any weaknesses in the proposed solution and to	<ul style="list-style-type: none"> ISSO 	<ul style="list-style-type: none"> ISO/IO 	<ul style="list-style-type: none"> Enterprise Cybersecurity Infrastructure 	<ul style="list-style-type: none"> IT & Business Project

Deliverable	Description	Responsible	Accountable	Consulted	Informed
	support future assessments of the solution.				Managers • IPgT • IPT
Security Risk Assessment	Documents the analysis of the risks and threats towards a system's confidentiality, integrity, and availability of data or information.	• ISSO	• ISO/IO	• Enterprise Cybersecurity • Infrastructure	• IT & Business Project Managers • IPgT • IPT
System Security Plan	Provides an overview of the security requirements of the system, and describes the controls that are in place or being planned for meeting those requirements. The SSP also delineates responsibilities and expected behavior of all individuals who access the system. The SSP should be viewed as documentation of the structured process for planning adequate and cost-effective security protection for a system.	• ISSO	• ISO/IO	• Enterprise Cybersecurity • Infrastructure	• IT & Business Project Managers • IPgT • IPT

Table 6: Deliverables RACI

3.2.4 External Processes

There are six external processes:

- **Business Needs Analysis:** Refers to the processes and tasks needed to refine a business need, determine the performance gap, and begin taking steps toward identifying and implementing a solution. For more information visit [EAD's website](#).
- **IT Risk Management:** Focuses on identifying and evaluating the threats and opportunities pertinent to the proposed IT program/project and identifying risk management and mitigation strategies. For more information, visit the [Policy and Compliance Division \(PCD\) website](#).
- **The Acquisitions Process:** Defines what steps and documentation is required to be in compliance with Federal Acquisition Requirements and procurement policies at PBGC. For more information visit the Procurement Department [Procurement Department website](#) on the intranet.
- **Budget Formulation and Execution:** Address managing departmental resources. These processes provide the technical budgeting due diligence needed to formulate and justify requests and execute appropriations at the departmental level.
- **Configuration Management:** Control the promotion of IT solutions to development, testing and production environments. It identifies the final location of all work products including software, code, documentation, plans,

status reports, critical communications, action items, and meeting minutes. For more information, visit [ITIOD's website](#).

- **Release Management:** Manage the deployment of changes in hardware and software to the infrastructure. For more information, visit the [Release and Deployment Management Process](#) in the OIT PPL.

3.3 Solution Implementation Phase



The Solution Implementation Phase is the third phase in the ITSLCM. During the Solution Implementation Phase, the IT solution is developed, implemented, and deployed. It is in this phase that the technology solution identified (regardless of the type) is deployed to production. Prior to

deployment, an Authority To Operate (ATO) review is required. Different methodologies may be employed in solution implementation with a preference on the use of modular development. The ITSLCM Framework includes a red dashed line (top to bottom) indicating the transition to production.



During the Solution Implementation Phase, the IT solution is developed, implemented, and deployed.

3.3.1 Program Management Stream

3.3.1.1 Gates & Reviews

There is one gate in the Solution Implementation Phase:

- **ITPRB Semi-Annual Program Review:** The ITPRB conducts a Control Reviews on a semi-annual basis for IT programs to assess programs on their continuing fulfillment of the agency's strategic IT needs in a timely and cost-efficient manner. The semi-annual program Control Review assesses the Cost Performance Index (CPI), Schedule Performance Index (SPI) and progress against defined program measures.

3.3.1.2 Roles

The most critical participants include:

- **IT & Business Program Managers:** Making regular updates to the IT Program Plan
- **ITPRB:** Conducts Program Control Reviews on a semi-annual basis

3.3.1.3 Tasks

The IT and Business Programs Managers' primary responsibility is making regular updates based on the progress (e.g., Program Risks, Operational Analysis, Artifacts) to the IT Program Plan during solution implementation at the program and project level. Program Managers also conduct IT performance monitoring which is reported to required authorities such as the Federal IT Dashboard or Steering Committees. As part of ongoing monitoring, all IT programs must also comply with PBGC's Performance Management approach identified in the Performance Management Brochure.

Preparation is made for program-level reviews with the ITPRB on a semi-annual basis where the program will be evaluated on program cost/schedule performance, progress against performance measures, and overall health of the program. Major projects ($\geq \$1M$) within the program will similarly be evaluated on a quarterly basis against project cost/schedule performance, reliability, sustainability, executability, and overall health of the project. Program managers are responsible for monitoring the project-level review outcomes for any of their component projects in the solution implementation phase and for engaging IPTs for assistance in preparing for reviews. Program Managers may participate in interviews with PMO, ITPD, and other SMEs as required and may need to meet with the ITRPB to provide a status based on information received from the Project Managers.

The IT and Business Program Managers are required to monitor and report CPI, SPI, CV, SV, and EV for the overall IT program to the Executive Steering Committee or Business Owner/Sponsor and Chief Information Officer (CIO) as well as the ITPRB and OMB:

- **Calculating Cost Performance Index (CPI):** $CPI = EV/AC$ (We are getting \$_ for every \$1 we spend)
- **Calculating Schedule Performance Index (SPI):** $SPI = EV/PV$ (We are progressing at a rate of _% of the rate originally planned)

	CPI	SPI	Reporting Guidelines
Green 	Between 0.95 and 1.05	Between 0.95 and 1.05	A normal project status report is provided.
Yellow 	Between 0.91 and 0.94 OR 1.06 and 1.09	Between 0.91 and 0.94 OR 1.06 and 1.09	A verbal explanation is required.
Red 	≤ 0.90 or ≥ 1.10	≤ 0.90 or ≥ 1.10	A written corrective action plan is required.

Figure 6: CPI and SPI Calculation Guidelines

Careful consideration must be given when analyzing IT Performance Management data. Budget and schedule variances must be evaluated to identify and resolve underlying problems:

Variance Analysis Reveals:

- Problem
- Cause
- Impact
- Potential corrective action(s)
- Get well date

Typical Causes:

- Poor initial planning or estimating
- Weak risk identification and management
- Technical breakthroughs or problems
- Load imbalance (e.g., front-end loading)
- Inflation or change in labor rates

Program Managers report on their program’s performance semi-annually at the ITPRB Program Control Review. However, they should be monitoring CPI, SPI, CV, SV, and EV on a continual basis.

3.3.1.4 Deliverables

The following table provides the minimum deliverables required as well as a recommended approach to assigning roles and responsibilities using a Responsible-Accountable-Consulted-Informed (RACI) matrix. It also notes organizations that, while not required on the Framework, may add value to the process. It is important to note that program and project managers have the authority to negotiate roles and responsibilities as well as create roles and responsibilities as they deem necessary and appropriate. Responsible roles own the deliverable in that they are responsible for completing it. Accountable roles must sign off or approve of the deliverable. Consulted roles have information that may be necessary to complete the deliverable. Informed roles must be notified of resulted, but need not be consulted.

Deliverable	Description	Responsible	Accountable	Consulted	Informed
IT Program Plan (Section C)	Serves as the central repository that tracks program and project performance including cost, schedule and scope. Information such as points of contact, acquisition strategy, and relationships/dependencies to other IT programs is also maintained within this tool.	<ul style="list-style-type: none"> • Business & IT Program Manager 	<ul style="list-style-type: none"> • Business Owner/ Sponsor 	<ul style="list-style-type: none"> • PMO • ITPD • Enterprise Cybersecurity • Infrastructure • IPgT • IPT 	<ul style="list-style-type: none"> • ITPRB • IPgT • IPT
Program Performance	These monthly reports track the Schedule Performance	<ul style="list-style-type: none"> • IT & Business Program 	<ul style="list-style-type: none"> • Business Owner/ 	<ul style="list-style-type: none"> • PMO 	<ul style="list-style-type: none"> • ITPRB • Steering

Deliverable	Description	Responsible	Accountable	Consulted	Informed
Reports	Index (SPI), Cost Performance Index (CPI), and overall project development performance. The integrity of these reports is dependent on the program/project managers updating the approved tool in a timely manner.	Manager	Sponsor	<ul style="list-style-type: none"> • ITPD • IPgT • IPT 	Committee (CIO-CXO Meeting)

Table 7: Deliverables RACI

3.3.1.5 Standards

There are no applicable standards.

3.3.2 Project and Technology Stream

3.3.2.1 Gates & Reviews

There are four gates in the Solution Implementation Phase:

- **CAB (Infrastructure Resources Review):** The CAB reviews the required infrastructure resources (first CAB review in the Solution Implementation Phase).
- **ITPRB (Quarterly Project Review):** The ITPRB conducts Project Control Reviews on a quarterly basis for large IT Projects (\geq \$1M) to assess projects on their continuing fulfillment of the agency's strategic IT needs in a timely and cost-efficient manner. The quarterly project Control Review assesses PM qualifications/certifications; CPI and SPI; and reliability, sustainability, executability.
- **TRB (Design Review):** During this gate, the TRB reviews the submissions for technology, technical feasibility and compliance with PBGC's IT standards. The TRB will determine adherence to technical standards and guidelines for IT projects, business cases, and proposals and provide go/no-go decisions at the appropriate IT solutions life cycle decision points. The TRB will approve the insertion, replacement, and deletion of technology standards and remain up-to-date on the status of existing technology implemented at the Corporation. The TRB will also make formal recommendations to the CIO, Chief Enterprise Architect and ITPRB. For more information, refer to the Technical Reference Model (TRM) and the [TRB Processes and Procedures](#).
- **CAB (Production/COOP Deployment Review):** The CAB reviews the completeness of the Deployment and Disposition Plan (DDP) and approves deployment to the production environment. For more information, refer to Change Management/Release Management process on the [ITIOD's website](#).

There are three reviews in the Solution Implementation Phase:

- **Requirements (Technology Solution Review):** The IPT reviews the technology solution's requirements to ensure the requirements meet the business needs as well as each IPT member's domain's technical requirements and readiness for the TRB.
- **Design (Technology Solution Review):** The IPT reviews the technology solution's design to ensure the design supports the approved requirements as well as each IPT member's design concerns and readiness for the TRB. EA ensures adherence to EA standards.
- **Production Readiness Validation:** The IPT reviews the technology solution to ensure it is ready for production deployment.

3.3.2.2 Roles

The most critical participants include:

- **IT & Business Project Managers:** Oversee project execution, monitoring, and control
- **ITPRB:** Conducts Project Control Reviews on a quarterly basis
- **CAB:** Reviews required information
- **TRB:** Reviews submitted information and makes determination

3.3.2.3 Tasks

The IT and Business Project Managers oversee project execution, monitoring, and control occur in this phase. Additional requirements documentation is developed to elaborate on the high-level requirements defined during the Planning phase. This elaboration includes design specifications, detailed functional/technical requirements, and testing tasks. While developing the Implementation and Training Plan, there should be coordination with the Human Resources Department (HRD) to ensure identification and coordination of labor issues and training tasks.

Implementation of the selected development approach occurs as part of Technology Solution Management within this stream. This phase includes solution development life cycle tasks (requirements, design, build, test, and deploy). The IPT engages the release and change management processes to move the solution through the Solution Implementation phase into production.

The IPT applies the selected development approach (e.g., Agile, Iterative) in the Solutions Implementation phase. Sequencing the tasks, scheduling the reviews, and determining the releases and iterations needed to package and deploy functionality and/or a solution are all implemented in the Solutions Implementation phase. The IPT provides the recommended approach and deliverables based on the various constraints associated with the project. The IPT also determines deliverable structure. It is important to emphasize that the information identified in the deliverable structure may not ultimately be included in the deliverable. This gives the IPTs the flexibility to combine artifacts in the spirit of streamlining artifacts. For example, on small efforts, it is acceptable to combine the requirements document and design/COTS document.

The IT and Business Project Managers are required to Monitor and report CPI, SPI, CV, SV, and EV for individual IT Projects, including relationship and dependencies between other projects to the IT/Business Program Managers:

- **Calculating Cost Performance Index (CPI):** $CPI = EV/AC$ (We are getting \$_ for every \$1 we spend)
- **Calculating Schedule Performance Index (SPI):** $SPI = EV/PV$ (We are progressing at a rate of _% of the rate originally planned)

	CPI	SPI	Reporting Guidelines
Green ●	Between 0.95 and 1.05	Between 0.95 and 1.05	A normal project status report is provided.
Yellow ●	Between 0.91 and 0.94 OR 1.06 and 1.09	Between 0.91 and 0.94 OR 1.06 and 1.09	A verbal explanation is required.
Red ●	≤ 0.90 or ≥1.10	≤ 0.90 or ≥1.10	A written corrective action plan is required.

Figure 7: CPI and SPI Calculation Guidelines

Careful consideration must be given when analyzing IT Performance Management data. Budget and schedule variances must be evaluated to identify and resolve underlying problems:

Variance Analysis Reveals:

- Problem
- Cause
- Impact
- Potential corrective action(s)
- Get well date

Typical Causes:

- Poor initial planning or estimating
- Weak risk identification and management
- Technical breakthroughs or problems
- Load imbalance (e.g., front-end loading)
- Inflation or change in labor rates

Project Managers report on their project's performance quarterly at the ITPRB Project Review.

