NARA Systems Development Life Cycle (SDLC) Methodology

NATIONAL ARCHIVES AND RECORDS ADMINISTRATION

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1 Introduction

1.1 Purpose of NARA's SDLC

It is widely recognized that instituting a Systems Development Life Cycle (SDLC) process can facilitate the development of information systems, and enable more effective management of Information Technology (IT) projects. OMB Circular A-130 mandates that Federal agencies establish an SDLC process to guide the management of the programs in their IT investment portfolio, to facilitate transition plans as specified by their Enterprise Architecture (EA), and to ensure that information assurance (IA) and risk management considerations are addressed by all programs and projects.

The SDLC process is used to manage projects that are intended to develop, deploy, and operate information systems and Information Technology (IT) infrastructure capabilities in accordance with business needs. As stated by the International Council on Systems Engineering (INCOSE), *"The purpose in defining the system life cycle is to establish a framework for meeting the stakeholders' needs in an orderly and efficient manner. This is usually done by defining life-cycle stages and using decision gates to determine readiness to move from one stage to the next"*.[1] Using an SDLC helps enterprises to *"orchestrate the development of a solution from requirements determination through operations and system retirement by assuring that domain experts are properly involved, that all advantages and opportunities are pursued, and that all significant risks are identified and mitigated"*.[2] NARA's SDLC methodology draws heavily from concepts presented in the INCOSE Systems Engineering Handbook - and it is highly recommended that the INCOSE Handbook be used as a supplemental reference.

INCOSE defines a system as *"an integrated set of elements, subsystems, or assemblies that accomplish a defined objective"*.[3] NARA's SDLC is intended to address all aspects of a system including hardware, software, people, and processes – it is not intended to address only the development of software. Projects are free to integrate specific software development methods (e.g., Scrum, Extreme Programming, RUP, RAD) within the overall system development life cycle. This document defines NARA's SDLC methodology. Subsequent sections of the document will:

(a) Show the context of the SDLC as it relates to other agency Information Resources Management (IRM) processes, (e.g., Capital Planning and Investment Control and EA);

(b) Explain the stages of the SDLC and the various technical and management processes that comprise it;

(c) Describe the gate reviews used to assess project performance and system maturity; and

(d) Provide guidance on how to tailor the SDLC to the specific needs of a project.

[1] See the INCOSE Systems Engineering Handbook, Version 3.2.1, January 2011, pp. 21.

[2] Ibid.

[3] Ibid., Pg. 5.

1.2 Context of NARA's SDLC

NARA's SDLC process is established under the auspices of the agency Chief Information Officer (CIO). The SDLC process is a structured and integrated set of activities used to:

(a) Conceptualize, implement, and operate business information systems, IT Services, and IT infrastructure; and

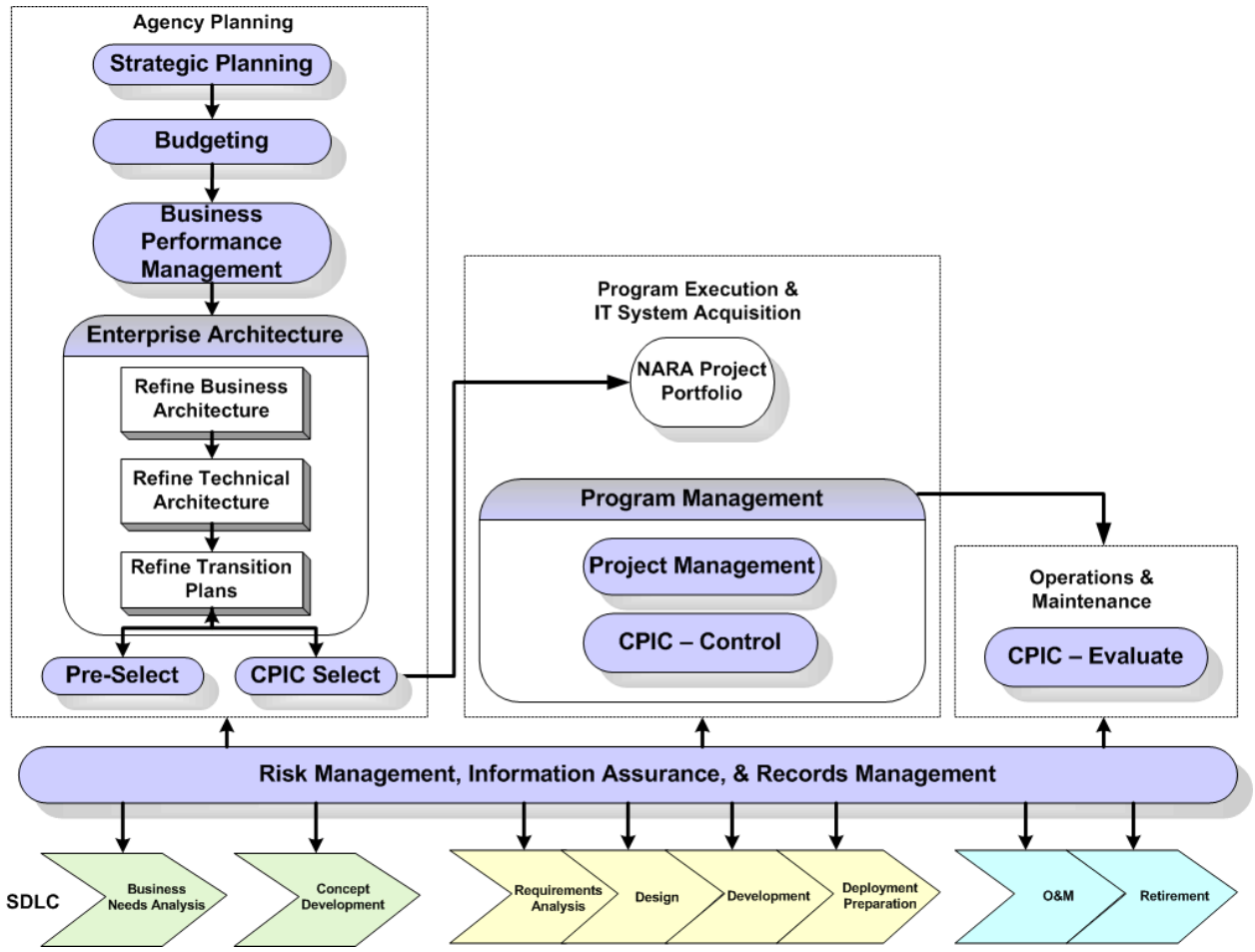
(b) Plan, manage, and control the projects that perform those activities.

The SDLC process is complementary to other federal IRM processes such as Enterprise Architecture (EA), Capital Planning and Investment Control (CPIC), Information Assurance (IA), Risk Management, and Records Management.[4] It does not replace these other processes.

To be effective, the SDLC must define and integrate the project management and systems engineering work activities that are performed by an IT project team – while enabling effective risk management and governance. Project management activities help organizations to plan, perform, monitor, and control projects. System engineering activities help organizations to design, develop, integrate, deploy, and operate IT products and services. *Figure 1.2-1* below depicts how the SDLC process relates to other mandated IRM processes.

[4] See the NARA IRM Strategic Plan for a more comprehensive description of IRM processes and their mandates.

Figure 1.2-1. Overview of Information Resources Management (IRM) Processes



The key take-away from this figure is that the IRM processes used to identify business initiatives and manage NARA's project portfolio (Strategic Planning, CPIC Select, EA), are different than the IRM processes used to develop, deploy, and operate IT products and IT services (SDLC and Project Management). The SDLC process is used to define, plan, and manage work activities that produce the IT products and services that NARA requires.

1.3 Overview of NARA's SDLC

NARA's SDLC process is structured to be simple and flexible. The process focuses on achieving meaningful project outcomes, not on prescribing specific, detailed work steps or massive amounts of documentation. However, the process is also intended to ensure that all projects, regardless of their size and complexity, perform adequate planning and analysis *prior* to making financial and contractual commitments to an IT system or IT service acquisition. For any

given project, the tasks, their sequencing, and the work products that are produced should be commensurate with the nature of the system being developed and the complexity of the project that implements and deploys that system. It is incumbent upon the business sponsor, project manager, and lead system engineer to determine the best approach for meeting project objectives and ensuring successful business outcomes.

NARA's SDLC provides a process framework and associated guidance that can be used to make decisions about how best to approach the implementation of an IT product or service, and how to plan and manage the project that will perform the implementation activities. NARA's SDLC process is predicated upon four basic concepts: (1) SDLC stages, (2) SDLC gate reviews, (3) SDLC activities, and (4) SDLC tailoring.

(1) *SDLC Stages* represent the level of maturity of a system as it moves through the life cycle from the analysis of business needs and the development of a system concept at the onset, through the design of a system solution, to the development and deployment of the solution, and finally to the ongoing operation and maintenance of the system and its eventual retirement. All systems will progress through these general stages of maturity, regardless of their size and complexity.

(2) *SDLC Gate Reviews* are prescribed governance checkpoints within the system life cycle that are used to assess the maturity of a system and the readiness of a project to move to the next stage of implementation. Gate reviews are used to validate the outcomes of a project, independent of the project team, and inclusive of the perspectives of all agency stakeholders (e.g., business, CPIC, IA, EA, systems engineering, acquisition, records management, and IT operations). Gates reviews ensure that cost, schedule, business, and technical risks are understood and mitigated throughout the system implementation process. Gate reviews also determine if the system, at each stage of maturity, meets requirements - and can still deliver the expected benefits when needed in accordance with the cost and schedule estimates established by the business case.

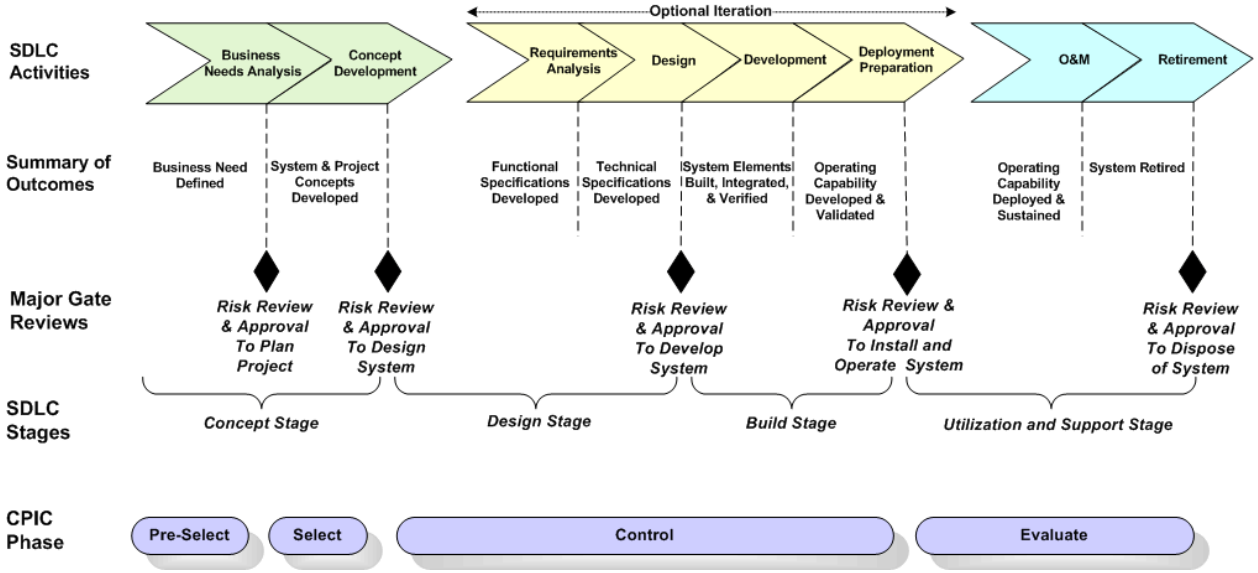
(3) *SDLC Activities* are broad categories of systems engineering tasks that are performed to implement a system. SDLC activities include: (a) business needs analysis; (b) concept development; (c) requirements analysis; (d) design, (e) development; (f) deployment preparation; (g) operations and maintenance; and (h) retirement. These activities can be performed sequentially, iteratively, or concurrently depending upon the nature of the system and the needs of the project.

(4) *SDLC Tailoring* is a planning activity whereby the project manager and lead systems engineer assess the nature of the system being developed and the overall complexity of the project. Based on this assessment, an appropriate SDLC tailoring plan is developed that defines the tasks and work products that are appropriate to and necessary for successful project performance and system implementation. The tailoring plan is used to vet the proposed approach to system implementation and project management with all agency stakeholders. The tailoring plan supports and influences the project management plan, the work breakdown structure (WBS), and the acquisition plan for the system.