Project Managers also prepare for Review/Gates reviews and approvals. Among these is the quarterly control reviews conducted by the ITPRB for major projects that are \geq \$1M. Project Managers ensure that the IT Program Plan has been updated with current performance data and coordinate with program management on gathering the information needed to present as part of the review package. PMO, EA, ITPD, and ECD review the information and provide feedback to the projects in preparation for the control reviews.

After the solution has been deployed into production, the ITPM work with the ISSO and ECD to establish the ATO from the AO/CIO/SAISO if appropriate. Upon receiving ATO, the IPT may commence stabilizing the solution, granting access to users, establishing service desk support, and transitioning the system into the Operations and Maintenance Phase. It is important to note that not every project/release will require an ATO. The ATO is only updated under certain criteria and/or periodically. Project Managers are also responsible for updating the Deployment and Disposition Plan to ensure traceability.

3.3.2.4 Deliverables

The following table provides the minimum deliverables required as well as a recommended approach to assigning roles and responsibilities using a Responsible-Accountable-Consulted-Informed (RACI) matrix. It also notes organizations that, while not required on the Framework, may add value to the process. It is important to note that program and project managers have the authority to negotiate roles and responsibilities as well as create roles and responsibilities as they deem necessary and appropriate. Responsible roles own the deliverable in that they are responsible for completing it. Accountable roles must sign off or approve of the deliverable. Consulted roles have information that may be necessary to complete the deliverable. Informed roles must be notified of resulted, but need not be consulted.

Deliverable	Description	Responsible	Accountable	Consulted	Informed
Requirements Document	Defines the IT Solution's functional, operational, and service requirements needed to meet the business need.	<ul style="list-style-type: none"> • IT Project Manager 	<ul style="list-style-type: none"> • Business Project Manager 	<ul style="list-style-type: none"> • IPT • Enterprise Cybersecurity • Infrastructure • Release Manager 	<ul style="list-style-type: none"> • CAB • IPgT • TRB
Design and Commercial-Off-The-Shelf (COTS) Configuration Document	Refers to the designing of an IT solution (Design Document), the configuring of COTS products, or externally hosted IT solutions. It documents the information required to communicate architectural and system designs to the IPgT, IPT, and appropriate governance boards.	<ul style="list-style-type: none"> • IT Project Manager 	<ul style="list-style-type: none"> • EA Rep 	<ul style="list-style-type: none"> • IPT • Enterprise Cybersecurity • Infrastructure 	<ul style="list-style-type: none"> • TRB

Deliverable	Description	Responsible	Accountable	Consulted	Informed
Lessons Learned Document	Identifies processes, lessons learned, and recommendations to improve the quality and efficiency of the program/project.	<ul style="list-style-type: none"> IT & Business Project Manager 	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> Anyone that participated in the project 	<ul style="list-style-type: none"> PMO IT & Business Program Manager Steering Committee
User Manual	Provides direction for the end user on how the implemented IT solution can be used to achieve the business functionality that it was created to enable.	<ul style="list-style-type: none"> IPT 	<ul style="list-style-type: none"> Business Project Manager 	<ul style="list-style-type: none"> UAT Testers 	<ul style="list-style-type: none"> User Community
Implementation and Training Plan	Documents the organizational change tasks required to transition the IT solution from the IPgT/IPT to the business and end user community.	<ul style="list-style-type: none"> IPT 	<ul style="list-style-type: none"> Business Program Manager 	<ul style="list-style-type: none"> Resources as needed Learning Development Division Business community 	<ul style="list-style-type: none"> IT Project Manager Business user community
Deployment and Disposition Plan	A consolidated artifact that documents the planning, solution implementation, operations and maintenance, and disposition tasks of new and existing solutions within PBGC managed environments. It is used to facilitate the release management process.	<ul style="list-style-type: none"> IT Project Manager 	<ul style="list-style-type: none"> IT Program Manager 	<ul style="list-style-type: none"> Release Manager 	<ul style="list-style-type: none"> CAB IPT

Table 8: Deliverables RACI

3.3.2.5 Standards

There are seven standards in the Solution Implementation Phase:

- The [Requirements Document Standard](#) defines a consistent set of information that must be contained in the ITSLCM's requirement document deliverable. To document the IT Solution's defined functional, operational and services requirements needed to meet the business need.
- The [Design and COTS Configuration Document Standard](#) defines a consistent set of information that must be contained in the Design and COTS Configuration Document deliverable in the ITSLCM.
- The [System Development Standard](#) enables standardization of the runtime platforms, development and production environments and coding and design approaches.
- The [Enterprise Data Standard](#) defines mandatory practices for defining, modeling, storing, maintaining data and harmonizing it on an enterprise basis. It applies to internal PBGC systems and externally hosted systems that hold PBGC information.

- The [Software Service Standard](#) defines mandatory requirements that IT solutions development tasks shall consider when developing applications that require interfacing with other internal and external IT solutions or that can provide reuse and sharing of functionality.
- The [Implementation and Training Plan Standard](#) defines the information that must be contained in the implementation and training plan deliverable in the ITSLCM. To document the organizational change tasks required to transition the IT solution from the IPgT/IPT to the business/custom.
- The [Lessons Learned Document Standard](#) defines a consistent set of information that must be contained in the lessons learned deliverable in the ITSLCM. To document processes, lessons learned, and recommendations to improve the quality and efficiency of the program/project.

3.3.3 Cybersecurity Stream

3.3.3.1 Gates & Reviews

There is one gate in the Solution Implementation Phase:

- **Authority to Operate (ATO):** The ATO/Go Live milestone and is a formal declaration by a Designated Approving Authority that authorizes operation of a solution and explicitly accepts the risk to agency operations. The ATO is signed after a Certification Agent certifies that the system has met and passed all requirements to become operational. ATO is issued at the approval of Security Authorization Package.

3.3.3.2 Roles

The most critical participants include:

- **ISSO:** Responsible for providing guidance on ITSLCM gates, reviews, roles, tasks, deliverables, and standards related to cybersecurity.

3.3.3.3 Tasks

The ISSO will work with the IPT to identify requirements and appropriate standards that are relevant to the solution. The ISSO will work with the IT & Business PMs, ISO/IO to develop the appropriate Security artifacts including a Security Impact Analysis, completing a Security Assessment & Authorization, and developing Memoranda of Understanding (MOUs), Service Level Agreements (SLAs), or Intra-agency Agreements, as needed. Once a solution is ready for deployment, it must first obtain ATO. As part of the ATO, a Security Authorization Package must be completed.

3.3.3.4 Deliverables

The following table provides the minimum deliverables required as well as a recommended approach to assigning roles and responsibilities using a Responsible-Accountable-Consulted-Informed (RACI) matrix. It also notes organizations that, while not required on the Framework, may add value to the process. It is important to note that program and project managers have the authority to negotiate roles and responsibilities as well as create roles and responsibilities as they deem necessary and appropriate. Responsible roles own the deliverable in that they are responsible for completing it. Accountable roles must sign off or approve of the deliverable. Consulted roles have information that may be necessary to complete the deliverable. Informed roles must be notified of resulted, but need not be consulted.

Deliverable	Description	Responsible	Accountable	Consulted	Informed
System Security Plan	Provides an overview of the security requirements of the system, and describes the controls that are in place or being planned for meeting those requirements. The SSP also delineates responsibilities and expected behavior of all individuals who access the system. The	<ul style="list-style-type: none"> • ISSO 	<ul style="list-style-type: none"> • ISO/IO 	<ul style="list-style-type: none"> • Enterprise Cybersecurity • Infrastructure 	<ul style="list-style-type: none"> • IT & Business Project Managers • IPgT • IPT

Deliverable	Description	Responsible	Accountable	Consulted	Informed
	SSP should be viewed as documentation of the structured process for planning adequate and cost-effective security protection for a system.				
Security Risk Assessment	Documents the analysis of the risks and threats towards a system's confidentiality, integrity, and availability of data or information.	<ul style="list-style-type: none"> • ISSO 	<ul style="list-style-type: none"> • ISO/IO 	<ul style="list-style-type: none"> • Enterprise Cybersecurity • Infrastructure 	<ul style="list-style-type: none"> • IT & Business Project Managers • IPgT • IPT
MOUs, SLAs, Intra-agency Agreements	Various forms of agreements that have been created with a provider or partner organization that outlines the agreed-upon responsibilities for maintaining, updating, or sharing an IT solution, data exchange, or platform that is integral to the development of the IT solution that has been developed in response to an identified business need.	<ul style="list-style-type: none"> • ISSO 	<ul style="list-style-type: none"> • Business Sponsor 	<ul style="list-style-type: none"> • IT & Business Project Managers • IT & Business Program Managers • PD • OGC 	<ul style="list-style-type: none"> • CIO • IPgT • IPT
Security Authorization Package	<ul style="list-style-type: none"> • Authorization Decision Letter • System Security Plan (SSP) • Security Assessment Report (SAR) • Plan of Action & Milestones (POA&M) 	<ul style="list-style-type: none"> • AO/ISSO 	<ul style="list-style-type: none"> • AO 	<ul style="list-style-type: none"> • ECD 	<ul style="list-style-type: none"> • CIO • CISO • AO • ISO

Table 9: Deliverables RACI

3.3.3.5 Standards

Applicable IT Security Standards can be found on the intranet website for the [OIT Policy and Process Library](#). Please consult this site for standards/requirements information that applies to all ECD deliverables.

3.3.4 External Processes

There are six external processes:

- **Configuration Management:** Control the promotion of IT solutions to development, testing and production environments. It identifies the final location of all work products including software, code, documentation, plans,

status reports, critical communications, action items, and meeting minutes. For more information, visit [ITIOD's website](#).

- **Release Management:** Manage the deployment of changes in hardware and software to the infrastructure. For more information, visit [ITIOD's website](#).
- **The Acquisitions process:** Defines what steps and documentation is required to be in compliance with Federal Acquisition Requirements and procurement policies at PBGC. For more information visit the Procurement Department [Procurement Department website](#) on the intranet.
- **Change Management:** A structured project management approach to formally introduce changes to the IT infrastructure. As an external process, change management tasks ensure that the appropriate level of organizational preparation occurs as part of an IT solution implementation. For more information visit [IT Infrastructure Operations Department's \(ITIOD\) website](#).
- **IT Risk Management:** Focuses on identifying and evaluating the threats and opportunities pertinent to the proposed IT program/project and identifying risk management and mitigation strategies. For more information, visit the [Policy and Compliance Division \(PCD\) website](#).
- **IT Service/Incident/Problem Management:** Focused on ensuring timely and effective response to operational issues. For more information, visit [ITIOD's website](#).

3.4 Operations & Maintenance Phase



Operations & Maintenance is the fourth phase in the ITSLCM. During the Operations and Maintenance Phase, the IT solution is monitored and reported on.



During the Operations & Maintenance Phase, the IT solution is monitored and reported on.

3.4.1 Program Management Stream

3.4.1.1 Gates & Reviews

There is one gate in the Operations & Maintenance Phase:

- **ITPRB (PIR & Annual OA):** The ITPRB conducts an annual Evaluate Review on all programs portions that are in an O&M phase or are Managed Services. These annual reviews assess the steady state or managed service performance while notating changes in the business or technology drivers that may require modification. The results of these reviews are recommendations to continue funding or a need to initiate a new planning phase. The Evaluate Review criteria consist of program performance measures, business drivers, technology drivers, and O&M costs.

3.4.1.2 Roles

The most critical participants include:

- **IT & Business Program Managers:** Monitor and report on solutions
- **ITPRB:** Conduct an Evaluate Review

3.4.1.3 Tasks

In the Program Management Stream, the IT and Business Programs Managers' primary responsibility is monitoring and reporting solutions to ensure they are being effectively managed and maintained in the agency's production environment. This includes ensuring that the latest approved set of requirements (e.g., bug fixes, patches, and maintenance upgrades) is implemented. During this phase, operational analyses are conducted. Tasks performed within the Operations & Maintenance Phase are predictive and focused on preventing failures or a decline in performance, efficiency, and/or reliability.

Program Managers continue to maintain updates to the IT Program Plan with annual maintenance/steady state tasks including results of their operational analysis. Preparation also occurs for annual program-level reviews with the ITPRB. The ITPRB Evaluate Reviews assess programs against performance measures, O&M/managed service cost analysis, business/technology driver changes, and overall health of the program.

IT & Business Program Managers may discover, through monitoring and reporting, the need to consider rebaselining the overall IT program.

The following are acceptable reasons for making a request to rebaseline:

- **Significant change in goals** for the IT program (e.g., scope, requirements, objectives) resulting from internal or external management decisions, changes in availability of funds (e.g., continuing resolution), or contracting (including protests);
- **Implementation approach is iterative or incremental** allowing for progressive baselining (elaboration may be necessary when transitioning from one iteration to the next, as scope and objectives evolve); or
- **Current baseline is no longer useful** as a management tool for realistic performance measurement (e.g., too many changes to the project and the variances are too high).

IT program rebaselining must be approved by the CIO and sponsoring CXO. It may also be helpful to consult with ITPRB to rebaseline. Rebaselining criteria includes:

- Reason for rebaselining
- Description of changes to performance goals and measures
- Description of changes in IT program’s scope and/or capabilities
- Chronology of changes and re-baselining
- CPI and SPI trend analysis
- Current EV Performance prior to rebaselining
- Updated IT Risk Matrix
- Impact to OMB reporting
- Other information critical to decision-making

3.4.1.4 Deliverables

The following table provides the minimum deliverables required as well as a recommended approach to assigning roles and responsibilities using a Responsible-Accountable-Consulted-Informed (RACI) matrix. It also notes organizations that, while not required on the Framework, may add value to the process. It is important to note that program and project managers have the authority to negotiate roles and responsibilities as well as create roles and responsibilities as they deem necessary and appropriate. Responsible roles own the deliverable in that they are responsible for completing it. Accountable roles must sign off or approve of the deliverable. Consulted roles have information that may be necessary to complete the deliverable. Informed roles must be notified of resulted, but need not be consulted.

Deliverable	Description	Responsible	Accountable	Consulted	Informed
IT Program Plan – Sections C & G	Serves as the central repository that tracks program and project performance including cost, schedule and scope. Information such as points of contact, acquisition strategy, and relationships/dependencies to other IT programs is also maintained within this tool.	<ul style="list-style-type: none"> • Business & IT Program Manager 	<ul style="list-style-type: none"> • Business Owner/Sponsor 	<ul style="list-style-type: none"> • PMO • ITPD • Enterprise Cybersecurity • Infrastructure • IPgT • IPT 	<ul style="list-style-type: none"> • ITPRB • IPgT • IPT

Table 10: Deliverables RACI

3.4.1.5 Standards

There are no applicable standards.

3.4.2 Project and Technology Stream

3.4.2.1 Gates & Reviews

There are no applicable gates or reviews.

3.4.2.2 Roles

The most critical participants include:

- **IT & Business Project Managers:** Monitor and report on solutions
- **ITPRB:** Conduct an Evaluate Review

3.4.2.3 Tasks

The IT and Project Managers' primary responsibility is monitoring and reporting on solutions to ensure they are being effectively managed and maintained in the agency's production environment. It is important to note that some operations and maintenance tasks can and should be managed like DME project/release as they have starts/ends and long durations (the prevailing direction is in excess of 2 weeks). These projects should have a schedule that is entered into the project scheduling tool.

Although there are standard annual maintenance tasks that must occur, it is important to note that maintenance projects can lead back into solution implementation and require completing some or all of the solution implementation tasks depending on the size and scope of the project. There may be instances when some maintenance tasks must be completed out of cycle to accommodate a system change, organizational change, or new business requirement. As a result of the cyclical nature of the phases, when new business requirements are identified to enhance an IT solution in production, an IT project is initiated and project managers will follow the tasks outlined in the Solution Implementation phase.

During this phase an annual ITPRB Evaluate Review is conducted at the program and major project level with the ITPRB to assess ongoing health of the program/project. The Evaluate Review assesses the steady state or managed service performance. It also notes changes in the business or technology drivers that may result in recommendations related to continue funding or initiate a new planning phase. Evaluate criteria includes program performance measures, business drivers, technology drivers, and O&M costs.

For Project & Technology Managers, execution is done of any maintenance or steady state tasks to ensure that the project is fulfilling its intended purpose and business functionality. Ongoing project monitoring and reporting is required and appropriate updates must be made to the IT Program Plan. Project Managers coordinate with Program Managers to ensure that they have the information necessary for the annual program-level evaluation reviews with the ITPRB.

IT & Business Project Managers may discover, through monitoring and reporting, the need to consider rebaselining an IT project. The following are acceptable reasons for making a request to rebaseline:

- **Significant change in goals** for the IT Project (e.g., scope, requirements, objectives) resulting from internal or external management decisions, changes in availability of funds (e.g., continuing resolution), or contracting (including protests);
- **Implementation approach is iterative or incremental** allowing for progressive baselining (elaboration may be necessary when transitioning from one iteration to the next, as scope and objectives evolve); or
- **Current baseline is no longer useful** as a management tool for realistic performance measurement (e.g., too many changes to the project and the variances are too high).

IT project rebaselining can be approved by the IT and Business Program Managers (with consultation from CIO and CXO), or CIO and sponsoring CXO. It may also be helpful to consult with ITPRB to rebaseline. Rebaselining criteria includes:

- Reason for rebaselining
- Description of changes to performance goals and measures
- Description of changes in IT program's scope and/or capabilities
- Chronology of changes and re-baselining
- CPI and SPI trend analysis
- Current EV Performance prior to rebaselining
- Updated IT Risk Matrix
- Impact to OMB reporting
- Other information critical to decision-making

3.4.2.4 Deliverables

The following table provides the minimum deliverables required as well as a recommended approach to assigning roles

and responsibilities using a Responsible-Accountable-Consulted-Informed (RACI) matrix. It also notes organizations that, while not required on the Framework, may add value to the process. It is important to note that program and project managers have the authority to negotiate roles and responsibilities as well as create roles and responsibilities as they deem necessary and appropriate. Responsible roles own the deliverable in that they are responsible for completing it. Accountable roles must sign off or approve of the deliverable. Consulted roles have information that may be necessary to complete the deliverable. Informed roles must be notified of resulted, but need not be consulted.

Deliverable	Description	Responsible	Accountable	Consulted	Informed
Deployment and Disposition Plan	A consolidated artifact that documents the planning, solution implementation, operations and maintenance, and disposition tasks of new and existing solutions within PBGC managed environments. It is used to facilitate the release management process.	<ul style="list-style-type: none"> IT Project Manager 	<ul style="list-style-type: none"> IT Program Manager 	<ul style="list-style-type: none"> Release Manager 	<ul style="list-style-type: none"> CAB IPT

Table 11: Deliverables RACI

3.4.2.5 Standards

There are no applicable standards.

3.4.3 Cybersecurity Stream

Since the ECD has its own process, ITSLCM users contact the ISSO.

3.4.4 External Processes

There are five external processes:

- Configuration Management tasks control the promotion of IT solutions to development, testing and production environments. It identifies the final location of all work products including software, code, documentation, plans, status reports, critical communications, action items, and meeting minutes. For more information, visit [ITIOD's website](#).
- IT Risk Management focuses on identifying and evaluating the threats and opportunities pertinent to the proposed IT program/project and identifying risk management and mitigation strategies. For more information, visit the [Policy and Compliance Division \(PCD\) website](#).
- The Acquisitions process defines what steps and documentation is required to be in compliance with Federal Acquisition Requirements and procurement policies at PBGC. For more information visit the Procurement Department [Procurement Department website](#) on the intranet.
- Change Management is a structured project management approach to formally introduce changes to the IT infrastructure. As an external process, change management tasks ensure that the appropriate level of organizational preparation occurs as part of an IT solution implementation. For more information visit [IT Infrastructure Operations Department's \(ITIOD\) website](#).
- IT Service/Incident/Problem Management is focused on ensuring timely and effective response to operational issues. For more information, visit [ITIOD's website](#).

3.5 Disposition Phase



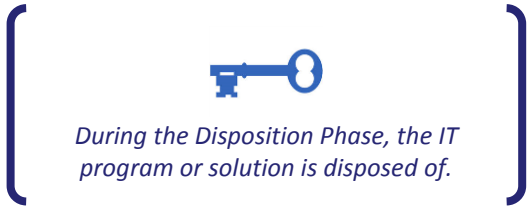
The Disposition Phase is the fifth and final phase of the ITSLCM. The purpose of the Disposition Phase is to efficiently dispose of IT program or IT solutions that are at the end of the useful life and no longer meet the IT or business needs. It provides for a planned approach to terminate an IT program or solution while ensuring that vital information is preserved for future restoration and/or reactivation, if necessary.

3.5.1 Program Management Stream

3.5.1.1 Gates & Reviews

There is one gate in the Disposition Phase:

- ITPRB Disposition Review:** When an IT program is no longer determined to be needed, a De-Select Review will need to occur. The Program Managers will need to provide the ITPRB with the appropriate information which demonstrates that the program is no longer needed or has been overcome by legislative mandate or technological advances. Once this review has occurred and permission for disposition given, the program will need to ensure that any enterprise-wide dependencies have been addressed to prevent any gaps in service to the agency’s strategic mission.



3.5.1.2 Roles

The most critical participants include:

- IT & Business Program Managers:** Write justifications
- ITPRB:** Conduct a Disposition Review

3.5.1.3 Tasks

If the program is ending, the ITPRB is convened and notified, and Program Managers must write justifications. Finally, OMB must be notified (part of the ITPRB process). The IT Program Plan must be updated and closed; and Program Managers must highlight any impacts to other programs/projects as well as mitigation plans for any negative impacts. Typically programs end after all projects have been completed and benefits met, gaps have been closed, or there has been an ITPRB or executive decision to close the program. Given that the projects will have already been closed, the DDP will already have been updated. In cases of an ITPRB or executive decision to close the program, the DDP will have to be updated.

3.5.1.4 Deliverables

The following table provides the minimum deliverables required as well as a recommended approach to assigning roles and responsibilities using a Responsible-Accountable-Consulted-Informed (RACI) matrix. It also notes organizations that, while not required on the Framework, may add value to the process. It is important to note that program and project managers have the authority to negotiate roles and responsibilities as well as create roles and responsibilities as they deem necessary and appropriate. Responsible roles own the deliverable in that they are responsible for completing it. Accountable roles must sign off or approve of the deliverable. Consulted roles have information that may be necessary to complete the deliverable. Informed roles must be notified of resulted, but need not be consulted.

Deliverable	Description	Responsible	Accountable	Consulted	Informed
Deployment and Disposition Plan	A consolidated artifact that documents the planning, solution implementation, operations and maintenance, and disposition tasks of new and	<ul style="list-style-type: none"> IT Project Manager 	<ul style="list-style-type: none"> IT Program Manager 	<ul style="list-style-type: none"> Release Manager 	<ul style="list-style-type: none"> CAB IPT

Deliverable	Description	Responsible	Accountable	Consulted	Informed
	existing solutions within PBGC managed environments. It is used to facilitate the release management process.				
IT Program Plan – Section C	Serves as the central repository that tracks program and project performance including cost, schedule and scope. Information such as points of contact, acquisition strategy, and relationships/dependencies to other IT programs is also maintained within this tool.	<ul style="list-style-type: none"> Business & IT Program Manager 	<ul style="list-style-type: none"> Business Owner/Sponsor 	<ul style="list-style-type: none"> PMO ITPD Enterprise Cybersecurity Infrastructure IPgT IPT 	<ul style="list-style-type: none"> ITPRB IPgT IPT

Table 12: Deliverables RACI

3.5.1.5 Standards

There are no applicable standards.

3.5.2 Project and Technology Stream

3.5.2.1 Gates & Reviews

There is one gate in the Disposition Phase:

- **Disposition Review:** The purpose of the Disposition Review is to ensure that all the proper measures are taken to bring an IT solution to successful exit from its life cycle.

3.5.2.2 Roles

The most critical participants include:

- **IT & Business Project Managers:** Execute the Deployment and Disposition Plan

3.5.2.3 Tasks

When a project is determined to be at the end of its usefulness or has been rendered obsolete, the Project Managers are responsible for executing the Deployment and Disposition Plan. Monitoring and reporting should be completed and a solution disposition review conducted prior to close-out. Any associated risks, dependencies, or impacts of the disposition are communicated to Program Managers in preparation for a disposition review with the ITPRB.

3.5.2.4 Deliverables

There are no applicable deliverables.

3.5.2.5 Standards

There are no applicable standards.

3.5.3 Cybersecurity Stream

Since the ECD has its own process, ITSLCM users should contact the ISSO for supporting details and information.

3.5.4 External Processes

There are four external processes:

- Change Management is a structured project management approach to formally introduce changes to the IT infrastructure. As an external process, change management tasks ensure that the appropriate level of organizational preparation occurs as part of an IT solution implementation. For more information visit [IT Infrastructure Operations Department's \(ITIOD\) website](#).
- Configuration Management tasks control the promotion of IT solutions to development, testing and production environments. It identifies the final location of all work products including software, code, documentation, plans, status reports, critical communications, action items, and meeting minutes. For more information, visit [ITIOD's website](#).
- IT Risk Management focuses on identifying and evaluating the threats and opportunities pertinent to the proposed IT program/project and identifying risk management and mitigation strategies. For more information, visit the [Policy and Compliance Division \(PCD\) website](#).
- The Acquisitions process defines what steps and documentation is required to be in compliance with Federal Acquisition Requirements and procurement policies at PBGC. For more information visit the Procurement Department [Procurement Department website](#) on the intranet.