An overview of NARA's SDLC process is depicted in *Figure 1.3-1* below. CPIC phases are noted at the bottom of the figure to show how the various SDLC activities align with OMB's

prescribed CPIC reviews. Each of the four SDLC concepts mentioned above is discussed in more detail in the subsequent sections of this document.

Figure 1.3-1. Overview of NARA's SDLC Process



1.4 Initiating a Project

The need for systems cannot always be anticipated and planned in conjunction with the agency's formal budgeting process and EA process. NARA's SDLC methodology recognizes that system needs can arise from multiple sources and at any time. The SDLC provides a pathway for a notional system idea to be presented and reviewed - and then approved, or rejected if it does not reflect a legitimate business need. This is accomplished by using a simple, two-step process as depicted in the top half of *Figure 1.4-1* below. This two-step process constitutes the Business Needs Analysis activity and is how all projects are started.

Figure 1.4-1. Initiating a Project

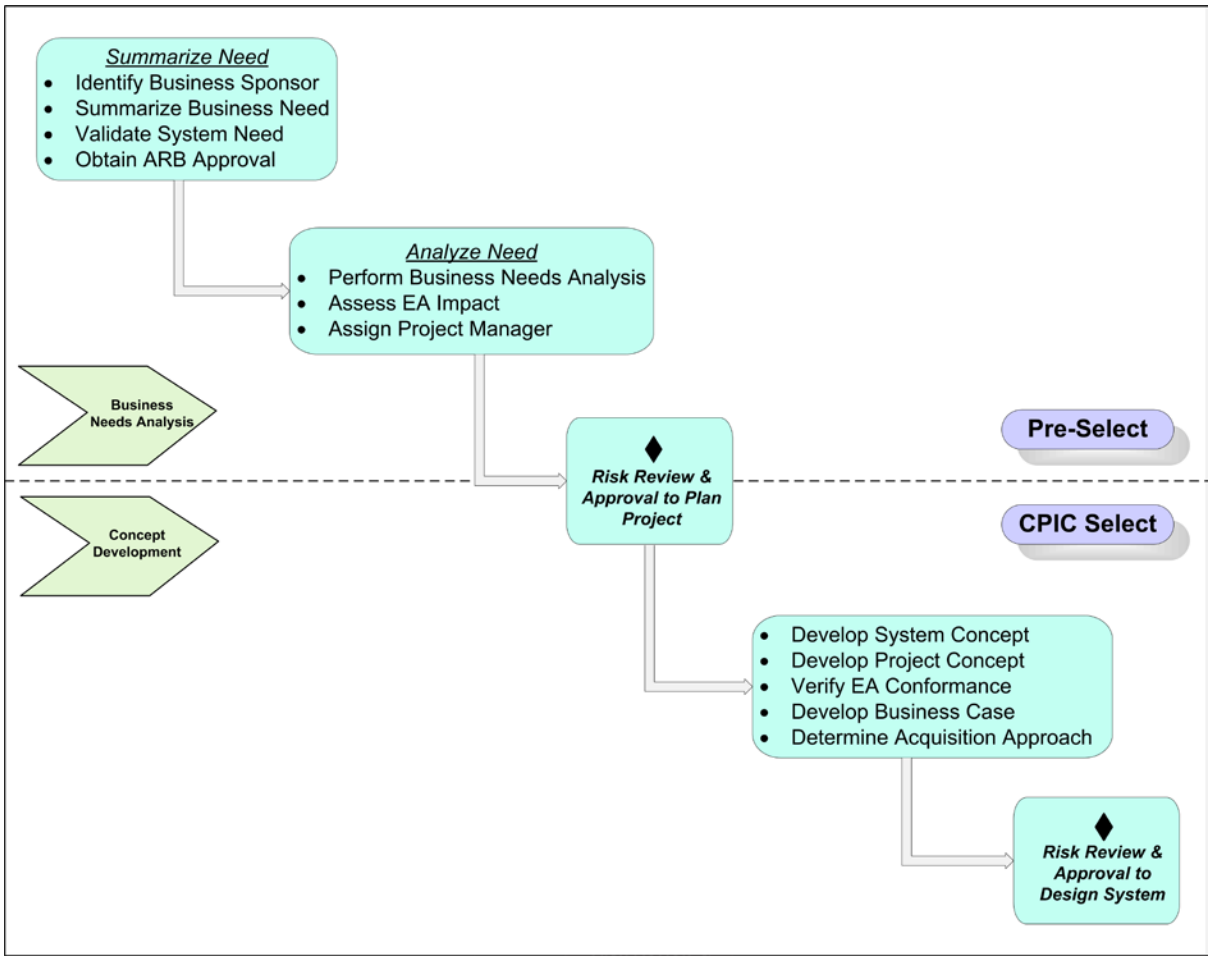


Figure 1.4-1 shows that the first step of project start-up is for the business sponsor to summarize the business need, validate that no exiting systems can meet that need, and obtain approval from the Architecture Review Board (ARB) to explore the idea in more detail. The second step in the process is to perform a comprehensive business needs analysis, assess the impact of the proposed system on NARA's EA, and assign a project manager. Based upon the outcome of these two steps, the gate review will determine if it is appropriate to allocate resources to SDLC Concept Development activities. Concept Development activities fully conceptualize the system, develop a comprehensive project plan, develop the business case, and determine the acquisition approach.

1.5 Reference Documents

The sources identified in *Table 1.5-1* below provide general references that are germane to NARA's SDLC methodology. NARA's SDLC is based primarily on the methods and concepts presented in the INCOSE Systems Engineering Handbook, which is derived from the ISO/IEC 15288:2008 systems engineering standard, and the corresponding software engineering standard ISO/IEC 12207:2008.

Table 1.5-1. Reference Documents

Document	Description
Clinger-Cohen Act of 1996	The Information Technology Management Reform Act, the Federal Acquisition Reform Act, and other reform legislation became known as the Clinger-Cohen Act (Public Law 104-106, 40 U. S. C. 11315).
Management of Federal Information Resources, OMB Circular A-130 (Nov. 30, 2000)	OMB's direction to Federal agencies to establish and maintain life cycle processes (among other topics).
ISO/IEC 15288:2008 Systems and software engineering - System life cycle processes	An international standard that provides a generic description of systems engineering lifecycle processes. This standard consolidates information from a number of earlier standards (e.g., IEEE 1220 and EIA 632) into a cohesive systems engineering process framework.
ISO/IEC 12207:2008 Systems and software engineering - Software life cycle processes	An international standard that provides a generic description of software engineering lifecycle processes. From the perspective of ISO/IEC 15288 (and systems engineering in general), software engineering is considered a specialty engineering field like human factors engineering, mass properties engineering, security engineering, reliability and maintainability engineering, environmental engineering, and integrated logistics support.
ISO/IEC TR 24748-1 First Edition 2010-10-01 Systems and software engineering – Life cycle management - Part 1: Guide for life cycle management	A Technical Report to facilitate the joint usage of the process content of ISO/IEC 15288 and ISO/IEC 12207. The purpose of the report is to help ensure consistency in system concepts and life cycle concepts when the two International Standards are used in combination.
INCOSE Systems Engineering Handbook, Version 3.2.1, January 201	This handbook elaborates on the generic processes expressed in ISO/IEC15288 and provides practical guidance on how to adapt and use systems engineering processes. The INCOSE handbook provides the basis for NARA's SDLC.

Table 1.5-1. Reference Documents

Document	Description
Project Management Institute - A Guide to the Project Management Body of Knowledge: (PMBOK Guide)	This handbook provides detailed information on the generic project management processes that are described in the INCOSE Handbook, from the perspective of project management and project control (as opposed to the systems engineering perspective presented by INCOSE).
NIST SP 800-64 Revision 2 – Security Considerations in the System Development Life Cycle	General guidance provided by NIST to assist federal government agencies with integrating essential information technology (IT) security steps into their established IT system development life cycle.
NIST SP 800-30 – Risk Management Guide for Information Technology Systems.	Section 2.2 of this reference provides general guidance for integrating risk management into the SDLC.

2 SDLC Stages and Gate Reviews

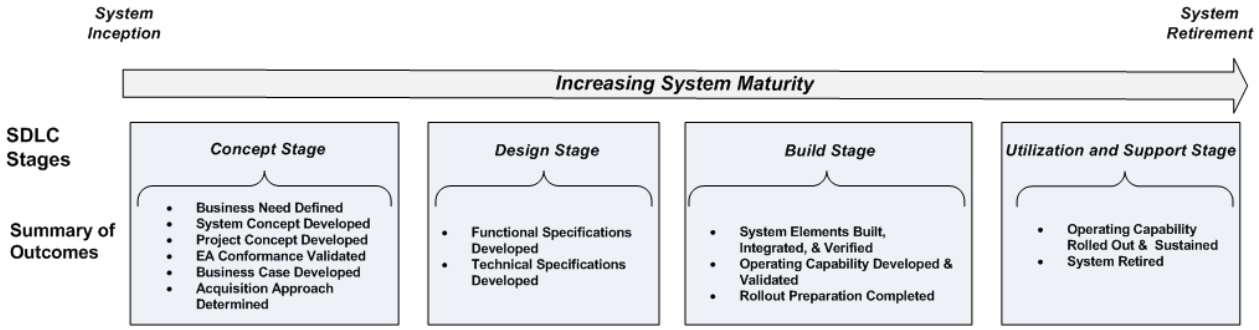
2.1 SDLC Stages

NARA's SDLC establishes four stages of system implementation: (1) Concept, (2) Design, (3) Build, and (4) Utilization and Support. All systems will progress through these four stages regardless of their size and complexity. It is important to note that an *SDLC stage* is different than a *project phase*. *SDLC stages* represent the *level of maturity* of a system as it moves through the life cycle. *Project phases* represent a *period of time* on a project schedule.

Although it may seem intuitive that system stages and project phases are aligned, this is often not the case. Unfortunately, when project phases get defined at a project's onset, insufficient information is available to accurately estimate schedules and costs. SDLC stages provide logical breakpoints, called gate reviews, during which schedules, cost estimates, and system specifications can be reviewed and assessed as more detailed information is gathered about the system. Gate reviews are used to ensure that project plans get updated to reflect more accurate estimates based upon actual project progress – and ensure that the system meets requirements and can still be delivered on time and in accordance with its business case. Gate reviews provide management visibility into a project and enable more effective risk management. NARA's governance boards oversee SDLC gate reviews for IT projects.

It is extremely important not to skip SDLC stages to expedite the project schedule as this invariably leads to increased risk, and often times outright project failure. *Figure 2.1-1* below provides an overview of the stages in NARA's SDLC and identifies the high-level outcomes that are expected at each stage of maturity. Achieving these outcomes demonstrates that the system is mature enough, and the project is sufficiently controlled, to progress to the next stage of implementation.

Figure 2.1-1. Overview of SDLC Stages

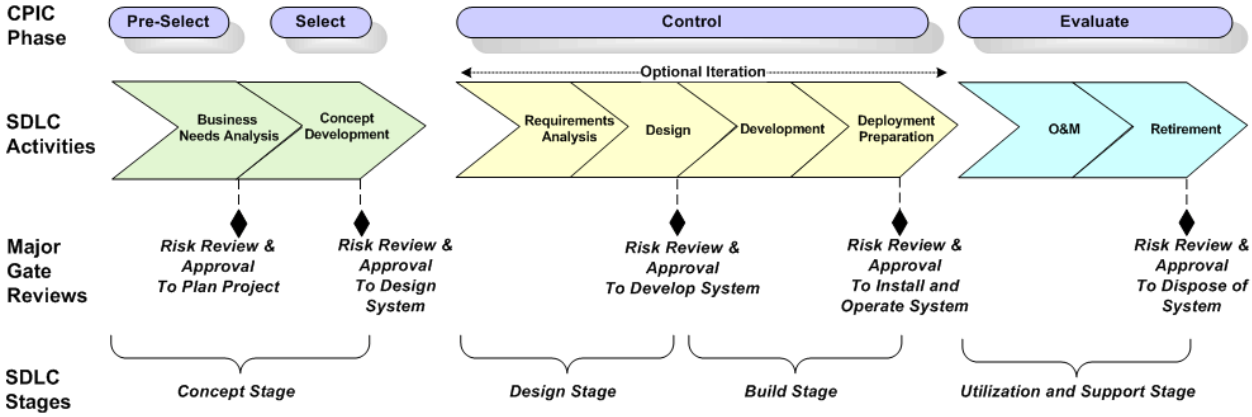


2.2 SDLC Gate Reviews

NARA's SDLC establishes an initial business review in the middle of the Concept stage, and four project gate reviews as depicted in *Figure 2.2-1* below. The business review is used only to initiate a project. At this review, notional project ideas are either: (a) approved for full planning and analysis; or (b) rejected if they do not reflect a legitimate business priority. At each of the subsequent project gate reviews: (a) project outcomes are reviewed against the project plan (b);

the business case is reviewed to ensure that it is still valid; (c) the technical feasibility of the system is assessed; and (d) the overall project receives a thorough risk review. The CPIC phases are noted at the top of *Figure 2.2-1* to show how CPIC controls align with the SDLC. Both SDLC and CPIC considerations are addressed at the gate reviews.