Appendix

Appendix A: PBGC IT Portfolio Governance – Overview

The following figure shows the PBGC’s IT Portfolio Governance approach by program area, IT program management, and IT portfolio governance.

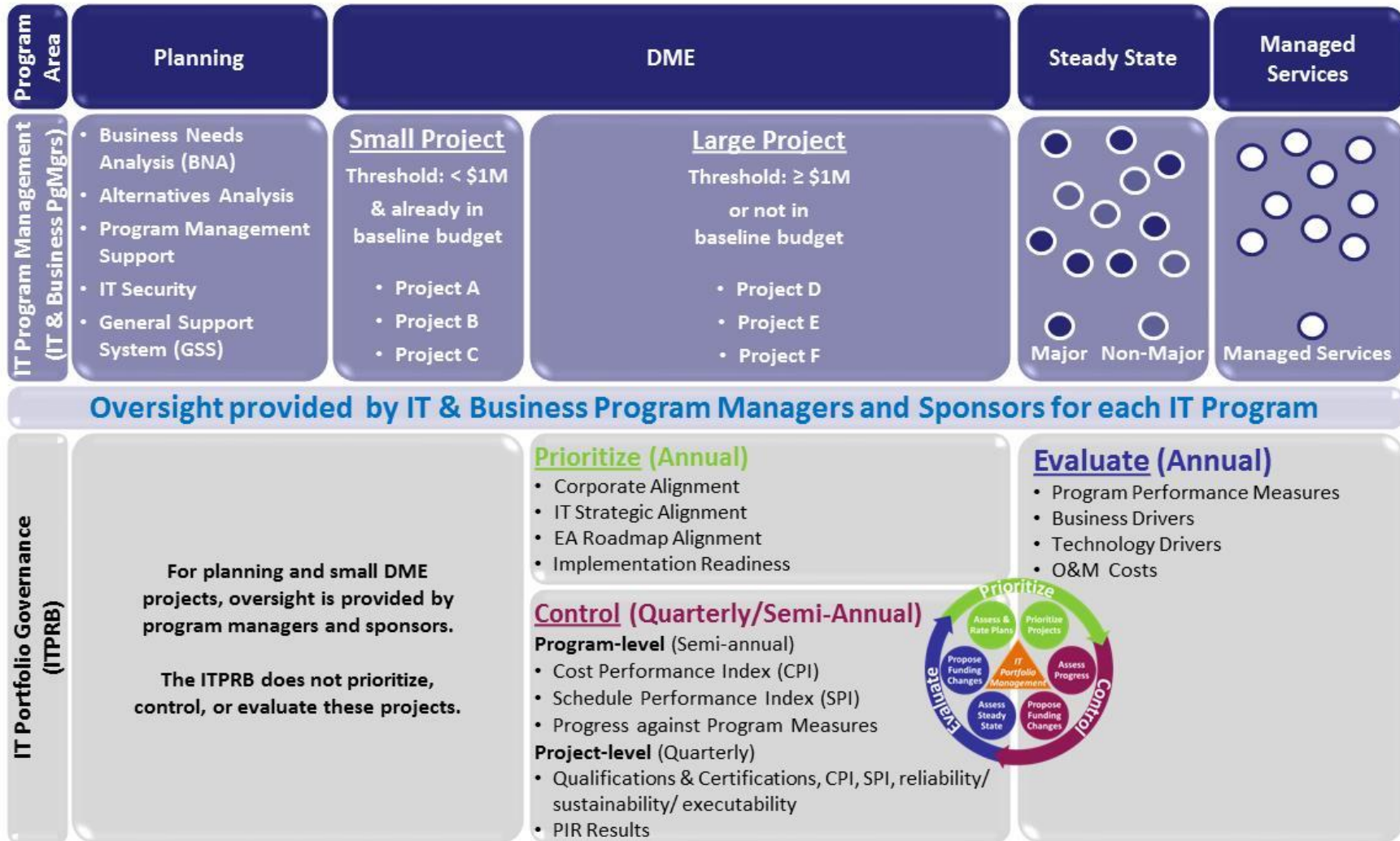


Figure 8: PBGC IT Portfolio Governance



Appendix B: Deliverables – Overview

Deliverables are artifacts produced as a result of performing specific activities within the ITSLCM. The deliverables identified in the Framework are the required baseline deliverables—the IPgT and/or IPT may determine that additional deliverables are needed based on a program’s and/or project’s specifications and variables. The following table provides the minimum deliverables required as well as a recommended approach to assigning roles and responsibilities using a Responsible-Accountable-Consulted-Informed (RACI) matrix. It also notes organizations that, while not required on the Framework, may add value to the process (e.g., user community, User Acceptance Testing [UAT] testers). It is important to note that program and project managers have the authority to negotiate roles and responsibilities as well as create roles and responsibilities as they deem necessary and appropriate. Responsible roles own the deliverable in that they are responsible for completing it. Accountable roles must sign off or approve of the deliverable. Consulted roles have information that may be necessary to complete the deliverable. Informed roles must be notified of resulted, but need not be consulted.

Deliverable	Description	Phase	Responsible	Accountable	Consulted	Informed
IT Program Plan	Serves as the central repository that tracks program and project performance including cost, schedule and scope. Information such as points of contact, acquisition strategy, and relationships/dependencies to other IT Programs is also maintained within this tool.	<ul style="list-style-type: none"> • Need / Concept • Planning • Solution Implementation • O&M • Disposition 	<ul style="list-style-type: none"> • Business & IT Program Manager 	<ul style="list-style-type: none"> • Business Owner/Sponsor 	<ul style="list-style-type: none"> • PMO • ITPD • Enterprise Cybersecurity • Infrastructure • IPgT • IPT 	<ul style="list-style-type: none"> • ITPRB • IPgT • IPT
IT Portfolio Registration Checklist	Supports ITPRB decisions about whether to classify a budget request as IT/non-IT and helps determine potential impact to PBGC’s IT Portfolio. This checklist is completed by the PMO and program managers and then submitted to the ITPRB.	<ul style="list-style-type: none"> • Need / Concept 	<ul style="list-style-type: none"> • Business Program Manager 	<ul style="list-style-type: none"> • ITPRB 	<ul style="list-style-type: none"> • PMO • ITPD • Enterprise Chief Architect • Enterprise Cybersecurity • Infrastructure 	<ul style="list-style-type: none"> • IT & Business Program Manager • BPIT
Business Needs Analysis Document	A result of an analysis of a business areas processes and technology to determine how best to meet business requirements, progress towards the enterprise target architecture, and align with the corporate and IT strategic plans. It contains a set of recommendations for business sponsors and IT Professionals which defines a modernization roadmap to reach the target state.	<ul style="list-style-type: none"> • Need / Concept • Planning 	<ul style="list-style-type: none"> • Enterprise Chief Architect 	<ul style="list-style-type: none"> • Business Sponsor 	<ul style="list-style-type: none"> • Enterprise Cybersecurity • Infrastructure 	<ul style="list-style-type: none"> • IPgT

Deliverable	Description	Phase	Responsible	Accountable	Consulted	Informed
Deployment and Disposition Plan	A consolidated artifact that documents the planning, solution implementation, operations and maintenance, and disposition activities of new and existing solutions within PBGC managed environments. It is used to facilitate the release management process.	<ul style="list-style-type: none"> • Planning • Solution Implementation • O&M • Disposition 	<ul style="list-style-type: none"> • IT Project Manager 	<ul style="list-style-type: none"> • IT Program Manager 	<ul style="list-style-type: none"> • Release Manager 	<ul style="list-style-type: none"> • CAB • IPT
Cost Loaded Project Schedule	Provides a cash flow forecast that indicates how cash will be spent over time on a project. It is a sequenced schedule of project activities that accounts for cost and project risk.	<ul style="list-style-type: none"> • Planning 	<ul style="list-style-type: none"> • IT & Business Project Manager 	<ul style="list-style-type: none"> • IT & Business Program Manager 	<ul style="list-style-type: none"> • PMO 	<ul style="list-style-type: none"> • IPT • IPgT
Business Implementation Strategy Document	Takes a “top-down approach” and helps project teams articulate the expectations for the project (e.g., what will the implementation result in), help maintain focus, and identify expectations for each stage of the implementation.	<ul style="list-style-type: none"> • Planning 	<ul style="list-style-type: none"> • IT Program Manager • IT Project Manager 	<ul style="list-style-type: none"> • Business Project Manager 	<ul style="list-style-type: none"> • PMO • <i>TBD by Project Manager</i> 	<ul style="list-style-type: none"> • ITPRB
Security Registration Document	Provides the information required to clearly identify any weaknesses in the proposed solution and to support future assessments of the solution.	<ul style="list-style-type: none"> • Planning 	<ul style="list-style-type: none"> • ISSO 	<ul style="list-style-type: none"> • ISO/IO 	<ul style="list-style-type: none"> • Enterprise Cybersecurity • Infrastructure 	<ul style="list-style-type: none"> • IT & Business Project Managers • IPgT • IPT
Security Risk Assessment	Documents the analysis of the risks and threats towards a system’s confidentiality, integrity, and availability of data or information.	<ul style="list-style-type: none"> • Planning • Solution Implementation 	<ul style="list-style-type: none"> • ISSO 	<ul style="list-style-type: none"> • ISO/IO 	<ul style="list-style-type: none"> • Enterprise Cybersecurity • Infrastructure 	<ul style="list-style-type: none"> • IT & Business Project Managers • IPgT • IPT
System Security Plan	Provides an overview of the security requirements of the system, and describes the controls that are in place or being planned for meeting those requirements. The SSP also delineates responsibilities and expected behavior of all individuals who access the system. The SSP should be viewed as documentation	<ul style="list-style-type: none"> • Planning • Solution Implementation 	<ul style="list-style-type: none"> • ISSO 	<ul style="list-style-type: none"> • ISO/IO 	<ul style="list-style-type: none"> • Enterprise Cybersecurity • Infrastructure 	<ul style="list-style-type: none"> • IT & Business Project Managers • IPgT • IPT

Deliverable	Description	Phase	Responsible	Accountable	Consulted	Informed
	of the structured process for planning adequate and cost-effective security protection for a system.					
Program Performance Reports	These monthly reports track the Schedule Performance Index (SPI), Cost Performance Index (CPI), and overall project development performance. The integrity of these reports is dependent on the program/project managers updating the approved tool in a timely manner.	<ul style="list-style-type: none"> • Solution Implementation 	<ul style="list-style-type: none"> • IT & Business Program Manager 	<ul style="list-style-type: none"> • Business Owner/Sponsor 	<ul style="list-style-type: none"> • PMO • ITPD • IPgT • IPT 	<ul style="list-style-type: none"> • ITPRB • Steering Committee (CIO-CXO Meeting)
Requirements Document	Defines the IT Solution's functional, operational, and service requirements needed to meet the business need.	<ul style="list-style-type: none"> • Solution Implementation 	<ul style="list-style-type: none"> • IT Project Manager 	<ul style="list-style-type: none"> • Business Project Manager 	<ul style="list-style-type: none"> • IPT • Enterprise Cybersecurity • Infrastructure • Release Manager 	<ul style="list-style-type: none"> • CAB IPgT • TRB
Design and Commercial-Off-The-Shelf (COTS) Configuration Document	Refers to the designing of an IT solution (Design Document), the configuring of COTS products, or externally hosted IT solutions. It documents the information required to communicate architectural and system designs to the IPgT, IPT, and appropriate governance boards.	<ul style="list-style-type: none"> • Solution Implementation 	<ul style="list-style-type: none"> • IT Project Manager 	<ul style="list-style-type: none"> • EA Rep 	<ul style="list-style-type: none"> • IPT • Enterprise Cybersecurity • Infrastructure 	<ul style="list-style-type: none"> • TRB
Lessons Learned Document	Identifies processes, lessons learned, and recommendations to improve the quality and efficiency of the program/project.	<ul style="list-style-type: none"> • Solution Implementation 	<ul style="list-style-type: none"> • IT & Business Project Manager 	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • Anyone that participated in the project 	<ul style="list-style-type: none"> • PMO • IT & Business Program Manager • Steering Committee
User Manual	Provides direction for the end user on how the implemented IT solution can be used to achieve the business functionality that it was created to enable.	<ul style="list-style-type: none"> • Solution Implementation 	<ul style="list-style-type: none"> • IPT 	<ul style="list-style-type: none"> • Business Project Manager 	<ul style="list-style-type: none"> • UAT Testers 	<ul style="list-style-type: none"> • User Community
Implementation and Training Plan	Documents the organizational change activities required to transition the IT solution from the IPgT/IPT to the	<ul style="list-style-type: none"> • Solution Implementation 	<ul style="list-style-type: none"> • IPT 	<ul style="list-style-type: none"> • Business Program Manager 	<ul style="list-style-type: none"> • Resources as needed • Learning 	<ul style="list-style-type: none"> • IT Project Manager • Business user

Deliverable	Description	Phase	Responsible	Accountable	Consulted	Informed
	business and end user community.				Development Division • Business community	community
MOUs, SLAs, and/or Intra-agency Agreements	Various forms of agreements that have been created with a provider or partner organization that outlines the agreed-upon responsibilities for maintaining, updating, or sharing an IT solution, data exchange, or platform that is integral to the development of the IT solution that has been developed in response to an identified business need.	• Solution Implementation	• ISSO	• Business Sponsor	• IT & Business Project Managers • IT & Business Program Managers • PD • OGC	• CIO • IPgT • IPT
Security Authorization Package	<ul style="list-style-type: none"> • Authorization Decision Letter • System Security Plan (SSP) • Security Assessment Report (SAR) • Plan of Action & Milestones (POA&M) 	• Solution Implementation	• AO/ISSO	• AO	• ECD	• CIO • CISO • AO • ISO

Table 13: ITSLCM Deliverables



Appendix C: Standards – Overview

ITSLCM IT standards provide the minimum requirements or criteria for ITSLCM deliverables, reviews, and gates without dictating a template. The intent of the standards is to allow maximum flexibility in the development of deliverables, while ensuring that the appropriate level of due diligence and documentation occurs throughout the life cycle of IT solutions. While not on the Framework, additional ITSLCM guidance documents that provide details relating to the development of ITSLCM deliverables, is available on the [ITSLCM website](#). Below is a listing of all the applicable standards that fall within the ITSLCM Framework and should be consulted when creating deliverables or reporting information.

For Cybersecurity standards please refer to your ISSO.

Standard	Description
Business Implementation Strategy	The Business Implementation Strategy Standard applies to version 1.0 or Large (> \$1M) DME efforts. It requires project teams to articulate the expectations for the project.
Business Needs Analysis	The Business Needs Analysis Standard defines the architectural approach for conducting a business needs analysis to support the prioritization, investment and planning decisions as well as to establish or confirm the alignment of these decisions to PBGC business plans and strategic goals.
Deployment & Disposition Plan	The Deployment and Disposition Plan (DDP) Standard 's purpose is to link to required content from select ITSLCM artifacts to facilitate communication throughout the IT solutions lifecycle. Specifically, the information collected in the DDP will be leveraged by board members to make go/no go decisions at planned CAB meetings (1 st CAB: Review Infrastructure Requirements; 2nd CAB: Review Readiness for Prod/COOP Deployment). ITIOD IT Assets & Technology Requirements Management (ITA&TR) Team will own and populate the DDP for both IT solutions development and infrastructure projects.
Design and COTS Configuration Document	The Design and COTS Configuration Document Standard defines a consistent set of information that must be contained in the Design and COTS Configuration Document deliverable in the ITSLCM.
Enterprise Data	The Enterprise Data Standard defines mandatory practices for defining, modeling, storing, maintaining data and harmonizing it on an enterprise basis. It applies to internal PBGC systems and externally hosted systems that hold PBGC information.
Enterprise Information Security	Applicable IT Security Standards can be found on the intranet website for the OIT Policy and Process Library . Please consult this site for standards/requirements information that applies to all ECD deliverables.
Implementation and Training Plan	The Implementation and Training Plan Standard defines the information that must be contained in the implementation and training plan deliverable in the ITSLCM. To document the organizational change activities required to transition the IT solution from the IPgT/IPT to the business/custom.
Lessons Learned Document	The Lessons Learned Document Standard defines a consistent set of information that must be contained in the lessons learned deliverable in the ITSLCM. To document processes, lessons learned, and recommendations to improve the quality and efficiency of the program/project.

Standard	Description
Product and Technology	The Product and Technology Standard defines the approach for using a technology component or IT product (and their versions) that is best for PBGC overall and properly documenting the selection decision for input into acquisition processes. This approach is used only after the Business Needs Analysis is complete, a Technical Reference Model (TRM) gap is defined and business requirements are delineated. This standard also integrates the Procurement department throughout the process to ensure compliance with Procurement policy and timely execution of procurement-related activities.
Requirements Document	The Requirements Document Standard defines a consistent set of information that must be contained in the ITSLCM's requirement document deliverable. To document the IT Solution's defined functional, operational and services requirements needed to meet the business need.
Software Services	The Software Service Standard defines mandatory requirements that IT solutions development activities shall consider when developing applications that require interfacing with other internal and external IT solutions or that can provide reuse and sharing of functionality.
System Development	The System Development Standard enables standardization of the runtime platforms, development and production environments and coding and design approaches.

Table 14: ITSLCM Standards

Appendix D: External Processes – Overview

External processes are PBGC processes that are independent of the ITSLCM but serve as required “touch points” to the ITSLCM for the purpose of ensuring enterprise compliance. Not all processes apply to all phases, but are used as needed (e.g., The Business Needs Analysis process applies to the Planning Phase only). The external processes identified in the ITSLCM are described in the table below.

External Process	Description
Acquisition	The Acquisitions process defines what steps and documentation is required to be in compliance with Federal Acquisition Requirements and procurement policies at PBGC. For more information visit the Procurement Department Procurement Department website on the intranet.
Business Needs Analysis	Business Needs Analysis refers to the processes and activities needed to refine a business need, determine the performance gap, and begin taking steps toward identifying and implementing a solution. For more information visit EAD’s website .
Budget Formulation and Execution	Budget Formulation and Execution activities and processes address managing departmental resources. These processes provide the technical budgeting due diligence needed to formulate and justify requests and execute appropriations at the departmental level. For more information, visit the Budget Office’s website .
Change Management	Change Management is a structured project management approach to formally introduce changes to the IT infrastructure. As an external process, change management activities ensure that the appropriate level of organizational preparation occurs as part of an IT solution implementation. For more information visit IT Infrastructure Operations Department’s (TIOD) website .
Configuration Management	Configuration Management activities control the promotion of IT solutions to development, testing and production environments. It identifies the final location of all work products including software, code, documentation, plans, status reports, critical communications, action items, and meeting minutes. For more information, visit TIOD’s website .
IT Risk Management	IT Risk Management focuses on identifying and evaluating the threats and opportunities pertinent to the proposed IT program/project and identifying risk management and mitigation strategies. For more information, visit the Policy and Compliance Division (PCD) website .
IT Service/Incident/Problem Management	IT Service/Incident/Problem Management is focused on ensuring timely and effective response to operational issues. For more information, visit TIOD’s website .
Release Management	Release Management activities and processes manage the deployment of changes in hardware and software to the infrastructure. For more information, visit TIOD’s website .

Table 15: ITSLCM External Processes

Appendix E: Federal Statutes & Requirements – Overview

Below is a table highlighting federal statutes and requirements that authorize the implementation of an IT management life cycle.

Legislative Authority	Description
Clinger–Cohen Act of 1996	Supports streamlining Information Technology acquisitions and emphasizes life cycle management as a capital investment.
E-Government Act of 2002	Supports the use of the Internet to provide citizens with access to the Government and technology to improve agencies' success.
Federal Acquisition Regulation Part 39	Requires representation from the agency's technical, supply, and procurement communities to balance competing interests to provide the best value product or service to meet the customer's needs.
Federal Acquisition Streamlining Act of 1994, Title V (FASA V)	Requires agencies to establish cost, schedule, and measurable performance goals for all major acquisition programs, and achieve on average 90 percent of those goals.
Federal Information Security Management Act	Requires federal agencies to develop, document, and implement an agency-wide program to secure information and information systems.
Government Paperwork Elimination Act of 1998	Supports the use of electronic records and signatures as valid, legal, and enforceable records of transactions.
GPRA Modernization Act of 2010	Requires agencies to document and disseminate a strategic plan that includes a mission statement and a prioritized set of goals and objectives.
NIST Special Publication 800-53	Provides recommended security controls for Federal Information Systems and Organizations. Guidelines call for the following: An organization should include Information Security considerations in their Systems Development Life Cycle (SDLC) methodology (SA-3). An organization should obtain or at minimum attempt to obtain administrator and user documentation for its information systems (SA-5).
OMB Circular A-130	Prescribes the requirements for management and planning practices of information systems and technology.
OMB Circular A-11	Prescribes the requirements for Enterprise Architecture (EA), Information Security, Acquisition, Project and Systems Development Life Cycle (SDLC) management.
OMB Circular A-123	Requires agencies to establish and assess the adequacy of internal controls in Federal programs and operations.
Privacy Act of 1974	Requires agencies to give public notice of their systems of records through publication in the Federal Register.

Table 16: Federal Statutes & Requirements

Appendix F: Solution Development Approach Guidance

Introduction

What is the Purpose and Scope of this Document?

The Solution Development Approach Guidance document is a resource for assisting Pension Benefit Guaranty Corporation (PBGC) federal staff and contractors in selecting an approach for developing and implementing IT solutions that will meet business needs, fulfill business requirements, and close performance gaps. IT solutions include, but are not limited to, Commercial Off-the-Shelf (COTS) solutions, Government-Off-the-Shelf (GOTS) solutions, customized development solutions, enhancements to existing IT solutions, hosted solutions, infrastructure solutions, or any hybrid of the previously mentioned. Also, note that for the purpose of this document, the term “development” refers to custom development, COTS/GOTS configuration, and/or a hybrid.

Although determined in the Planning Phase, the selected development approach will be applied to the tasks in the Solution Implementation Phase of the Information Technology Solutions Life Cycle Management (ITSLCM) framework for the purpose of successfully implementing an IT solution.

The solution development approaches outlined in this document include some of the most widely used within the IT Industry; however, this document does not contain an exhaustive list of all of the approaches that teams³ can use at PBGC.

How Do I Use this Document?

The Solution Development Approach Guidance is organized into four sections:

- **Section 1: Introduction** - provides a description of the document’s purpose, scope, and how to use the document.
- **Section 2: Solution Development Approaches and the ITSLCM** - provides an overview of what a solution development approach is, how a development approach is used in conjunction with the ITSLCM, and what should be considered before selecting a specific development approach.
- **Section 3: Solution Development Approaches** - provides an overview of some of the solution development approaches used within the IT industry, known strengths and weaknesses of each approach, and when each approach may or may not be an appropriate selection.



Look for “stars” to indicate the known strengths of a development approach.



Look for “lightning” to indicate the known weaknesses of a development approach.

- **Section 4: Conclusion**

³ For the purpose of this document, “teams” refers to the collective group of individuals that have a role in implementing an IT solution and may be involved in the selection of the solution development approach.

Solution Development Approaches and the ITSLCM

What is a Solution Development Approach?

A solution development approach refers to the relationship between tasks, processes, and cycles that are cultivated and specifically ordered for the purpose of delivering an IT solution. Development approaches provide a recognized method of structuring the necessary components of IT development and, when used appropriately, can assist in managing constraints, delivering required functionality, and meeting business needs.

A wide variety of development approaches have evolved over the years in response to the growing complexity of IT software and systems. Each of the established approaches have recognized strengths and weaknesses that can contribute to the success or challenges while implementing IT solutions. As each IT solution is unique, it is critical that the selected development approach correlates with the solution's constraints and variables. Choosing an approach that is inappropriate for the solution or the expectations of stakeholders can cause a delay in schedule, increase in cost, and may ultimately fail to solve the business problem. Comparatively, choosing the correct approach can assist in delivering a solution that closes performance gaps and meets the needs of the user community, on time and within budget.

How do Solution Development Approaches Relate to the ITSLCM?

PBGC's ITSLCM framework is designed to accommodate different approaches of developing and implementing IT solutions. While the framework identifies the essential tasks, such as requirements analysis, design specification, and testing, the selected development approach will help teams define the relationship between required tasks, team member roles and responsibilities, and deployment cycles.

How is a Solution Development Approach Selected?

During the development of the IT Program Release Plan⁴, the Integrated Program Team may make an initial determination of which solution development approach will be applied to upcoming releases and projects. Although the IT Program Release Plan is developed [and updated annually and/or as needed] at the program planning level, the associated IT and Business Project Managers should be consulted and involved in the initial discussions and planning. Involving more members of the IPgT, such as the IT and Business Project Managers, will enhance the connection between each project and release and the goals, strategic alignment, management strategies, and artifacts of the overall program.

If the appropriate solution development approach cannot be determined during the development of the IT Program Release Plan, the selection can be postponed until more in-depth project planning tasks begin.

If an initial selection of the solution development approach was made during the development of the IT Program Release Plan, the selection should be reviewed by the Integrated Project Team (IPT) during the project's planning. The federal IT and Business Project Managers need to understand the particular nuances of the selected approach and confirm the resources required to make the implementation a success are available. For instance, if an iterative or agile approach has been selected, resources from the business will need to be heavily involved (in comparison to a linear, waterfall approach) throughout the solution's development to provide feedback and participate in testing activities.