Figure 2.2-1. SDLC Gate Reviews



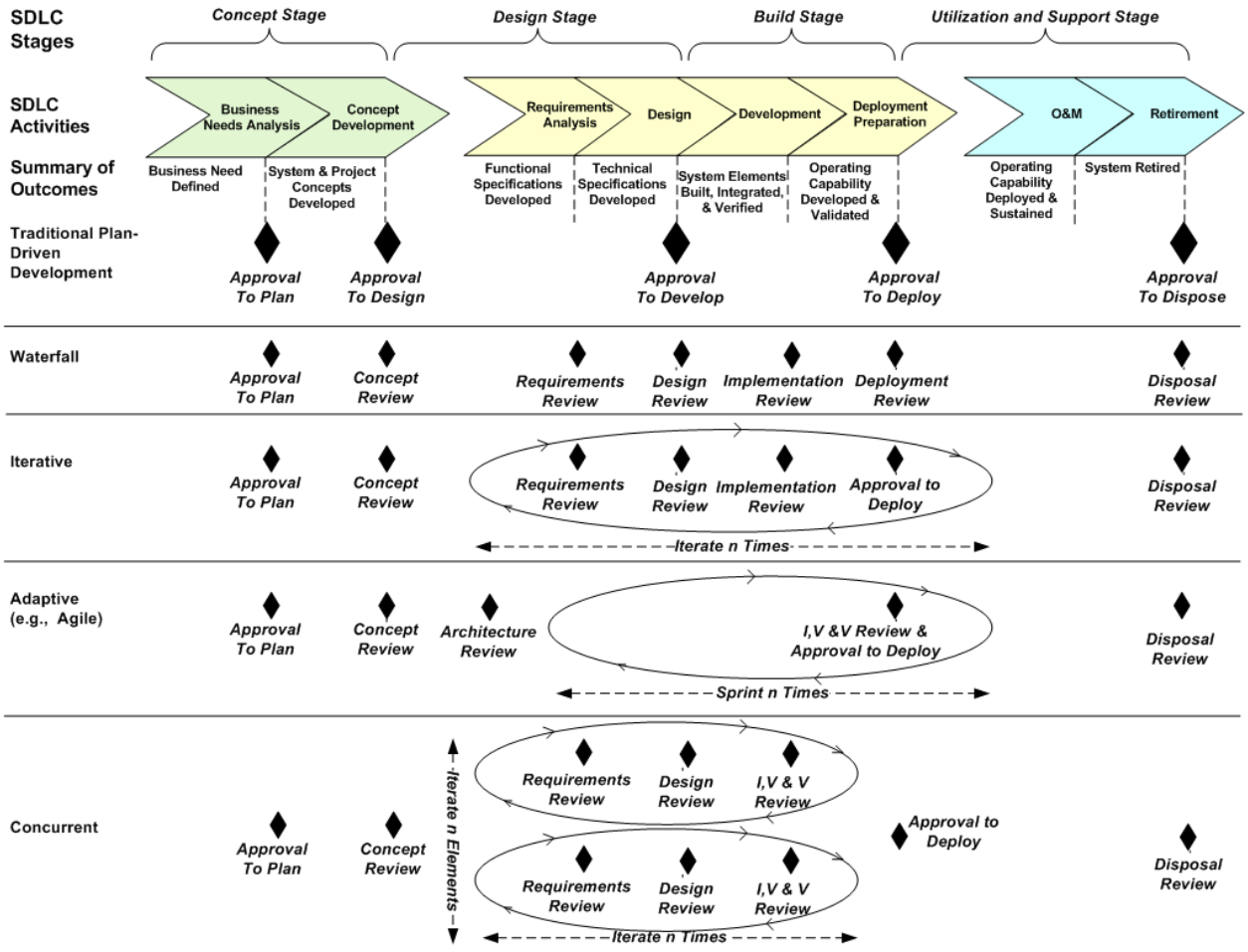
Each of the project gate reviews depicted in *Figure 2.2-1* have exit criteria that must be satisfied to demonstrate that the project has successfully completed the current SDLC stage and the system is mature enough to proceed to the next stage. *Table 2.2-1* below identifies the criteria for exiting each SDLC gate review, and identifies additional criteria that must be met to enter the subsequent SDLC stage. All gate reviews identified in *Figure 2.2-1* are required. In fact, it may be necessary to incorporate additional gate reviews into to a project schedule for larger, more complex projects (e.g., preliminary and detailed design reviews) – or for projects that will perform multiple iterations of SDLC activities (e.g., projects using agile or iterative development approaches). For small systems, very simple projects, or projects using adaptive or concurrent engineering approaches it may be possible to combine gate reviews in some cases. The number and timing of gate reviews should be planned during the Concept Stage and should be tailored to the specific needs of each project. *Figure 2.2-2* below depicts some gate review patterns that illustrate how gate reviews can vary for different SDLC approaches. (Note: When an adaptive SDLC approach (e.g., agile) is used by a project, it is essential to perform extensive project planning, and schedule comprehensive reviews of the system's architecture concept before beginning development activities. Additionally, requirements must be well tracked and managed when using adaptive approaches because they may be quite volatile.)

Table 2.2-1. SDLC Gate Review Exit Criteria	
Gate Review	**Exit Criteria**
Business Needs Analysis Stage Exit / Approval to Plan Project	• Business Needs Analysis reviewed & approved • Business sponsorship confirmed • ARB approval to initiate project • Project Manager assigned *Required to Enter Next Stage* • Resources made available for Concept Development activities
Concept Stage Exit / Approval to Design System	• All Concept Stage work products are completed, reviewed, & approved • SDLC tailoring approach approved • System & project concepts developed and documented • Business case developed and documented • All risks, comments, and action items are addressed *Required to Enter Next Stage* • Funding made available for Design Stage • Required Acquisition(s) for Design Stage completed • ARB approval to design system
Design Stage Exit / Approval to Build System	• All Design Stage work products are completed, reviewed & approved • Functional specifications documented • Technical specifications documented • Requirements traceability verified • All risks, comments, and action items are addressed *Required for Next Stage* • PMP/WBS for Build Stage approved • Required Acquisition(s) for Build Stage completed • Funding made available for Build Stage • Business case updated and validated

Table 2.2-1. SDLC Gate Review Exit Criteria

Gate Review	Exit Criteria
	• Governance Board approval to build system
Build Stage Exit / Approval to Install and Operate System	• All Build Stage work products are completed, reviewed, & approved • All risks, comments, and action items are addressed • Delivered system is integrated and verified • System pilot(s) is validated and accepted • Rollout preparation is completed • Authority to rollout & operate is signed *Required to Enter Next Stage* • PMP/WBS for Utilization and Support Stage approved • Required Acquisition(s) for Utilization and Support Stage completed • Funding made available for Utilization and Support Stage • Business Case updated and validated • Governance Board approval to install & operate system
Utilization and Support Stage Exit / Approval to Dispose of System	• Information Assurance Controls Verified • Records Safeguarded/Archived • Project Closeout Report reviewed, signed, and accepted • System disposal verified • All risks, comments, and action items are addressed • Governance Board approval to dispose of system

Figure 2.2-2. Sample SDLC Gate Review Patterns



2.3 Preparing for SDLC Gate Reviews

The purpose of a gate review is to have the appropriate governance board review the status of the project against the exit criteria for the applicable SDLC stage. Based upon the outcome of the gate review, the governance board determines whether or not the project has satisfied the exit criteria and can proceed to the next SDLC stage. The possible gate review outcomes, as per the judgment of the governance board, and the corresponding governance decisions are identified in *Table 2.3-1* below. It is the project manager's responsibility to plan for and schedule gate reviews as part of the project's overall project plan and schedule.

Project managers must allow adequate time not only for the actual gate review meeting, but also for any ancillary meetings and work efforts that are necessary to prepare for the gate review. Project managers should ensure that all work products have been delivered - and reviewed by both the project team and any appropriate stakeholders external to the project. All stakeholder issues, risks, and concerns should be addressed and, ideally, resolved prior to gate reviews. A gate review meeting should be treated as a forum to:

- Arbitrate issues with stakeholders that cannot be resolved solely by the project team;
- Validate that all risks have been addressed and appropriately mitigated;
- Verify that the project is on schedule and on budget, and the system can still meet requirements and satisfy the objectives established by the business case;
- Ensure that adequate funding and resources are available for the next SDLC stage; and
- Render a final decision as to whether or not the project should continue.

Gate review meetings are *not* a forum to discuss and resolve internal project issues, or to address the technical details of the system. These types of discussions should occur in project status meetings or in project work sessions.

Table 2.3-1. Gate Review Outcomes and Governance Decisions

Gate Review Outcome	Governance Decision
All Criteria Met	Proceed to next stage
Criteria Mostly Met	Proceed once all risks and action items are addressed
Criteria Not Met	Continue with this stage until all criteria are met
Major scope, schedule, or requirements changes are necessary	Return to a prior stage as designated by the governance board
Non-Performing Project	Suspend project activity and re-plan project
Unsalvageable Project	Terminate project

3 SDLC Activities

SDLC activities are broad categories of technical and project management tasks that get performed by a project team to actually realize a system of interest. NARA's SDLC establishes eight SDLC activities that are performed to implement a system including: (1) *Business Needs Analysis*; (2) *Concept Development*; (3) *Requirements Analysis*; (4) *Design*, (5) *Development*; (6) *Deployment Preparation*; (7) *Operations and Maintenance*; and (8) *Retirement*. SDLC activities are comprised of numerous, discrete tasks that gradually evolve the maturity of a system - thereby achieving the outcomes that are necessary to successfully manage the project and implement the system. *Figure 3-1* below identifies the technical and management outcomes expected for each of the eight SDLC activities, and shows how they align to the various stages of system maturity. *Table 3-1* below defines the purpose of each SDLC activity and lists its expected outcomes. The discrete tasks and work products that comprise each SDLC activity are discussed in detail in *Appendix A*.

Project team members having expertise in specific functional areas or technical disciplines perform the SDLC tasks planned for a project. Depending on the type of system being developed, an Integrated Project Team (IPT) may need to be established that includes specialists from a variety of functional areas (e.g., requirements engineering, verification and validation, functional analysis, modeling and simulation, configuration management, and quality assurance) - and from a variety of engineering disciplines (e.g., software engineering, reliability and maintainability, logistics, safety, survivability, security, and human factors).

Figure 3-1. Overview of SDLC Activities and Main Objectives

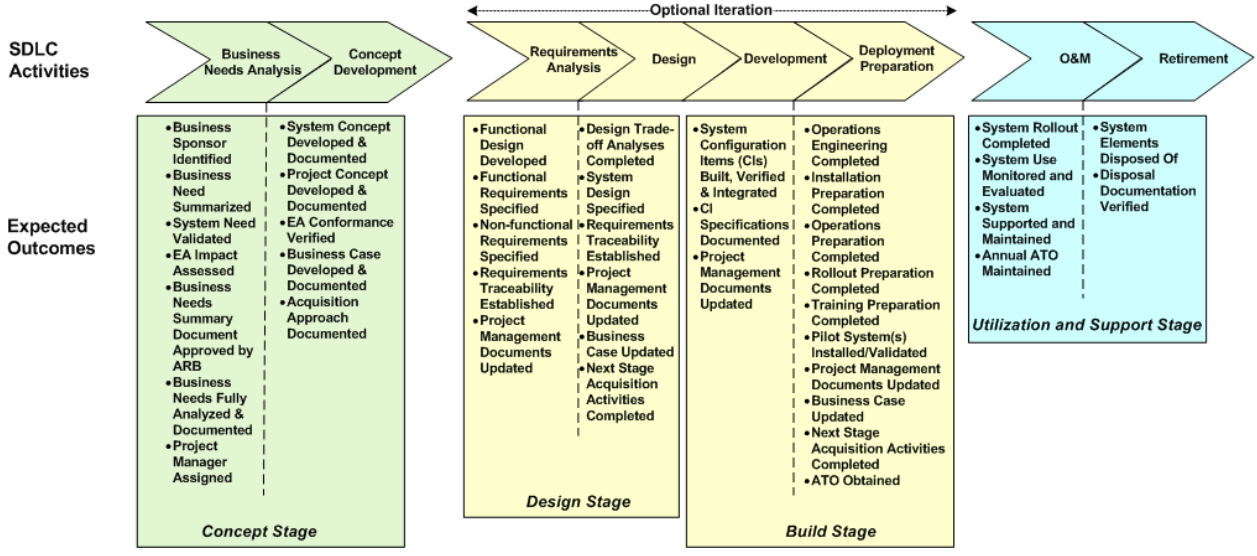


Table 3-1. Purpose and Outcomes of SDLC Activities

Activity	Purpose	Expected Outcomes
Business Needs Analysis	The purpose the *Business Needs Analysis* activity is to explore the business need for system capabilities, summarize those needs, analyze them in detail, and vet them with key business stakeholders	• Business Sponsor Identified • Business Need Summarized • System Need Validated • EA Impact Assessed • Business Needs Summary Document Approved by ARB • Business Needs Fully Analyzed & Documented • Project Manager Assigned
Concept Development	The purpose of the *Concept Development* activity is to: (a) define the overall system concept and the project concept for managing the implementation of the system; and (b) develop a comprehensive business case for acquiring the system.	• System Concept Developed and Documented • Project Concept Developed and Documented • EA Conformance Verified • Business Case Developed and Documented • Acquisition Approach Determined
Requirements Analysis	The purpose of the *Requirements Analysis* activity is to develop a functional representation of a system that will meet stakeholder requirements and that, as far as constraints permit, does not imply any specific implementation. Requirements analysis should provide a comprehensive functional description of the envisioned system.	• Functional Design Developed • Functional Requirements Specified • Non-functional Requirements Specified • Requirements Traceability Established • Project Management Documents Updated
Design	The purpose of the *Design* activity is to synthesize a system solution that meets the system requirements. The design should provide a comprehensive technical description	• Design Trade-off Analyses Completed • System Design Specified • Requirements Traceability Established