If outside resources will be or have been contracted to support the solution's implementation, additional steps may need to be taken to ensure all appropriate stakeholders agree to and understand the selected development approach. If the development approach selection has been finalized prior to procuring outside resources, language may need to be included in the appropriate contract documents to help ensure vendors have an accurate understanding of expectations and resources required. If the development approach selection has not been

⁴ The IT Program Release Plan details the releases and projects that are scheduled to be implemented over the period of time that covers the current year through the following Budget Year (as indicated in OMB Exhibit 53 and 300).

finalized prior to procuring outside resources, the contractor project manager should be involved in any relevant conversations and decisions.

Contractor staff may also recommend a particular development approach in their proposal or can be asked to recommend a development approach once on site. While contractor staff may bring skills and expertise in executing a particular development approach, it is imperative that the federal staff responsible for a solution's implementation understand and have the resources to implement the approach as they are ultimately accountable for ensuring requirements are met and performance gaps are closed.

There are a variety of reasons as to why the initial selection of a solution development approach, which is documented in the IT Program Release Plan, may be changed. Regardless of the reason for the change, the program's IT Program Release Plan needs to be updated to reflect the agreed upon change.

Hints and Tips For Selecting a Solution Development Approach

Before selecting a solution development approach, consider the following -

- Determine if there is a business need to immediately (or as quickly as possible) implement a portion of the solution's requirements, which have been identified as high priority, safety or security critical, etc. An approach that supports staged deployments will allow a team to deliver requirements based on their priority.
- Ensure that all team members and appropriate stakeholders understand the approach and the correlating responsibilities. User involvement, development milestones, and certain tasks vary by approach.
- Think about the team that will be involved with developing and implementing the solution. Consider individual team members' experience, interpersonal skills, and work load, as well as the size of the team and work location. A team that is small, that works in relative physical proximity, and is led by an experienced Project Manager may be more apt at successfully utilizing an agile approach. In comparison, a large team comprised of individuals with less experience or have competing responsibilities may be better suited to a more traditional, linear approach, such as waterfall.
- Consult the Release Manager and the Application & Infrastructure Impact Meeting (AIIM) infrastructure calendar prior to selecting a development approach for any planned outages and to ensure testing resources will be available. The number of projects/releases and high priority or risk solutions may affect testing and release schedules. Communicating the proposed approach and/or presenting the solution's goals at AIIM may also help decrease the possibility of unidentified impacts.
- If the development approach is selected after acquiring contractor support, the Project Manager should ensure there are not any contract constraints, such as mandatory signoffs and acceptance dates that would affect the selection of a specific development approach. If the IT or Business Project Manager is not the Contracting Officer's Representative (COR), he or she may need to be consulted as well.
- The user community's familiarity with the proposed solution must be considered. If users are unfamiliar or the solution requires new technology, their involvement or feedback throughout development may increase the likelihood the solution solves the problem and meets the expectations and needs of the users.
- Estimate the level of effort that will be required to define and analyze the solution's requirements. If the requirements are relatively straightforward and understood by the appropriate stakeholders, multiple cycles of analysis and refinement may not be necessary. For example, a planned maintenance release for a solution already in production may be relatively straightforward for stakeholders to understand. In comparison, if the solution is new, supports a large number of users, and/or has complex interrelationships with data, security, etc., a team may need to utilize an approach that supports continual requirements analysis and allows users to provide ongoing feedback during design and development.

- Review the solution's scope, budget, and schedule. If a small budget and limited timeframe has been allocated to the solution's implementation, a team may want to avoid an approach or technique that is traditionally associated with high costs, such as Agile.
- Certain *types* of solutions, such as COTS, hosted, maintenance, etc., may be better managed with some development approaches over others. For example, a COTS product may support a successful iterative approach, while a maintenance release may be best implemented with a linear approach.
- Variables external to the solution itself should be taken into account. For example, changes to or new government mandates, political climate, changing technology, vendor dependencies, etc. may affect a team's ability to successfully adhere to a particular development approach.

Solution Development Approach Overviews

The following section provides an outline of various solution development approaches and will provide readers with a general overview of each approach, some of the known strengths and weaknesses of each of the approaches, and variables or characteristics of a solution that may suggest a particular approach is or is not an appropriate selection. While the solution development approaches outlined in this section are among the most commonly used to develop IT solutions, they do not represent an exhausted list of all approaches that may be used during the Solution Implementation Phase of the ITSLCM.

The following solution development approaches are outlined in this section:

- Waterfall
- Incremental
- Iterative
- Agile
- Prototyping
- Spiral

Waterfall

Waterfall is a linear solution development approach. The waterfall approach is based on teams adhering to a sequential series of tasks, reviews and gates, and deliverables that must each be completed and approved before moving to the next. The waterfall approach emphasizes defining and finalizing all of a solution's requirements and design specifications prior to beginning development tasks.

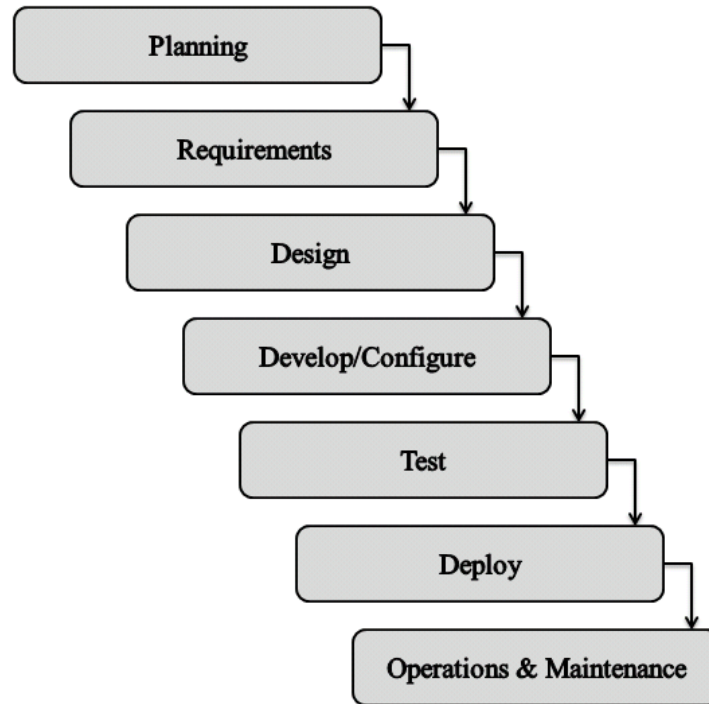


Figure 1: Waterfall

In waterfall development, tasks occur in a top-to-bottom linear line, like a waterfall.



What are the Strengths of a Waterfall Development Approach?

- After the requirements and design specifications are finalized, resources from the business and user community can be conserved while the development team develops/configures the solution.
- The emphasis on documentation helps to ensure traceability and constancy throughout a solution's lifecycle.
- Comprehensive documentation and progress reviews between tasks may help facilitate communication among stakeholders and can be useful if team members are expected to fluctuate.
- The systematic transition between tasks, deliverables, and reviews assists in managing and maintaining constraints, resources, and stakeholder expectations.
- As defined tasks and deliverables need to be completed and approved before teams proceed to the subsequent one, the solution's progress can be measured with definitive milestones and accomplishments.



What are the Weaknesses of a Waterfall Development Approach?

- The solution is not usually tested by users until it is almost fully developed. As a result, unidentified or misunderstood requirements may not be detected until the solution is almost fully developed, which can result in expensive or time consuming corrective actions.
- Stakeholders do not usually “see” the solutions features or tangible progress throughout the development process.
- The structured sequence of tasks makes it difficult to respond to changes. As the waterfall approach discourages changes once a task has been completed or a document has been approved, it is often a time-consuming and expensive exercise to revert back to a previous phase.
- Clear division of responsibilities and separation of work between the business and developers may lead to communication gaps or misunderstandings.
- Inflexible and tight controls prevent teams from moving to the next task before the previous one or documentation is approved, which can cause team members to become idle while waiting for approval.

When is Waterfall an Appropriate Solution Development Approach to Select?

The following variables indicate that waterfall may be an appropriate development approach for implementing a particular IT solution; however, the needs of the business and any variables unique to the solution should be considered before deciding on a solution development approach:

- The requirements can be comprehensively articulated and are stable at the onset of the project. The user community is able to understand the design specifications.
- The IT Project Manager or project team is less experienced and would benefit from set milestones and a structured approach that would assist in managing the schedule, cost, resources, etc.
- The solution requires comprehensive, complete documentation.
- Resources and testers from the user community are unable to provide continual feedback and input during the development of the solution.
- The development and/or business team members are expected to fluctuate during the development of the solution.

When is Waterfall Not an Appropriate Solution Development Approach to Select?

The following variables indicate that waterfall may not be an appropriate development approach for implementing a particular IT solution; however, the needs of the business and any variables unique to the solution should be considered before deciding on a solution development approach:

- There is a business need to immediately implement the solution’s high priority requirements, while other requirements can be incrementally added to the solution in later releases.
- Requirements cannot be wholly articulated or will require multiple cycles of analysis and refinement.
- Some requirements may fluctuate or are based on unsteady variables, such as budget changes or technology updates.
- The solution has lots of impacts and/or dependencies and needs to be tested throughout development.
- The solution involves new technologies or real-time systems.

Incremental

Incremental is a combination of a linear and an iterative solution development approach. Incremental is based on the need to reduce risks and incorporate user feedback by breaking development into several small increments. In each increment, new functionality is integrated into the overall solution in order to meet the prioritized requirements based on the needs of the business and user community. Each increment encompasses a planned set of requirements, which allows the solution to be tested and for users to provide feedback throughout the development process.

There are various methods that can be used to incrementally develop a solution. Teams can select to make each increment a mini-waterfall, meaning that each individual increment contains an abbreviated version of the tasks included in the waterfall development approach. Teams may also select to define and obtain approval of the solution's requirements and design specifications before beginning a series of develop-and-test increments.

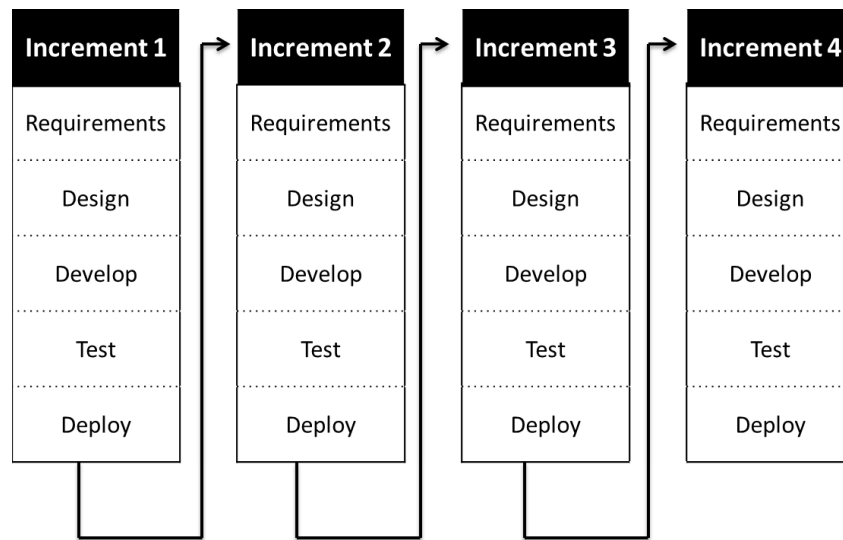


Figure 2: Incremental

In this version of incremental development, teams should complete an increment, which contains abbreviated versions of the tasks included in the waterfall development approach, before moving on to the following increment.

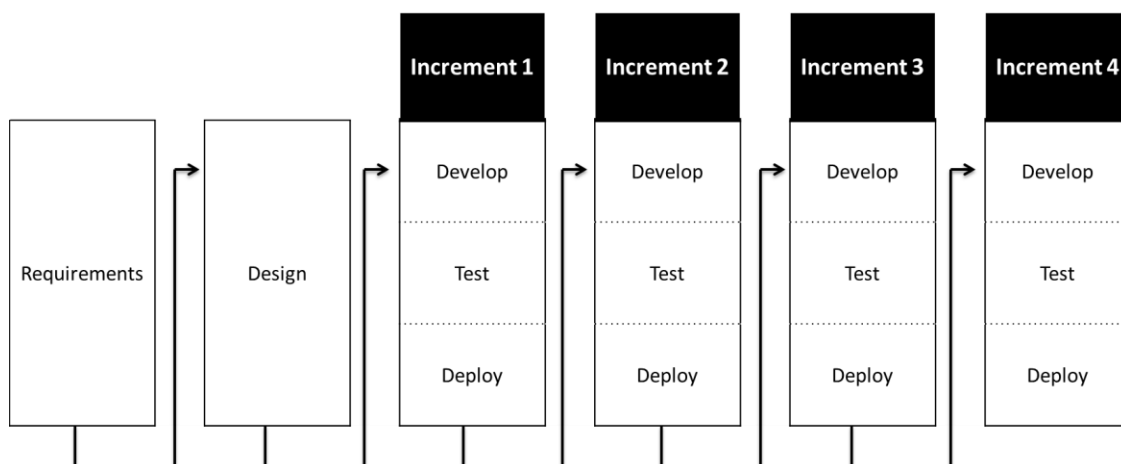


Figure 3: Incremental

In this version of incremental development, a solution's requirements and design specifications should be defined before teams begin individual develop-and-test increments.