Table 3-1. Purpose and Outcomes of SDLC Activities

Activity	Purpose	Expected Outcomes
	of the envisioned solution	• Project Management Documents Updated • Business Case Updated and Validated • Next Stage Acquisition Activities Completed
Development	The purpose of the *Development* activity is to build the system elements that comprise the system solution - in accordance with the design. Development activities transform design specifications into specified hardware, software, procedures, or training elements.	• System Configuration Items (CIs) Built, Verified & Integrated • CI Specifications Documented • Project Management Documents Updated
Deployment Preparation	The purpose of the *Deployment Preparation* activity is to prepare for the installation and rollout of the system. Deployment preparation activities assess the impact of the as-built system elements on the current operating environment, install the system in a pilot environment, validate the system installation, and train and prepare all users, operators, and maintainers to use the system.	• Operations Engineering Completed • Installation Preparation Completed • Operations Preparation Completed • Rollout Preparation Completed • Training Preparation Completed • Pilot System(s) Installed/Validated • Project Management Documents Updated • Business Case Updated and Validated • Next Stage Acquisition Activities Completed • ATO Obtained
Operations and Maintenance	The purpose of the *Operations and Maintenance* activity is to deploy and use the system in production operations, and sustain the system's capabilities throughout its useful lifecycle.	• System Rollout Completed • System Use Monitored and Evaluated • System Supported and Maintained • Annual ATO Maintained
Retirement	The purpose of the *Retirement* activity is to end the existence of a system. Retirement deactivates, disassembles, and removes all	• System Elements Disposed Of • Disposal Documentation Verified

Table 3-1. Purpose and Outcomes of SDLC Activities

Activity	Purpose	Expected Outcomes
	elements of a system from the operating environment. Retirement also ensures that all records, data, media, and removed system elements are disposed of and safeguarded in accordance with applicable laws, regulations, and policies.	

Although *Figure 3-1* depicts SDLC activities in a manner that follows a sequential, waterfall approach to system implementation, it is important to note that NARA's SDLC *does not* prescribe a waterfall methodology. The waterfall outline is presented only to provide a common frame of reference because it is the most widely understood approach to system implementation. In fact, SDLC activities can be performed sequentially, iteratively, concurrently, or incrementally throughout the four stages of system maturity depending upon the needs of the system. For example, requirements analysis tasks can be performed during the concept stage to identify stakeholder requirements; during the design stage to identify functional and non-functional requirements; during the development stage to refine installation and support requirements; and during the operations and maintenance stage to specify necessary changes in system capabilities.[5] As another example, adaptive, non-linear software development methods (e.g., Agile) tend to perform Requirements Analysis, Design, Development, and Deployment Preparation tasks concurrently and iteratively in the context of small, frequent releases of business capabilities.

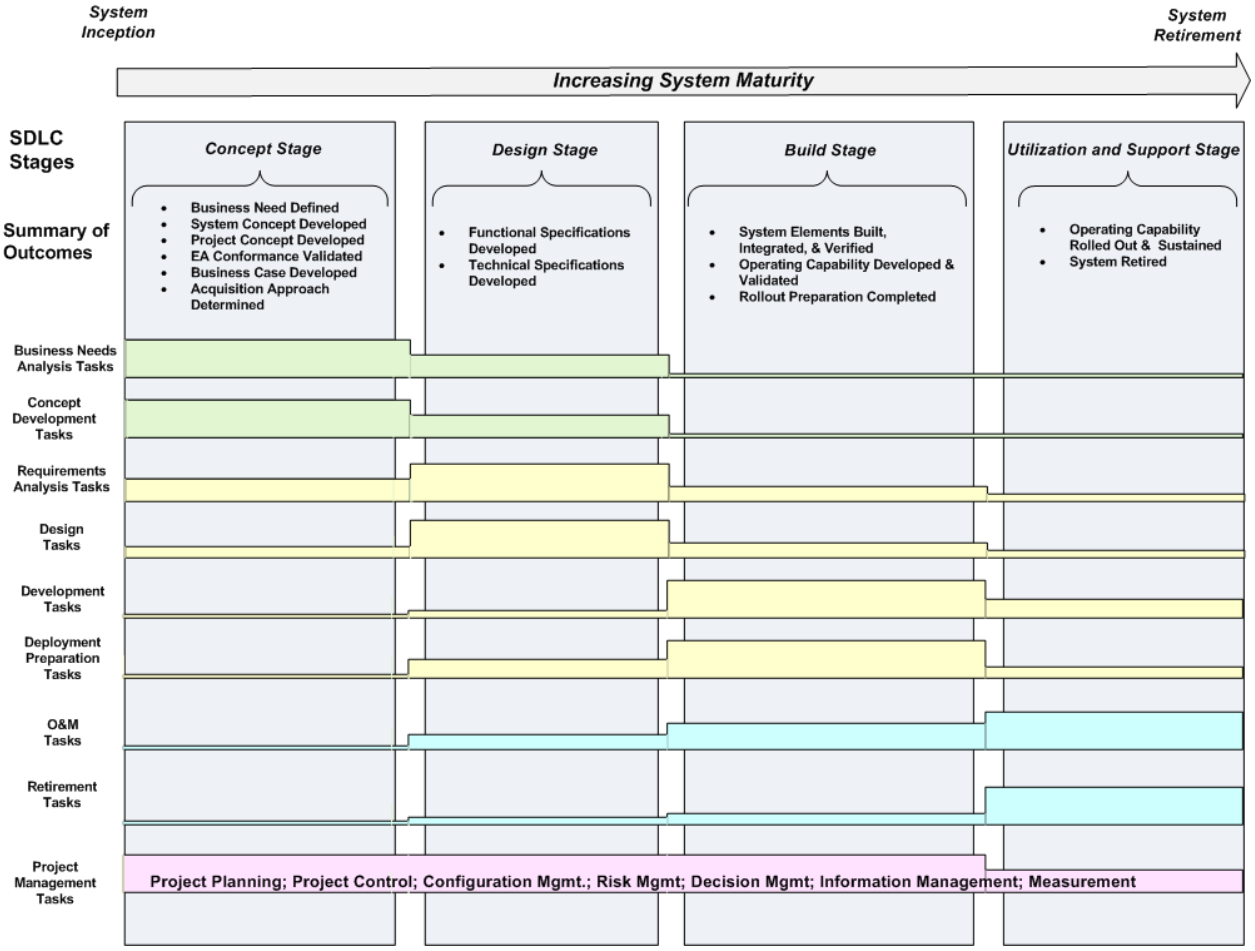
Figure 3-2 below shows how it is possible to apply all SDLC activities across all life cycle stages as the system matures. Generally, certain SDLC activities tend to be used more heavily in certain life cycle stages (e.g., design activities in the *Design Stage*), and less heavily in others (e.g., concept development activities in the *Utilization and Support Stage*). However, all SDLC activities tend to be used to some degree in all life cycle stages, and there is no hard and fast rule regarding how best to sequence SDLC activities.

It is incumbent upon project teams to use plan driven, adaptive, iterative, or concurrent SDLC approaches as applicable to the system they are developing – but the approach that is selected must address all aspects of a system including hardware, software, people, and processes. *Projects are free to tailor SDLC activities into a waterfall, spiral, incremental, evolutionary, concurrent, lean, or agile approach based upon the nature of the system and the needs of the*

[5] INCOSE identifies seven project processes and eleven technical processes that are applied to varying degrees, throughout the life cycle of a system. NARA's SDLC methodology accounts for all of the tasks represented by the INCOSE processes in the SDLC activities, but consolidates them, simplifies their organization, and adopts terminology that is more familiar to NARA staff and contractors.

project. It is also possible to use multiple approaches within the same project, and use a variety of project management guidelines (e.g., PMBOK, CMMi). What is important is to ensure that the desired outcomes are achieved as planned regardless of the implementation approach that is selected. SDLC tailoring is discussed in greater detail in *Section 4* of this document.

Figure 3-2. SDLC Activities Applied to SDLC Stages



4 SDLC Tailoring

4.1 Tailoring Plan

The primary purpose of NARA's SDLC is to help projects identify and plan work activities that are necessary to achieve successful project outcomes. Every project and system differs in scope, complexity, and risk. This makes it necessary to tailor the SDLC to the specific needs of a project. Tailoring the SDLC is a critical work activity that gets performed during the concept stage of a project. All projects are required to develop a tailoring plan. The tailoring plan is developed by the project manager and the lead systems engineer - and must be approved by the ARB to exit the concept stage of the life cycle.

The tailoring plan identifies critical system engineering and project management activities that must be performed to successfully implement the proposed system. Because the tailoring plan identifies the work activities that must be performed, developing the tailoring plan is a prerequisite for establishing the project work breakdown structure (WBS) and schedule - and for performing project cost analyses. It is also a prerequisite for understanding and managing risk.

4.2 Tailoring Concepts

There are three simple concepts that need to be understood to tailor the SDLC for any given project: (1) SDLC work streams (2) project types; and (3) work product templates.

(1) *SDLC work streams* are generalized workflow templates for planning and managing projects. These templates identify the tasks that are required to successfully perform broad types of system implementation projects (e.g., custom application development or IT infrastructure upgrade) - and they prescribe gate reviews to enable risk management and effective governance. Because work streams are generalized, they must be adjusted to the needs of individual projects. They are not intended to tie the hands of project managers and system engineers – but they are intended to prescribe the tasks that are necessary to ensure project success when performing a certain type of project. It should be noted that SDLC work streams are not the same thing as generic system implementation approaches (e.g.; waterfall, spiral, incremental, iterative, concurrent, lean, or agile). Work streams can be tailored to use any of these approaches (or combinations thereof) based upon the needs of a project.

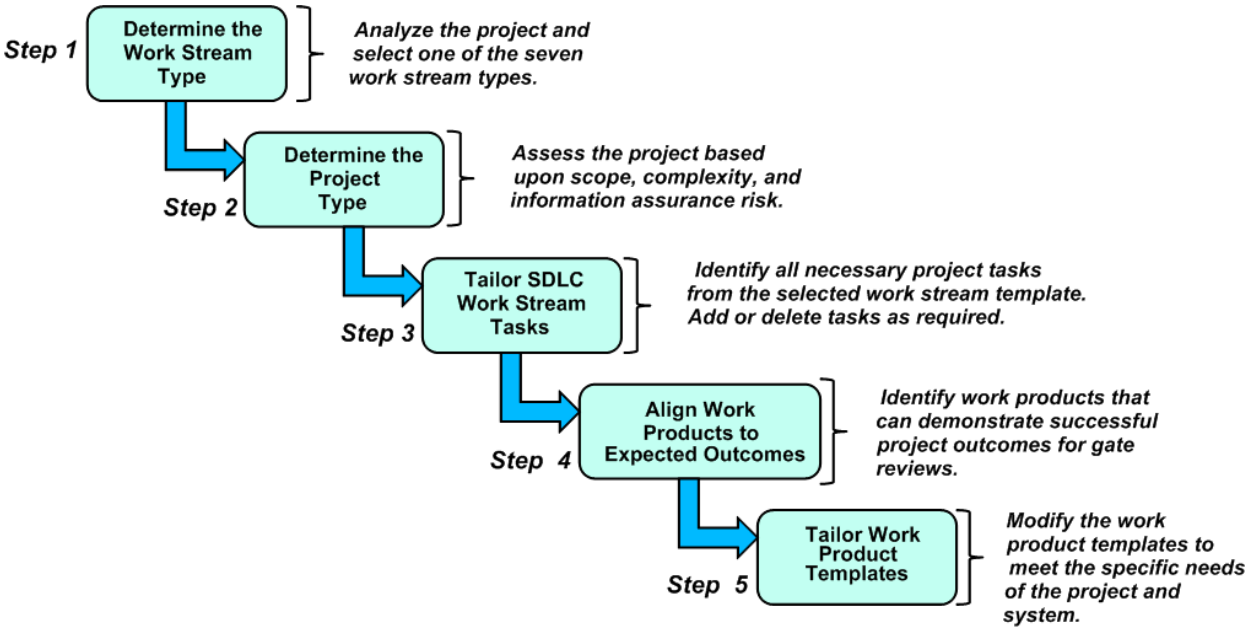
(2) *Project Type* is determined by the nature of the system being developed and the scope of the project. Systems tend to increase in complexity as: (a) the scope of functionality increases; (b) the number and diversity of technical elements increases; (c) the number of system interfaces increases; or (d) as new technologies are introduced. Projects tend to increase in complexity as: (1) the scope of business impact increases; (2) the number and variety of stakeholders increases; (3) the size of the project team increases; (4) specialized information assurance needs are added; or (5) the number of dependencies on other projects and other systems increase. Increased system and project complexity invariably leads to increased project risk.

(3) *Work Product Templates* are generalized formats for the deliverables that are produced by a project as it progresses through the life cycle. These templates outline the types of information that are typically contained in certain document types (e.g., requirements specifications, design specifications, concept of operations, use cases, configuration management plans and project management plans) and provide a pre-formatted structure for developing project documents. Work product templates can be modified or combined to meet the need of a given project.

4.3 Tailoring Process

NARA's SDLC prescribes a five-step process for tailoring the SDLC to project needs, and provides templates, forms, and guidelines to assist project managers with tailoring. The tailoring process allows the tailoring plan to be refined incrementally as more detailed information about the system and the project becomes available. The tailoring process is performed during the SDLC concept stage – but the tailoring plan can be modified as necessary throughout the life cycle. An overview of the tailoring process is depicted in *Figure 4.3-1* below. Additional detail about each step in the process is provided in the subsequent sections.

Figure 4.3-1. Overview of the SDLC Tailoring Process



4.3.1 Determining the Work Stream Type

The first step in SDLC tailoring is to determine the type of system that is being implemented. Different types of system implementations require that different types of tasks be planned and performed. For example, implementing a very large custom-developed software system is quite a different undertaking than updating the IT infrastructure to support a new communications protocol, or providing a new directory service. NARA's SDLC pre-defines eight work stream options that support the types of systems typically implemented at NARA. The work streams fall into two main categories: (1) business application work streams; and (2) IT infrastructure service work streams. It is not expected that projects will exactly fit a specific work stream type. For this reason, the tasks and sequencing described by the various work streams get further refined in subsequent steps of the tailoring process. *Table 4.3.1-1* below lists NARA's eight work stream options and describes the types of system implementations for which they are used. Projects can simply identify the work stream that most closely describes the type of system being implemented. (Note: The rows in the table are color coded to match the work stream to the corresponding template for that work stream in *Appendix B*).

Table 4.3.1-1. SDLC Work Streams

Work Stream	Description
Business Application Work Streams	
New Custom Developed or COTS Application	Used for new systems that: (a) require significant custom development; (b) use modified COTS products to satisfy requirements; or (c) include both custom developed and COTS software elements. Examples include ERA, DAS, ARCIS, and HMS.
New Software as a Service (SaaS) Application	Used for new systems that will be: (a) provisioned external to NARANET by an external service provider; (b) accessed over the Internet using a web browser; and (c) used "as-is" based upon a vendor-defined Service Level Agreement. Examples include SCTS and OAS.
Application Upgrade	Used to upgrade the business software of an existing system either to: (a) add significant new functional capabilities; (b) make significant changes to the underlying database structure, application architecture, or application platform of a COTS product; or (c) dispose of an application. Examples include CMRS and ADRRES.
Application Maintenance	Used for routine maintenance, bug fixes, or minor functional enhancements to an existing business application. Examples include OFAS and ENOS updates.

Table 4.3.1-1. SDLC Work Streams	
Work Stream	**Description**
IT Infrastructure Service Work Streams	
New IT Infrastructure Capability	Used to provision new IT infrastructure services. Examples include the enterprise wireless deployment and Storage Network Infrastructure (SNI).
New Platform as a Service (PaaS) / Infrastructure as a Service (IaaS) Capability	Used to implement IT infrastructure capabilities that will be: (a) provisioned external to NARANET by an external service provider; (b) accessed via NARA's Internet interface; and (c) used predominantly "as-is" based upon a Service Level Agreement (SLA).
Major IT Infrastructure Upgrade	Used to upgrade an existing IT infrastructure service that: (a) adds significant new capabilities; (b) significantly impacts interoperability with other IT infrastructure services; (c) makes significant changes to underlying service technologies; (d) moves in-house infrastructure services to an external service provider; or (e) disposes of an existing IT Infrastructure system or service. Examples include NARANET Server Upgrade (NSU), MPLS migration, and cloud-based email.
IT Infrastructure Refresh	Used to upgrade hardware, system software, or network devices that will minimally impact current configuration settings or interoperability with other IT components. Examples include, switch replacements, router upgrades, desktop COTS software updates, or server upgrades that do not affect the application platform.

4.3.2 Determining the Project Type

The second step in SDLC tailoring is to generally characterize the type of project that is being performed. Project type is determined by system complexity and project scope because, ultimately, these two attributes drive cost, schedule, and risk when implementing technology intensive systems. Generally, as a project's scope increases and a system gets more complex, additional project management and systems engineering work activities are required.

NARA's SDLC specifies three types of projects: (1) Low Complexity Projects; (2) Medium or High Complexity Projects; and (3) Projects having high information assurance risk. When considering project type, SDLC tasks are additive. This means that as complexity and scope increase, additional work activities must be added to address that scope and complexity. It is not important that projects be classified by some arbitrary rating such as high/medium/low or large/medium/small. What is important is that all necessary systems engineering tasks and project management activities get planned and performed.

Project managers can determine the type of project that they are performing by reviewing the *key attributes* listed for each type of project in *Table 4.3.2-1* below. Typically, projects will not exhibit all of the key attributes listed for a project type. In fact, they might have attributes from all three types of projects. Projects managers should look through the key attributes listed for the three project types and choose the project type that best characterizes the specific project they are performing. Later in the tailoring process there is ample opportunity to fine-tune the systems engineering tasks and project management activities that are needed in a project plan.

Table 4.3.2-1. SDLC Project Types

Type of Project	Key Attributes
Low Complexity Project	• The schedule to achieve Full Operating Capability (FOC) is less than 12 months. • FOC will be implemented by a single-phase project. • Interfaces to other systems are not required, or are simple and easy to accommodate. • The impact to NARANET is well understood, and is easily accommodated. • Requirements are well understood, or can be elicited and verified in a short timeframe. • Minimal software development or data conversion is required. • Solutions are generally available off-the-shelf or as a service. • The system being developed is isolated to a single business function or business office. • Expertise across many business or technical disciplines is not required. • O&M costs and impacts are well understood and easily accommodated. • Acquisition requirements are minimal and easy to define. • There would be minimal business impact if the project fails.
Medium or High Complexity Project *(Projects of medium and high complexity have the same basic attributes. The complexity of a project typically increases as the complexity of the system increases, and the scope of the project expands in terms of capabilities provided, schedule*	• The schedule to achieve Full Operating Capability (FOC) extends beyond 12 months. • System capabilities will be implemented by multiple phase projects or in increments. • Interfaces with other systems are required. • The system introduces significant impacts to NARANET and IT operations. • Software development and/or data conversion is required.

Table 4.3.2-1. SDLC Project Types	
Type of Project	**Key Attributes**
duration, resource needs, integration difficulty, and business/technical impact – all of which tend to increase cost and risk.)	• Requirements are not well understood at the onset of the project. • Expertise across several business process areas or technical disciplines is required. • New technologies and/or new business processes are being introduced. • Prototyping and/or proof-of-concept efforts may be necessary. • Significant acquisition support is required across several system life cycle stages. • There could be significant impact to customer service, business performance commitments, or business mission execution if the project fails.
High Information Assurance Risk Project	• Handles or stores classified information. • Handles or stores PII data. • Handles or stores restricted access data (e.g., Title -13, HIPAA). • Handles or stores permanent archival records or their associated metadata. • Handles or stores financial information.

4.3.3 Tailoring SDLC Work Stream Tasks

The third step in SDLC tailoring - tailoring SDLC work stream tasks - is the most involved and the most important. This is the step that determines what specific tasks need to be performed - and in what order - to actually implement the system.

Once the project manager has determined the work stream type and project type, the lead systems engineer can be engaged to assist with SDLC work stream tailoring. Each SDLC work stream has a pre-populated template that identifies the SDLC tasks that need to be performed, and associates those tasks with the appropriate SDLC stages based upon the general characteristics of the work stream type. Additional tasks are identified for high complexity projects and projects having high information assurance risk. Project teams should consider the perspectives of all system stakeholders when tailoring the SDLC work stream tasks. *Appendix D* highlights the particular SDLC tasks that address key NARA stakeholder perspectives including CPIC, Data Administration, Security, Records Management, and IT Operations.

The project manager and lead system engineer can add tasks, remove tasks, or rearrange the sequencing of tasks based upon the specific needs of the project they are performing (simply by redlining the template). However, sufficient justification should be provided when removing

tasks. SDLC work stream templates are provided in *Appendix B* and color-coded according to the work stream descriptions in *Table 4.3.1-1* above.

When planning large or complex projects, it may be necessary to iterate SDLC activities, re-arrange gate reviews, or add additional gate reviews to support incremental, adaptive, or concurrent approaches to system implementation. The work stream templates can be adjusted to support an iterative or adaptive approach simply by using multiple copies of the template and tailoring each copy to a specific a named increment of the system.

4.3.4 Aligning Work Products to Expected Outcomes

The fourth step in the tailoring process aligns the tasks that must be performed with the outcomes that are required at the various gate reviews – and identifies the work products that will be developed to achieve those outcomes. This step in SDLC tailoring provides the basis for developing the project plan and work breakdown structure, scheduling gate reviews, determining resource needs, estimating the costs of the project, assessing risks, and developing the overall business case.

Once the project manager and the lead system engineer have tailored the SDLC work stream and identified the tasks that need to be performed, they can determine what specific work products need to be developed. *Section 3* above provides an overview of the various SDLC activities (e.g., concept development, requirements analysis, and design) and lists the outcomes expected for each activity. *Appendix A* identifies a variety of specific tasks that can be performed to achieve the required outcomes, and describes typical work products that result from performing those tasks. For example, under the SDLC activity *Requirements Analysis*, there is a task called *Identify & Define System Functions.* This task can be accomplished by developing either a *Functional Decomposition Document* or a *Functional Decomposition Model*. The project manager and the lead system engineer should determine which of these work products will be developed (or if different work products will be developed) as a result of performing this task.

The net result of this activity is that the outcomes required for each SDLC stage are aligned with the specific tasks that need to be performed and the corresponding work products that will be developed – all based upon tailoring the SDLC work stream to the needs of the project. This information is consolidated and documented in the project's Tailoring Plan using the Tailoring Plan Worksheets (templates provided in *Appendix C*). The Tailoring Plan Worksheets are also used to identify the gate reviews that are anticipated throughout the project. Additional gate review checkpoints can be added as necessary for each project and the same gate reviews can be iterated multiple times when projects are using adaptive, iterative, or concurrent approaches to system implementation. Appendix C provides some sample patterns for incorporating gate reviews into the Tailoring Plan for common approaches to system implementation. The Tailoring Plan for the project, inclusive of the schedule of gate reviews, is reviewed and approved at the concept stage gate review.

4.3.5 Tailoring Work Product Templates

The final step in the tailoring process is to tailor the structure and content of the specific work products that are being developed. NARA's SDLC provides templates for many commonly used work products (e.g., Concept of Operations, Use Cases, and System Requirements

Specification). These templates can be used as is, modified, or even combined depending upon the needs of the project. It is acceptable for projects to use templates or work product formats from outside sources – or even to develop their own templates and formats. As projects develop work products in the design and build stages of the SDLC, the work products will tend to be more specific to the system being developed and it may be difficult to find generalized templates that are useful. For example, there is not a single generalized format for expressing a detailed design that will be useful for all projects and systems. However, industry standard approaches to design (e.g., UML, SysML) can be used to combine behavioural and structural models with requirements allocations into a design document formatted to the specific needs of a system. The important point about work products is that they adequately communicate the required information to stakeholders and reviewers. The SDLC allows flexibility in work product content and format. It is incumbent upon the project manager to ensure that their project teams develop work products of acceptable quality, and in accordance with project needs.