What are the Strengths of an Incremental Development Approach?

- Incremental development and testing provides additional opportunities to identify internal and external impacts or dependencies.
- Frequent testing may increase the developers' ability to isolate and resolve technical issues.
- Lessons learned and knowledge gained can be incorporated in later increments.
- Stakeholders can see tangible progress of the solution's development with each increment.
- Continuous interaction and collaboration between the developers and user community helps ensure the solution solves the business problem and fosters a sense of ownership among stakeholders.
- Incremental testing and user feedback assists in identifying overlooked or misunderstood requirements.
- Business needs can be met and [prioritized] requirements can be fulfilled with each increment so users can begin utilizing the solution's functionality while later increments are developed.



What are the Weaknesses of an Incremental Development Approach?

- Consistent resources from the user community need to be available throughout the development to participate in testing and provide feedback on the solution's design or user experience.
- Schedule delays in one increment can cause delays in the overall solution's development.
- Unforeseen inner-dependencies within the solution may require adjustments to the order in which functions are developed and requirements are met. Interfaces within the system need to be understood and well defined by the team during the upfront planning.
- Issues discovered early in development tend to be shifted to later increments, which may cause a false sense of early project success or running ahead of schedule. Issues or problems should be addressed as they arise.
- Teams may become too focused on the requirements, milestones, or issues and successes of a single increment and can lose focus on integrating into the overall solution. As with any development approach, scope, schedule, and issues need to be managed throughout a solution's lifecycle.

When is Incremental an Appropriate Solution Development Approach to Select?

The following variables indicate that incremental may be an appropriate development approach for implementing a particular IT solution; however, the needs of the business and any variables unique to the solution should be considered before deciding on a solution development approach:

- The solution's requirements or design specifications cannot be fully articulated at the start of development or could be impacted by external variables, such as budget changes or new technologies.
- The solution has intricate, complex features that need to be independently tested prior to being integrated with the rest of the solution.
- The team is experienced and the user community is able to commit resources to test and provide feedback throughout the development.
- The solution requires new or complex technology.
- Stakeholders need to see tangible progress throughout the solution development process.

When is Incremental Not an Appropriate Solution Development Approach to Select?

The following variables indicate that incremental may not be an appropriate development approach for implementing a particular IT solution; however, the needs of the business and any variables unique to the solution should be considered before deciding on a solution development approach:

- The overall scope of the solution is relatively small, the solution does not require new or complex technology, or stakeholders are already familiar with the general solution, such as an enhancement to an existing system or software.
- The solution's requirements and design specifications can be articulated prior to beginning development.
- Resources need to be conserved or testers will not be available throughout the solution's development.
- Team members are expected to fluctuate during the development of the solution.

Iterative

Iterative development promotes flexible, dynamic development, opposed to the rigid, sequential method emphasized in linear approaches. Although there are many specific types of iterative development approaches, such as Agile, Spiral, and Prototyping that have unique characteristics (i.e. emphasizing particular tasks, risk management strategies, etc.) common aspects of iterative development include:

- Solution functionality is developed and implemented in multiple iterations based on the business needs and prioritized requirements.
- Emphasis is placed on communication between the development teams and the user community.
- Requirements and design are analyzed, refined, and tested throughout development to ensure the solution solves the business problem(s) and closes performance gaps.
- Each iteration improves on existing or delivers new functionality.

	Requirements	Design	Develop	Test	Deploy
1	Iteration 1	Iteration 1	Iteration 1	Iterations 1 & 2	Iterations 1, 2, 3, 4, 5
2	Iteration 2	Iteration 2	Iteration 2		
3	Iteration 3	Iteration 3	Iteration 3	Iterations 3 & 4	
4	Iteration 4	Iteration 4	Iteration 4		
5	Iteration 5	Iteration 5	Iteration 5	Iterations 5	

Figure 4: Iterative

In iterative development, teams plan cyclic iterations of IT development tasks. Teams may select to plan iterations based on the ability to combine and merge various development tasks, such as testing multiple iterations simultaneously, in order to deliver requirements and meet business needs.



What are the Strengths of an Iterative Development Approach?

- Communication and feedback between the development team and the business/user community minimizes the possibility that requirements are misunderstood or the design does not meet the business need. Continual interaction encourages commitment and a sense of ownership among the solution's stakeholders.
- The solution's functionality is tested throughout development, which encourages issues and unanticipated impacts to be discovered and corrected as they arise.
- Stakeholders can see tangible progress throughout the solution's development.
- Continual review of requirements and frequent testing promotes requirements tracking and bi-directional traceability.
- Small iterations allow teams to focus on risk management, complex portions of the solution, and/or other components based on the variables of a specific solution.



What are the Weaknesses of an Iterative Development Approach?

- Early planning and understanding of the solution's general requirements are imperative for the team to map requirements to a specific iteration to ensure the solution's constraints can be managed and requirements are implemented based on priority and/or dependency.
- Resources from the business/user community need to be available throughout the solution's development to provide feedback and participate in testing activities.
- The IT Project Manager (ITPM) must be experienced in Change Management. Modified or new requirements must be carefully analyzed and communicated to the appropriate stakeholders to ensure possible impacts or risks are identified.
- The flexible, dynamic nature of iterative development does not lead to as many inherent controls or obvious milestones as a linear approach. Teams should baseline some assumptions regarding how tasks will be performed, lines of communication, and how earned value will be calculated prior to beginning development.
- Challenges and issues need to be communicated and addressed throughout the solution's development. If possible challenges are reserved for later iterations, stakeholders may be given a false sense of early success.

When is Iterative an Appropriate Solution Development Approach to Select?

The following variables indicate that iterative may be an appropriate development approach for implementing a particular IT solution; however, the needs of the business and any variables unique to the solution should be considered before deciding on a solution development approach:

- There is an immediate business need to implement a portion of the solution's requirements.
- The solution is technologically complex or requires feedback from a large number of stakeholders.
- The solution requires new technology or technology users are not familiar with.
- The implemented solution will need to handle a large volume of users, users will need the solution for a multitude of purposes, or the users will have varying levels of experience with the solution.
- The team is experienced and the business is able to commit resources to test and provide feedback throughout the development.

When is Iterative Not an Appropriate Solution Development Approach to Select?

The following variables indicate that iterative may not be an appropriate development approach for implementing a particular IT solution; however, the needs of the business and any variables unique to the solution should be considered before deciding on a solution development approach:

- The user community is already knowledgeable about the solution (i.e. the project or release is a maintenance or minor enhancement effort).
- Team members are expected to fluctuate during development or the business cannot commit resources to be available throughout development.
- The solution's requirements and design specifications can be fully articulated and understood by stakeholders prior to beginning development tasks.
- The solution is not very technically complex or there is a low risk of impacting features or other solutions already in production.
- The effort has a short schedule, low budget, or resources need to be conserved.

Agile

Agile is an iterative development approach and, like other iterative approaches, emphasizes business and IT collaboration and breaking a solution's development into small segments in order to meet requirements, collect feedback, and test frequently. Agile tends to distinguish itself from other iterative approaches by emphasizing short development sprints (usually no more than a few weeks each) and the principles documented in the "Agile Manifesto," including:

- Customer satisfaction is the highest priority and is maintained through continuous and frequent delivery of requirements.
- Changes should be incorporated quickly.
- Business and IT representatives should have daily, face-to-face interaction.
- Daily communication and collaboration between developers and customers.
- A working solution is the primary measure of progress.
- Individual team members must be motivated and committed to excellence.
- Development cycles are time-boxed into short sprints in order to frequently deliver prioritized and planned requirements and functionality.

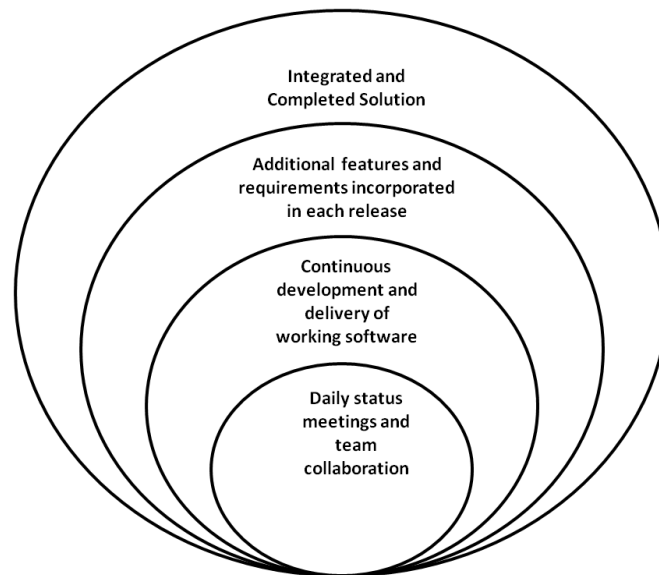


Figure 5: Agile

In agile development, teams develop IT solutions using the principles of the "Agile Manifesto," such as daily team collaboration, continuous delivery of requirements, incorporating changes quickly, and individual motivation, in order to ensure customer satisfaction.



What are the Strengths of an Agile Development Approach?

- The emphasis on customer satisfaction helps ensure requirements are met, the solution closes performance gaps, and quality standards are maintained throughout the project or release.
- Allows for flexibility to incorporate changes to the requirements or design specifications throughout the development process. Quick response to change and continuous development are encouraged.
- Daily, face-to-face communication between IT and business representatives can encourage team camaraderie and a sense of ownership among stakeholders. Continuous interaction promotes a greater

understanding of the overall solution and decreases the possibility of the solution not meeting the business need(s).

- Working products are delivered quickly and frequently, which allows stakeholders to see tangible progress throughout the solution’s development.
- Each iteration or development sprint is tested, which allows for corrective actions and lessons learned to be incorporated throughout development.



What are the Weaknesses of an Agile Development Approach?

- Daily, face-to-face interaction between IT and business representatives can encourage continual requests for change. A change management process needs to be carefully followed in order to prevent scope creep or unanticipated impacts on the solution.
- Short, time-boxed development sprints and informal, face-to-face communication can lead to documentation gaps. Decisions and changes need to be documented and communicated to all appropriate stakeholders and all required documentation needs to be maintained [as necessary] and complete at the end of the project or release.
- The rapid pace of agile may cause teams to appear unorganized or developing using an “ad-hoc” approach. Each iteration or development sprint should have clearly defined goals and deliver requirements based on the prioritized needs of the business.
- Individual team members need to be highly motivated, experienced, and dedicated to the solution. Unstable resources can lead to schedule delays, conflicting feedback, or knowledge gaps regarding the solution’s development.
- Although the “Agile Manifesto” calls for progress to be measured by delivered functionality, teams may have to agree on additional milestones or a means of tracking and reporting progress. Milestones and progress reporting expectations should be defined prior to beginning development.

When is Agile an Appropriate Solution Development Approach to Select?

The following variables indicate that agile may be an appropriate development approach for implementing a particular IT solution; however, the needs of the business and any variables unique to the solution should be considered before deciding on a solution development approach:

- The solution’s scope, requirements, or design specifications may fluctuate based on user feedback, budget changes, new technology, etc.
- Business or end-user stakeholders are not familiar with the solution’s design or a new technology is being used. Continuous interaction may increase understanding and ensure the solution fulfills to business need(s).
- Individual team members are motivated, experienced, and dedicated to the solution. The developers assigned to the effort are highly skilled and will be able to maintain the rapid pace and quality standards required in agile development. Similarly, team members responsible for documentation must be able to produce quality deliverables in a time-frame that coincides with an agile schedule.
- The team is centrally located, relatively small, and is expected to remain stable throughout the solution’s development.

When is Agile Not an Appropriate Solution Development Approach to Select?

The following variables indicate that agile may not be an appropriate development approach for implementing a particular IT solution; however, the needs of the business and any variables unique to the solution should be considered before deciding on a solution development approach:

- Team members are not able to commit to daily, face-to-face interactions due to completing priorities, lack of resources, or varying work locations.
- Team members are inexperienced or expected to fluctuate during development.

- The solution has a small scope, budget, schedule, and/or risk level.
- The solution's requirements and design specifications are stable, approved, and understood by appropriate stakeholders prior to beginning development tasks.