Appendix A – Detailed SDLC Tasks and Work Products

NARA's SDLC establishes eight broad categories of systems engineering activities that are performed to implement a system including: (1) *Business Needs Analysis*; (2) *Concept Development*; (3) *Requirements Analysis*; (4) *Design*, (5) *Development*; (6) *Deployment Preparation*; (7) *Operations and Maintenance*; and (8) *Retirement*. This appendix defines the detailed tasks and work products that constitute each of these eight SDLC activities.

In the subsequent sections of this appendix, each category of SDLC activity is broken down into a comprehensive set of tasks that are typically performed to accomplish the objectives of that activity. For example, the Requirements Analysis activity is comprised of more than 20 discrete work tasks that are used to: (a) develop the functional specifications for the system inclusive of defining functional requirements; (b) define the non-functional requirements for the system; and (c) manage the system's requirements. A set of work product options is provided for each specific task. Work products are used to capture and document the results of the task for the purposed of reviewing, vetting, and approving SDLC outcomes.

It is important to note that not all projects will require all tasks or all work products. The tailoring process is used to select the tasks and work products that are applicable to a given system implementation effort. Projects managers and lead system engineers select the appropriate tasks and work products when they tailor the SDLC to their specific project needs.

A.1 Business Needs Analysis

The purpose of the *Business Needs Analysis* activity is to explore the business need for system capabilities, summarize those needs, analyze them in detail, and vet them with key business stakeholders. Business needs analysis is intended to fully characterize the business need for a system by:

- Describing which business processes will be improved and how.
- Describing the business performance or service issues that will be addressed, and explaining why they have become an automation priority (e.g.; support Annual Performance Plan targets, comply with an audit recommendation, address a new policy mandate, control/reduce costs, or improve operational efficiency).
- Identifying the stakeholder groups that will be impacted and describing how they will be impacted.
- Explaining why a technology based solution is warranted, and why no existing NARA system can be used (or readily modified) to address the need.

Business needs analysis tasks include identifying a business sponsor, assigning a project manager, identifying finding constraints, and vetting the idea with business stakeholders. *Table A.1-1* below lists the specific tasks that comprise business needs analysis, and briefly describes the two work products that are produced. Standard templates are provided for these two work products.

Table A.1-1. Business Needs Analysis Tasks and Work Products

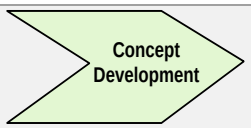
Task	Work Products Options	Description
Summarize Need	Business Needs Summary Document	The Business Needs Summary work product: • Identifies the project sponsor; • Summarizes the business need; and • Validates the system need.
Analyze Need	Business Needs Analysis Document	The Business Needs Analysis work product: • Provides the budget estimate; • Identifies the funding source & specifies funding constraints; • Defines the initiative activities & timeframes for the project under consideration; • Identifies the Strategic Goals or Long Range Performance Targets (LRPTs) that are supported; • Identifies the business processes that are supported • Describes Measures of Success for the project and system; and • Describes the Risks & Opportunities Being Addressed.

A.2 Concept Development

The purpose of the *Concept Development* activity is to develop a comprehensive business case for the system. Concept development tasks define and refine both the overall system concept, and the project plans that will manage the implementation of the system by:

(a) Developing and documenting the system concept;
(b) Developing and documenting the project concept;
(c) Verifying that the system conforms to NARA's EA and identifying any changes that are required to the EA;
(d) Performing and documenting a thorough financial analysis (i.e., *Business Case*) that estimates the total life cycle cost of the system and identifies the expected return on investment; and
(e) Planning and documenting the acquisition approach.

Table A.2-1 below lists the specific tasks that comprise the concept development activity, and briefly describes the corresponding work products that are produced. Projects managers and lead system engineers select the appropriate concept development tasks and work products when they tailor the SDLC to their specific project needs. NARA's SDLC provides templates for some of the more common work products and, in many cases, work product templates can be found online through vendors, system integrators, or professional associations. When available, templates describe the content of the work products in much greater detail.



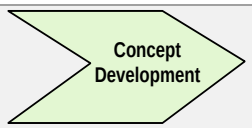
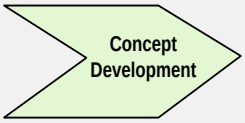


Table A.2-1. Concept Development Tasks and Work Products

Task	Work Product Options	Description
	- Develop System Concept -	
Develop the Concept of Operations (CONOPS)	CONOPS Document	The CONOPS Document describes - in business terms - the business context and need for a system, the *current-state* business operating environment, the *future-state* business operating environment once the system is built and deployed, and the approach by which the business plans to integrate the system into the business and transition from the *current-state* to the *future-state*. The CONOPs also identifies key information exchanges (e.g., National Information Exchange Model [NIEM] and Open Archival Information System [OAIS])



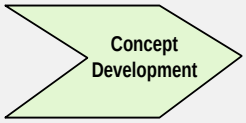
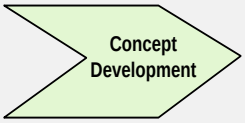


Table A.2-1. Concept Development Tasks and Work Products

Task	Work Product Options	Description
		with system elements external to NARA.
Perform Business Process Analyses(BPAs)	Process Flow Diagrams	Process Flow Diagrams are traditional flow diagrams depicting process steps and sequencing.
	Process Flow Models	Process Flow Models are formal models in standard notations (such as Business Process Modeling Notation [BPMN] or Integrated Definition Language [IDEF]) depicting process activities, stakeholders, flows between stakeholders via swim lanes, and information flows and exchanges (e.g., NIEM and OAIS).
	Business Context Diagrams	Business Context Diagrams are diagram or formal models (e.g., IDEF) describing the scope and boundaries of a given business process, service, or operating environment. Business Context Diagrams also identify high-level information exchanges (e.g., NIEM and OAIS).
	Activity Based Costing Models	Activity Based Costing Models are formalized models mapping costs to business activities and allowing the analysis of costs sensitivity to various factors, such as resource changes, process changes, or scheduling changes.
	Business Scenario Simulations	Business Scenario Simulations are functional models of business processes that allow changes to business activity parameters and sequencing to be explored for impacts to the efficiency of the process.
Develop Concept of Deployment	Concept of Deployment Document	The Concept of Deployment Document describes - in business terms - the approach that will be used to prepare the business for



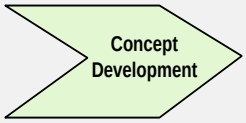
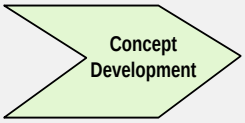


Table A.2-1. Concept Development Tasks and Work Products

Task	Work Product Options	Description
		the new system (change management), deploy the system to the business operating environment, and integrate the system with existing business procedures and staff. For smaller projects, this information can be included as a section within the CONOPS.
Develop Concept of Support	Concept of Support Document	The Concept of Support Document describes - in business terms - the approach to be used to support the users and stakeholders of the new system once it is deployed and operating. For smaller projects, this information can be included as a section within the CONOPS document.
Perform Proof of Concept Analyses	Product Demonstrations	Product demonstrations provide hands-on use of the products or services being considered as alternatives for parts of the system of interest.
	Product Inspections	Product inspections provide a review of the products or services being considered as alternatives for parts of the system of interest - in an actual operations environment.
	Working papers and presentations	Working papers and presentations provide informal documentation used to capture and vet findings about the envisioned system.
Develop System Architecture Concept	Architecture Concept Document	The Architecture Concept Document defines the overall functional architecture concept for the system of interest and identifies and defines the main elements of the architecture. This document is developed only in those cases where a substantial understanding of the system architecture exists very early in the SDLC. Technical architecture concepts and constraints can be identified as applicable.



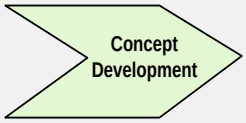
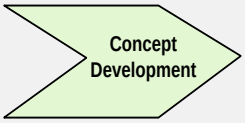


Table A.2-1. Concept Development Tasks and Work Products

Task	Work Product Options	Description
	Architecture Concept Diagrams	Architecture Concept Diagrams provide a one or two page visual representation of the functional architecture of the system of interest, as it is initially envisioned. Technical architecture concepts and constraints can be identified as applicable.
Perform Market Surveys	Working papers and presentations	Working papers and presentations provide informal documentation used to capture and vet findings about alternative products and services that might support the system of interest.
	Vendor provided white papers	Vendor provided white papers provide documentation about specific products or services that might support the system of interest.
	Market Research	Market Research provides information germane to the system of interest that is developed by professional market-research firms, such as Gartner or Forrester.
Perform Preliminary Information Assurance Assessment	Preliminary Information Assurance Assessment Document	The Preliminary Information Assurance Assessment Document identifies and describes any sensitive information to be created or processed by the system for each of the following categories of information: • Classified; • Privacy (PII); • Records Management; • Business Continuity; • Financial; • Title 13; or • HIPAA.



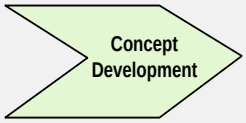
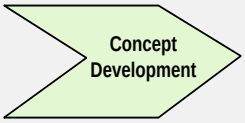


Table A.2-1. Concept Development Tasks and Work Products

Task	Work Product Options	Description
		A specialized template is provided for this work product.
Define Stakeholder Requirements	Stakeholder Requirements Document	The Stakeholder Requirements Document records all stakeholder requirements and identifies the source of each requirement (e.g., working sessions, stakeholder surveys, business analyses, CONOPS).
Document Validation Criteria	Stakeholder Requirements Document	Validation criteria are established for each stakeholder requirement and recorded along with the requirement in the Stakeholder Requirements Document. Validation criteria define what attributes will be evaluated to determine if the system meets the business need.
Establish Initial Requirements Verification and Traceability Matrix (RVTM)	Stakeholder Requirements Document	The Stakeholder Requirements Document initializes the RVTM when the sources for stakeholder requirements are captured and the corresponding validation criteria are established. This information is often times transferred to an Excel spreadsheet or a requirement management database as part of the requirements analysis tasks of a project.
- Develop Project Concept -		
Develop Integrated Product Team (IPT) Charter	IPT Charter	The IPT Charter defines the overall mission and objectives of the project, in standard NARA format, so the Charter can be reviewed and approved.
Tailor SDLC	SDLC Work Stream Template	The SDLC Work Stream template is a redlined markup of particular SDLC work stream chosen for a specific project. This template is used to tailor the generic set of tasks to the specific needs of a project / system. This information is used to develop



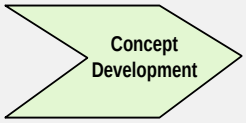
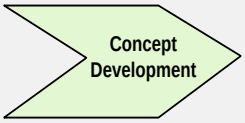


Table A.2-1. Concept Development Tasks and Work Products

Task	Work Product Options	Description
		the PMP and WBS for the project - and provides a basis for cost and schedule estimates.
	SDLC Tailoring Plan Worksheet	The SDLC Tailoring Plan Worksheet identifies the specific tasks that will be performed on a project based upon the tailoring of the SDLC work stream template. The worksheet aligns tasks to expected outcomes and aligns work products to tasks.
Develop Project Management Plan (PMP) including Work Breakdown Structure (WBS) & Schedule	PMP Document	The PMP Document is a traditional project management plan document tailored to the specific needs of the project.
	WBS and Schedule	These work products provide a traditional WBS/schedule, typically maintained in Microsoft project.
Develop Project Risk Mgmt. Plan	Risk Management Plan	The Risk Management Plan identifies, tracks, and manages all risks to the project throughout its lifecycle. Risks are assessed for likelihood of occurrence and potential impact – and are given an appropriate mitigation strategy. For smaller projects, this information can be included as a section within the PMP Document.
Establish Configuration Management (CM) Plan/Repository	CM Plan	The CM Plan describes how artifacts will be stored, managed, base-lined, and disseminated throughout the system lifecycle. For small projects, this information can be included as a section within the PMP Document, or expressed as a set of operational procedures rather than as a formal plan.
	CM Repository Workspace Definition	The CM Repository Workspace Definition defines and describes the folder structure and



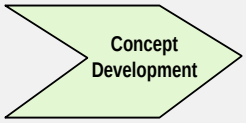
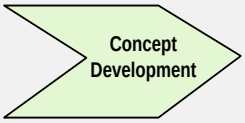


Table A.2-1. Concept Development Tasks and Work Products

Task	Work Product Options	Description
		access controls established to store and manage artifacts produced by the project throughout the lifecycle.
Develop Quality Assurance (QA) / Independent Verification & Validation (IV&V) Plans	QA Plan	The QA Plan describes how project activities and outcomes will be managed and evaluated against the standards and policies of the project and the agency. For smaller projects, this information can be included as a section within the PMP.
	IV&V Plan	The IV&V Plan describes how project work products will be reviewed by an independent third-party. An IV&V Plan is sometimes required for very large projects or projects having high information-assurance risks. The IV&V Plan can be developed as a separate document or included as part of the QA Plan or PMP Document.
- Ensure EA Conformance -		
Perform EA Impact Analysis	EA Change Request (CR) Form	Based on the CONOPS and system architecture concept, the EA CR Form is used to determine what changes will be required to either NARA's EA or the proposed system concept. This is done in conjunction with EA/SE staff.
Develop EA CR	EA CR Form	The EA CR Form documents required changes to EA work products.
- Develop Business Case -		
Define Resource Needs	Full Lifecycle Cost/Benefit Model	The Full Lifecycle Cost/Benefit Model identifies and estimates costs for all labor hours and all non-personnel resources (facilities, equipment, supplies, logistics support, etc.), required by the project, as part



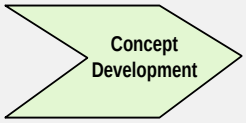
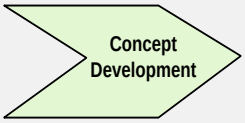


Table A.2-1. Concept Development Tasks and Work Products

Task	Work Product Options	Description
		of the cost model for the full lifecycle of the system.
Define Staffing Needs	Full Lifecycle Cost/Benefit Model	The Full Lifecycle Cost/Benefit Model identifies and estimates costs for all labor hours and all non-personnel resources (facilities, equipment, supplies, logistics support, etc.) required by the project, as part of the cost model for the full lifecycle of the system.
Perform CBA	Full Lifecycle Cost/Benefit Model	The Full Lifecycle Cost/Benefit Model identifies costs and benefits for the system, so projections can be run to determine if the full lifecycle costs are offset by the expected benefits of the system – and if so, when the break-even point occurs and what overall Return on Investment (ROI) is achieved.
Develop CPIC Business Case	CPIC Business Case Form	Complete the appropriate CPIC Business Case form based upon the information provided by the other Concept Stage work products.
Define Business Performance Measures (BPMs)	Stakeholder Requirements Document	The Stakeholder Requirements Document provides specific measures of success established for the system from the business-mission perspective. System Performance Measures (SPMs) will trace to BPMs downstream in the SDLC. BPMs must be documented as a specific category of stakeholder requirements.
Perform Analysis of Alternatives (AoA)	AoA Document	The AoA Document identifies and describes alternative approaches to acquiring the system of interest, evaluates items such as sourcing options, development alternatives, architectural options, cost, and risk – and recommends/justifies the best approach to



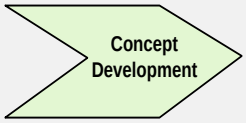


Table A.2-1. Concept Development Tasks and Work Products

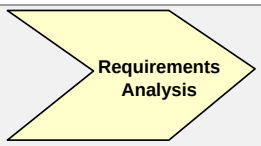
Task	Work Product Options	Description
		acquiring the system of interest.
- Determine Acquisition Approach -		
Develop Acquisition Plan	Acquisition Plan Document	The Acquisition Plan Document describes the final approach selected for acquiring the system and defines the acquisition approach, schedule, documentation set, team members, and selection criteria.
Identify Source Selection Authority	Acquisition Plan Document	The Acquisition Plan Document defines the source-selection authority.
Develop Statement of Work (SOW), Request For Proposal (RFP), and Technical Direction Letters (TDLs)	Various Acquisition Documents	These work products are comprised of the SOW, RFP, and TDL documentation typically associated with federal contracts.

A.3 Requirements Analysis

The purpose of the *Requirements Analysis* activity is to develop a functional representation of a system that will meet stakeholder requirements and that, as far as constraints permit, does not imply any specific implementation. Requirements analysis should provide a comprehensive functional description of the envisioned system by:

(a) Developing functional specifications;
(b) Specifying the functional requirements;
(c) Specifying the non-functional requirements (e.g., performance requirements, constraints on design, and specialty engineering needs);
(d) Establishing and documenting requirements traceability; and
(e) Updating all applicable project management plans and documents.

Table A.3-1 below lists the specific tasks that comprise the requirements analysis activity, and briefly describes the corresponding work products that are produced. Projects managers and lead system engineers select the appropriate requirements analysis tasks and work products when they tailor the SDLC to their specific project needs. NARA's SDLC provides templates for some of the more common work products and, in many cases, work product templates can be found online through vendors, system integrators, or professional associations. When available, templates describe the content of the work products in much greater detail.



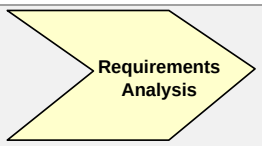
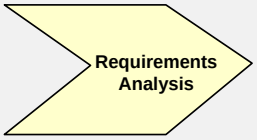


Table A.3-1. Requirements Analysis Tasks and Work Products

Task	Work Product Options	Description
- Develop Functional Specifications -		
Identify & Define System Functions	Functional Decomposition Document	The Functional Decomposition Document provides a hierarchical breakdown of the functions the system is intended to provide, providing standard names for major system functions, defining those functions, decomposing them into one or more levels of sub-functions, and describing their functional attributes. This information can (optionally) be captured, maintained, and managed using functional decomposition models – before being extracted into various documentation formats.



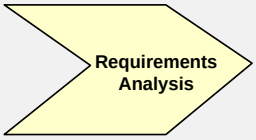
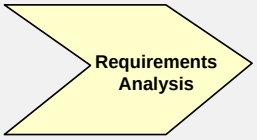


Table A.3-1. Requirements Analysis Tasks and Work Products

Task	Work Product Options	Description
	Functional Decomposition Models	This work product consists of models capturing and depicting the functional hierarchy of a system, using a formal modeling notation, including Function Trees, Business Process Hierarchy Charts, Unified Modeling Language (UML) or System Modeling Language (SysML) Structure Diagrams, and Department of Defense Architecture Framework (DoDAF) OV-5 node tree diagrams.
Describe System Functions	Functional Decomposition Document	The Functional Decomposition Document describes system functions and can be prepared as a stand-alone document or captured as part of formal functional decomposition models.
	Functional Description Models	This work product consists of models describing the context (inputs, outputs, controls, and enablers) of functions defined in the functional hierarchy of the system of interest, typically expressed using a formal modeling notation, such as IDEF0 and DoDAF OV-5 context diagrams.
Define Functional Interfaces	Functional Flow Block Diagrams (FFBDs)	This work product consists of traditional systems engineering diagrams depicting and describing flows of inputs and outputs across the functions of the system.
	N^2 Charts	This work product consists of traditional systems engineering diagrams, providing an overview of all inputs and outputs across all functions in a system of interest. N^2 charts are useful for understanding which functional elements of a system of interest interact with one another.



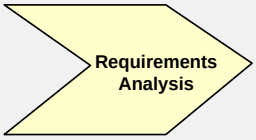
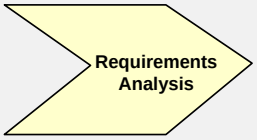


Table A.3-1. Requirements Analysis Tasks and Work Products

Task	Work Product Options	Description
	Activity Diagrams	This work product consists of activity diagrams (UML or SysML) that provide more detailed specifications of functional flows and the sequencing of system functions.
	IDEF0 and DoDAF OV-5 Context Diagrams	This work product consists of diagrams identifying inputs and outputs of functions defined in the functional hierarchy of a system of interest.
Develop Conceptual Data Model (CDM) with Information Assurance Attributes	UML/SysML Static Class Diagram or IDEF1X with the corresponding data dictionary	This work product consists of static class diagrams or IDEF1X diagrams, identifying and defining the information classes associated with a system of interest and describing the relationships between those classes of information. A CDM represents the information used by a system from the perspective of the business; i.e., it is a functional description of the business domain - not a technical specification for implementing a database. The CDM can be minimally attributed to identify the need to address key information assurance handling requirements such as classified, privacy, financial, Title 13, records management, etc.
Define Information Flows	Activity Diagrams	This work product consists of activity diagrams (UML or SysML) that provide detailed specifications of the functional flows and sequencing of system functions. The diagrams can depict the integration of information flows with those functions.
	Data Flow Diagrams (DFDs)	This work product consists of diagrams showing (a) the flow of data from external entities into the system; (b) how data moves from one process to another; and (c) how data is persisted. DFDs were introduced and popularized for structured analysis and design



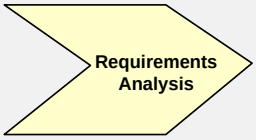
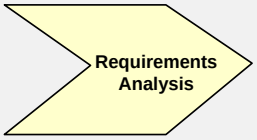


Table A.3-1. Requirements Analysis Tasks and Work Products

Task	Work Product Options	Description
		in 1979 (Gane and Sarson).
	IDEF0 and DoDAF OV-5 Context Diagrams	This work product consists of diagrams depicting how information flows in and out of a function.
	Business Process Modeling Notation (BPMN) Diagrams	This work product consists of diagrams depicting how information flows across activities and across stakeholders in the context of workflow definitions.
Develop Use Cases	Use Case Descriptions and Diagrams	Use cases typically consist of a high-level diagram (UML or SysML) that depicts the actors that interact with a system of interest, and the functional capabilities that those actors use. A use case diagram is a accompanied by a structured, textual description that discusses attributes of the interaction such as the normal flow of events, alternative flows of events, exception handling, triggers, information utilized, preconditions, classes of users or actors, post conditions, and frequency of use. The main purpose of a use case is to define interaction with a system - in the context of a scenario, thread, transaction, or workflow – to help define functional requirements.
Define Functional Requirements	System Requirements Specification (SRS)	The SRS is initialized as the master data store for all requirements of all types associated with a system of interest. This can be implemented as a document or as part of a requirements database. Larger projects will most likely need to use a requirements database to facilitate the management of requirements throughout the lifecycle. At a minimum, the SRS should classify and track requirements according to the following categories: (a) functional; (b) non-functional;



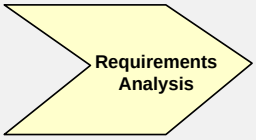
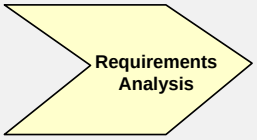


Table A.3-1. Requirements Analysis Tasks and Work Products

Task	Work Product Options	Description
		(c) performance; (d) constraints on design; or (e) information assurance. Requirements for interfaces and information exchanges (e.g., NIEM and OAIS) should be specified as part of the functional requirements.
Define System Performance Measures (SPMs)	Section of the System Requirements Specification (SRS)	This work product consists of a specialized class of requirement used to define the metrics for the overall operation of a system. These measures should trace back to the BPMs defined for the system and should be used to tie system performance to business need. Some general types of measures include: • transaction timing and throughput; • availability; • accuracy of information; • accessibility of information; and • efficiency of processing. SPMs must include requirements for instrumentation of system elements as appropriate.
Update Stakeholder Requirements	Section of the System Requirements Specification (SRS)	This work product consists of stakeholder requirements updated as a result of the completion of functional specifications of a system. As the functional analysis for a system of interest nears completion, stakeholder requirements and validation criteria must be integrated within the system's master requirements data store.



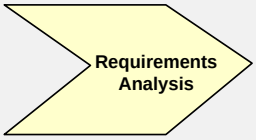
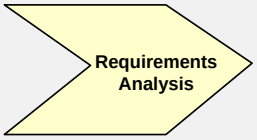


Table A.3-1. Requirements Analysis Tasks and Work Products

Task	Work Product Options	Description
- Define Non-functional Requirements -		
Define Information Assurance Requirements including Records Management, Security, Privacy, Business Continuity, Compliance & Audit, Title 13, and HIPAA	Section of the System Requirements Specification (SRS)	This work product consists of documentation of all special information handling needs for sensitive information processed by a system of interest for each of the following categories of sensitive information: • Classified; • Privacy (PII); • Records Management; • Business Continuity; • Financial; • Title 13; and • HIPAA. Detailed information assurance requirements should be derived from, and trace to, the Preliminary Information Assurance Assessment developed in the Concept stage.
Define Training Requirements	Section of the System Requirements Specification (SRS)	This work product consists of documentation of all requirements for training material development, training infrastructure, and training delivery associated with the system of interest.
Define O&M Requirements	Section of the System Requirements Specification (SRS)	This work product consists of documentation of all requirements for instrumentation, operations procedures, operations documentation, facilities preparation, support systems, and training associated with operating and maintaining a system of interest throughout its lifecycle.