Prototyping

Prototyping is a unique technique that can be used for a multitude of purposes throughout a solution’s development. Although prototyping is not generally considered a development approach unto itself, it is a strong tool that can be integrated with a variety of iterative approaches. A prototype is a mock-up of specific components or portions of a solution that stakeholders can experience and interact with. Prototyping assists in refining requirements and design specifications, collecting feedback, testing specific conditions, and mapping requirements to specific functions. Prototyping may reduce uncertainty by allowing stakeholders to see tangible options prior to making final decisions or approvals.

Regardless of the prototype’s purpose, complexity, or featured functions, most prototypes can be generally categorized as “throwaways” or “evolutionary.” Throwaway prototypes are generally used to assist in developing and analyzing requirements and are rapidly built. Development teams do not spend time testing or creating extensive code behind an interface because as the name suggests, the prototype will be thrown away after it has served its purpose. Evolutionary prototypes are developed with the purpose of [eventually] being integrated with the rest of the solution. While development teams need to be able to incrementally modify or add functions based on stakeholder feedback, additional time will be needed to develop quality code and integration components. In order to effectively manage expectations, it is important that all appropriate stakeholders understand which type of prototype is being built and for what purpose.

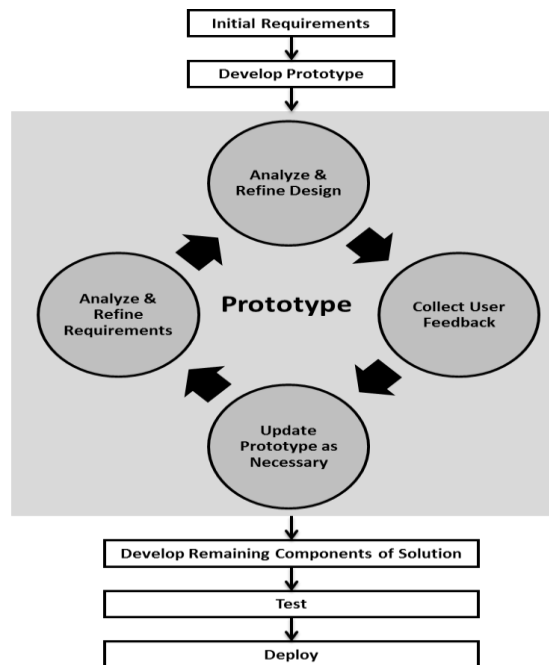


Figure 6: Prototyping

Prototypes may be used to assist in collecting, analyzing, defining, and refining requirements and design specifications from solution stakeholders.



[What are the Strengths of a Prototyping Development Approach?](#)

- Prototypes serve as a communication tool among users and developers. Instead of merely reading a requirements or design document, stakeholders can actually interact with portions of the solution and see interfaces and graphics.
- Early interactions with a tangible product may enhance stakeholder buy-in. Similarly, the opportunity to participate in and provide feedback early in a solution's development increases a sense of ownership among stakeholders.
- Helps ensure the implemented solution's interface, design, and functionality meets the customers' expectations.
- The "hands-on" approach provides an enhanced understanding of the solution to stakeholders, supports early training efforts, and may ease the transition to a new or enhanced solution.
- Developers can create multiple "scenarios" or "paths" for users to explore, which may assist in finding defects or issues early in development.



What are the Weaknesses of a Prototyping Development Approach?

- The approval and change control process is not inherently strict. While users and developers work closely to refine the solution's requirements and design, a change and analysis process needs to be in place to prevent scope creep and identify possible impacts.
- Prototypes may appear to be fully functional or near complete solution and users may want to deploy ahead of schedule. Expectations of the purpose and scope of the prototype need to be carefully managed to avoid frustrations and ensure the solution is correctly designed and fully functional before "going live."
- Prototypes tend to be associated with development efforts that are high risk, have an extended schedule, and/or have a large budget. Although prototypes can be scaled to almost any solution's needs, including simple paper images of the design, project and release teams should ensure the time and money spent on a prototype can be justified as enhancing the final solution's quality and better meeting the business needs.
- Although developers may be encouraged to quickly incorporate a stakeholder's feedback into the prototype, teams may need to conduct an in-depth "walk-through" of the solution prior to deployment to record all changes, functions, and ensure documentation is comprehensive and accurate.
- The prototype's purpose and scope need to be well understood by the development team to avoid creating overly complex or detailed models. Prototypes that include unnecessary back-end code or unnecessary features may lead to an overrun in budget and schedule.

When is Prototyping an Appropriate Solution Development Approach to Select?

The following variables indicate that prototyping may be an appropriate development approach for implementing a particular IT solution; however, the needs of the business and any variables unique to the solution should be considered before deciding on a solution development approach:

- The solution will have a large number of users, has complex interrelationships and functions, or will be used for a variety of purposes and stakeholders need to understand/visualize how the solution will operate in different scenarios and conditions.
- The team is experienced and will be able to manage scope and change effectively, while quickly responding the stakeholder feedback, throughout the solution's development.
- The solution requires extensive user interface or is utilizing a new technology that stakeholders are not familiar with.
- There is a business need to provide visual and tangibles examples to stakeholders early in the development process or to support early training and transition to the new solution.
- The project/release has an adequate budget, schedule, and dedicated resources to support the initial development of a prototype and several iterations of refinement.

When is Prototyping Not an Appropriate Solution Development Approach to Select?

The following variables indicate that prototyping may not be an appropriate development approach for implementing a particular IT solution; however, the needs of the business and any variables unique to the solution should be considered before deciding on a solution development approach:

- Team members are expected to fluctuate or resources will not be continuously available to provide feedback on the prototype.
- The solution has a small budget, minimal risk, short schedule, and/or only incorporates basic enhancements or modifications to a solution already in production.
- Stakeholders cannot agree on the purpose, scope, or need for a prototype. If a consensus or general understanding cannot be reached prior to developing a prototype, expectations of schedule, quality, design, and even scope may be challenging to manage afterwards.
- The solution's requirements and design specifications can be articulated and understood by the majority of stakeholders prior to beginning development tasks.

Spiral

Spiral is a type of iterative development that emphasizes risk assessment and management throughout a solution's development. The approach is based on the theory that breaking development into small increments [or spirals] enhances a team's ability to focus on developing specific functions or risk management strategies. A spiral approach allows teams to incorporate and blend aspects of other development approaches based on the needs and risks of individual spirals or the solution as a whole. For example, teams may use a prototype model to gather user input while each spiral adds functionality under the control used in a traditional waterfall approach.

As with other iterative development approaches, each spiral includes requirements analysis, design review, development/configuration, and testing; however, the spiral approach calls for teams to incorporate these tasks into four basic quadrants that promote keeping risk management at the forefront of a solution's progress.

1. *Determine the spiral's objectives, alternatives, and constraints.* Teams should clearly understand the objectives and goals of the spiral and how it contributes to the IT solution as a whole. In addition, teams should identify possible design alternatives and resource, schedule, etc. constraints that could impact the ongoing effort.
2. *Risk assessment and analysis.* The design alternatives are analyzed and various development approaches are examined to address the identified constraints and risks.
3. *Develop and verify.* Teams develop/configure specified portions of the solution and perform testing.
4. *Review and strategize.* The business community reviews the outcome of the spiral and overall progress of the solution's development. Stakeholders are involved in identifying and assessing new and outstanding risks, issues, constraints, and lessons learned. Risk management strategies, and the development approach(es) for upcoming spirals should be reviewed.

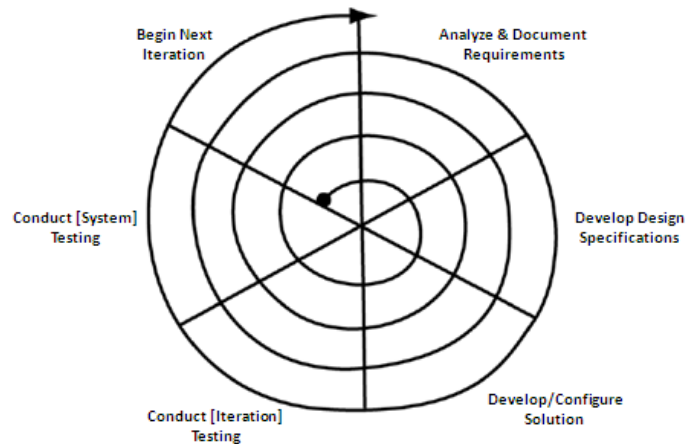


Figure 7: Spiral

In spiral development, IT solutions are developed in “spirals” that incorporate tasks and processes designed to ensure risks are managed and reviewed throughout development.



What are the Strengths of a Spiral Development Approach?

- Spiral provides teams with flexibility to incorporate elements of other development approaches and determine the length of each spiral. There is no set pattern teams must follow – each spiral should be based on the needs of the user community, prioritized requirements, or risk management strategies.
- Modifications or alternatives to requirements and design can be analyzed and, if necessary, incorporated throughout development in order to manage risks.
- Breaking development into small spirals allows teams to utilize different approaches and focus on highly complex or sensitive portions of a solution.
- Continual review and analysis of progress, risks, constraints, etc. naturally facilitates communication and transparency between IT and business stakeholders.
- Stakeholders can see tangible progress throughout development as each new spiral builds on the previous and fulfills specified requirements.



What are the Weaknesses of a Spiral Development Approach?

- Expertise in risk analysis and management are critical. A team’s ability to identify risks, assign accurate risk levels, develop appropriate risk management strategies, and track escalating risks and impacts is often critical to the success of a high risk solution using a spiral development approach.
- As the approach can be customized to the needs of the overall solution or individual spirals, it may be very challenging to reuse the exact pattern on a different development effort.
- Schedule delays in one spiral can cause the entire effort to fall behind schedule.
- A strong change control process needs to be carefully management throughout a solution’s development. As requirements and risks are reviewed frequently, a spiral approach may encourage stakeholders to suggest modifications. Any changes to a solution’s requirements, design, risk management strategy, budget, schedule, etc. need to be analyzed, documented, and communicated to all appropriate stakeholders.
- Although the flexibility of customizing the approach to each spiral allows teams to mitigate specific risks or focus on highly complex development portions, it is often challenging to define specific milestones or

for stakeholders to understand the solution's progress. Stakeholders should agree on how progress will be measured prior to beginning development tasks.

- Resources from the development team, business, and other appropriate stakeholders are needed throughout the solution's development to review the solution's progress, risks, and risk management approach(es).

When is Spiral an Appropriate Solution Development Approach to Select?

The following variables indicate that spiral may be an appropriate development approach for implementing a particular IT solution; however, the needs of the business and any variables unique to the solution should be considered before deciding on a solution development approach:

- The solution has multiple known risks and avoidance or mitigation is a high priority. Overall accuracy is essential to the solution's success.
- Stakeholder resources are stable and able to commit to being involved throughout the solution's development.
- Portions of the solution's requirements or design are based on maintaining risks below a certain level or changes to the solution's risks may impact the solution's requirements or design.
- Team members have demonstrated an ability to effectively manage change, scope, budget, schedule, and risks simultaneously.
- The solution requires complex or new technology and may require different approaches for various portions of development.
- There is an immediate need to quickly development and implement a portion of the solution's requirements, while others can be delivered in later spirals.

When is Spiral Not an Appropriate Solution Development Approach to Select?

The following variables indicate that spiral may not be an appropriate development approach for implementing a particular IT solution; however, the needs of the business and any variables unique to the solution should be considered before deciding on a solution development approach:

- The solution is low risk or stakeholders have decided to accept the risks.
- Consistent resources will not be available throughout the solution's development.
- The solution's requirements and design specifications are not overly complex or are well understood by stakeholders prior to beginning development tasks.
- The solution has a small budget or short development schedule.

Conclusion

The variety of solution development approaches that can be used at PBGC enables flexibility in developing and implementing IT solutions. No one development approach is appropriate for all IT solutions and teams should select an approach that will help facilitate effectively closing performance gaps, meeting the needs of the business and user community, and fulfilling requirements.

Choosing an approach that is inappropriate for the solution or the expectations of stakeholders can cause a delay in schedule, increase in cost, and may ultimately fail to solve the business problem. Comparatively, choosing the correct approach can assist in delivering a successful solution, on time and within budget. Some of the variables that should be considered before determining the solution development approach include:

- The experience, skills, and availability of the team assigned to development and implement the IT solution.
- The type of solution being implemented (i.e. COTS, Hosted, maintenance, etc.).
- The solution's scope, budget, schedule, and relevant resource availability.
- The estimated level of effort needed to elicit, analyze, and document a solution's requirements.
- The stability of the solution's requirements.
- Other development efforts within the organization that could affect testing and/or release schedules.
- The user community's familiarity with the proposed solution.
- Risks associated with the solution.

Regardless of which solution development approach is selected, all team members and appropriate stakeholders should understand any responsibilities, milestones, or processes associated with the selected approach. Team members' commitment to and understanding of the selected approach contributes to the ultimate successful delivery of an IT solution.

Appendix

Further Reading

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