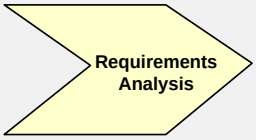
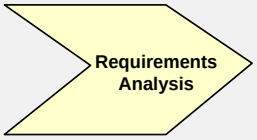


Table A.3-1. Requirements Analysis Tasks and Work Products

Task	Work Product Options	Description
Define Deployment Requirements	Section of the System Requirements Specification (SRS)	This work product consists of documentation of all requirements for operations preparation, installation, and rollout associated with a system of interest.
Identify Constraints on Design	Section of the System Requirements Specification (SRS)	This work product consists of documentation of all constraints on the design of the system – in terms of products, services, existing system capabilities or interfaces, and standards.
Define Disposal Requirements	Section of the System Requirements Specification (SRS)	This work product consists of documentation of all requirements for removing a system from operations and disposing of its assets, procedures, and data stores.
- Manage Requirements -		
Define Verification Criteria	System Requirements Specification (SRS)	The SRS defines attributes to be evaluated to determine if a particular system element meets requirements and satisfies the design. Verification criteria must also identify the means for verification, such as inspection, analysis, test, demonstration, or certification. One or more verification criteria must be established for and aligned with each system requirement. Verification criteria can be added incrementally to the SRS.
Update Requirements Verification and Traceability Matrix (RVTM)	RVTM	The RVTM is a matrix that cross references all system requirements to their parent stakeholder requirement, their decomposed child requirements, and the validation / verification criteria for each requirement. As the system of interest progresses through the lifecycle, the RVTM will also identify the functional and technical elements to which the requirements are allocated in the design. The RVTM is the primary work product used



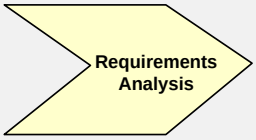
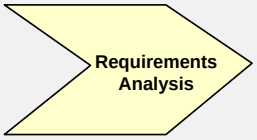


Table A.3-1. Requirements Analysis Tasks and Work Products

Task	Work Product Options	Description
		in requirements management, and is typically generated from a requirements management tool/database for all but the smallest systems.
Track Requirements Changes	System Requirements Specification (SRS) and RVTM	All additions, changes, and deletions of requirements are tracked, managed, and reported via the SRS and the RVTM.
- Manage Project -		
Update Mgmt. Plans/Work Breakdown Structure (WBS)	Project Management Plan, Risk Management Plan, Configuration Management Plan, Quality Assurance Plan, WBS	All baseline project management documents (as defined by the project concept activities) must be updated and maintained throughout the system development lifecycle.
Document Initial SSP	SRS/RVTM Extract	This work product consists of information assurance requirements extracted from the SRS, along with the functional modules to which they are allocated and the verification criteria assessing whether the requirements have been addressed. Alternatively, the Section of the SRS documenting information assurance requirements can simply be referenced.
Provide Project Status Reports/EVA	Project Status Reports	This work product consists of reports of project status, using any format appropriate to reporting progress and status for a project, according to the needs of the project manager and the organization's standards for project control.
	CPIC Quad Charts	This work product consists of reports summarizing project cost schedule, issues, and risks, using NARA's standard report format for project review meetings.



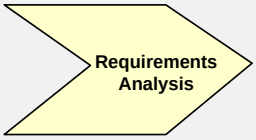


Table A.3-1. Requirements Analysis Tasks and Work Products

Task	Work Product Options	Description
Manage Baselines	CM Reports	This work product consists of any and all working reports required by a project to track and manage versions and baselines of system elements, system configuration items (CIs), and work products.
Develop Statement of Work (SOW), Request For Proposal (RFP), and Technical Direction Letters (TDLs)	Various Acquisition Documents	This work product consists of the SOW, RFP, and TDL documentation typically associated with federal contracts.

A.4 Design

The purpose of the *Design* activity is to synthesize a system solution that meets the system requirements. Both architectural and detailed designs should be developed. System functions and requirements get allocated to specific system elements during the design activity. The final design should provide a comprehensive technical description of the envisioned solution by:

(a) Completing design trade-off analyses as required;

(b) Specifying a comprehensive design of the system;

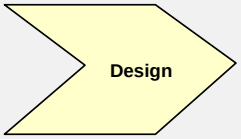
(c) Establishing and documenting requirements traceability;

(d) Updating all applicable project management documents;

(e) Updating and validating the business case; and

(f) Completing all applicable acquisition activities.

Table A.4-1 below lists the specific tasks that comprise the design activity, and briefly describes the corresponding work products that are produced. Projects managers and lead system engineers select the appropriate design tasks and work products when they tailor the SDLC to their specific project needs. NARA's SDLC provides templates for some of the more common work products and, in many cases, work product templates can be found online through vendors, system integrators, or professional associations. When available, templates describe the content of the work products in much greater detail.



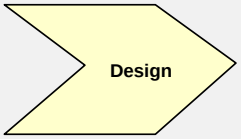
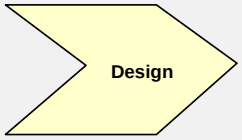


Table A.4-1. Design Tasks and Work Products

Task	Work Product Options	Description
- Perform Design Analysis -		
Develop Models & Prototypes	Models and Simulations	This work product consists of models and simulations used to obtain information about a system before significant resources are allocated to its detailed design and development. Models help stakeholders understand the ramifications of their preferences and allow technicians to explore the design requirements and limitations of technology. Models and simulations tend to be one of four major types: (1) physical; (2) graphical; (3) mathematical; or (4) statistical. A vast amount of literature is available on this topic.



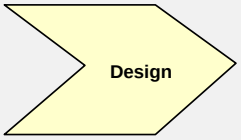
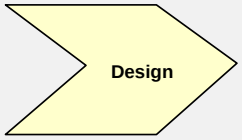


Table A.4-1. Design Tasks and Work Products

Task	Work Product Options	Description
	Prototypes	Prototypes allow end-users to explore aspects of a system's functionality prior to its being built, thereby increasing the likelihood that the system will meet their needs. Prototyping can reduce risk and uncertainty, and can help solidify requirements. Prototypes can vary in complexity and completeness from simulations of parts of a system – to a fully functioning system mock-up. A vast amount of literature is available on this topic.
Perform Trade Studies & Fit/Gap Analyses	Trade Studies	Although trade studies have no standard approach or format, they typically compare and rank various architectural design alternatives using weighted spreadsheet analyses, Analytical Hierarchy Process (AHP), or Multi-Attribute Utility Analysis (MAUA). Trade studies can also be performed using structured market surveys and market research to assess conformance with requirements architectural designs.
	Fit/Gap Analyses	Fit/Gap Analyses are typically used to evaluate suitability of Commercial-Off-The Shelf (COTS) components in the context of a design. Capabilities of COTS components are mapped against requirements to ascertain the degree to which a COTS solution meets requirements, and to identify gaps in functionality. Gaps are then assessed for mitigation options and costs to determine the cost/benefit of using the COTS component.
- Design System -		
Define System Architecture	Drawings and Working Papers	This work product consists of drawings (e.g. Visio) and working papers (e.g. Word and Excel) depicting and describing the overall system architecture and its context – and



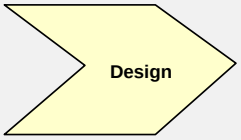
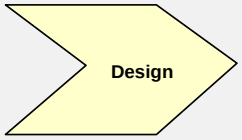


Table A.4-1. Design Tasks and Work Products

Task	Work Product Options	Description
		defining its major elements and their decomposition, and external interfaces.
	Architectural Models	This work product consists of formal models that identify and describe the elements of the system and capture information about relationships and interaction between and across system elements. Models are created using standard modeling notations for architecture development (e.g., DoDAF, IDEF, and SysML). Architectural Models show the structure of the overall system and also capture the functional elements and requirements allocated to them to provide bi-directional requirements traceability.
	System Design Specification (SDS)	The SDS consolidates all design elements associated with a system's architecture (architecture design drawings, text, tables, and models), expressing the overall design of the system of interest. Many design elements will be consolidated by reference to design models.
Specify Interface Requirements	Section of the System Requirements Specification (SRS)	This work product documents all requirements for system element interfaces and all interfaces with external systems.
Design Interfaces	Interface Summary Document	The Interface Summary Document identifies all interfaces in the system, providing a general characterization of each interface in terms of communicating elements, information communicated, information assurance considerations, usage characteristics, and communication formats and protocols. This information can be included as a section within the System Design Specification. A large system with many internal or external interfaces may



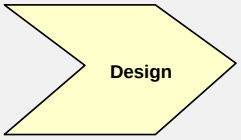
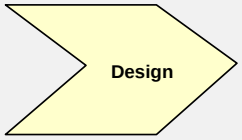


Table A.4-1. Design Tasks and Work Products

Task	Work Product Options	Description
		require a stand-alone interface summary document.
	Interface Control Documents (ICDs)	ICDs specify the functional and technical characteristics of each interface, expanding on the information provided in the Interface Summary Document, to fully express the technical design of each interface. The ICDs also reference the functional elements and requirements allocated to each interface design. The ICDs are initialized during design activities and finalized during development. Each interface must be documented in a unique ICD. ICDs can include Information Exchange Package Documentation (IEPD) for interfaces developed to NIEM or OAIS standards.
Specify System Elements	System Element Specifications	System Element Specifications provide detailed design information for each element that comprises the system architecture. System element specifications expand on the information provided in the System Design Specification to fully express the technical design of all system elements. The system element specifications also reference the functional elements and requirements allocated to each system element. Each system element are typically assigned a unique configuration item (CI) identifier.
	Structural Models	Structural Models (UML, SysML, and DoDAF) define numerous types of models that can be used to describe the structure of a system.
Allocate Requirements to System Elements	System Requirements Specification (SRS)	The SRS is updated during design activities to identify the system elements to which functional elements and specific requirements



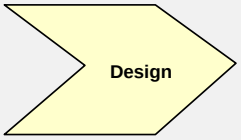
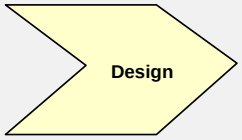


Table A.4-1. Design Tasks and Work Products

Task	Work Product Options	Description
		are allocated (i.e., requirements flow-down).
	RVTM	On completion of design activities, the RVTM should show bi-directional traceability between system elements and requirements – and should identify the verification criteria for each system element.
Remediate Gaps (if integrating COTS)	Gap Remediation Plan	On completion of Fit/Gap analyses, a gap remediation plan must be established to show how gaps in functionality will be addressed (e.g., work around, customization, drop requirements, or use additional COTS components). The cost, resource, and schedule changes for remediating gaps must be planned and integrated within the overall project management framework. Depending on the complexity of the system, a comprehensive Gap Remediation Plan document may be required, or a simple section to the PMP or Development Plan may be sufficient.
Define System Behavior & Control Flows	Activity Diagrams	This work product consists of activity diagrams (UML/SysML) providing detailed specifications of the flows between, and execution sequencing of, system elements. These diagrams can also depict the integration of information flows with system elements.
	Sequencing Diagrams	This work product consists of sequencing diagrams (UML/SysML) that can be used to show execution paths, interaction, and messaging between and across system elements.
	State Chart Diagrams	This work product consists of state chart diagrams (UML) used to describe various



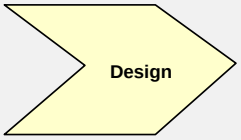
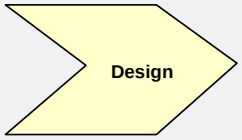


Table A.4-1. Design Tasks and Work Products

Task	Work Product Options	Description
		state changes associated with the function of a system element.
	DoDAF Models	This work product consists of DoDAF models type (OV or SV) used to express the structure and behavior of system elements.
Define Technical Performance Measures (TPMs)	Section of the System Requirements Specification (SRS)	TPMs are a specialized class of requirements used to define metrics for the technical behavior and operation of a specific system element or component. The general intent of TPMs is to provide objective measures of technical quality, so project managers do not rely on cost and schedule status alone. Example of TPMs include: • high- and low-water marks for system resource utilization; • percentage utilization of system resources; • availability of system resources; • mean time to failure of system elements; and • the number of faults incurred a system element.
Design Software (SW)	Software Models, Frameworks, and Specifications	SW design work products fully specify the architecture, behavior, structure and function of the SW elements to be developed. SW design work products will vary greatly depending on: • the type of system being developed; • the technologies used for development; • the type and degree of automation used for SW development; • the runtime environment targeted for



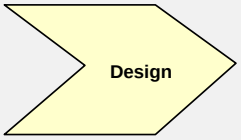
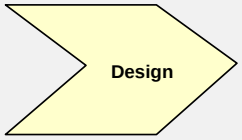


Table A.4-1. Design Tasks and Work Products

Task	Work Product Options	Description
		deployment; and • the types of COTS SW elements being used. Like all other system elements, SW elements must also provide bi-directional traceability to the requirements they address and the system elements they support. ISO/IEC 12207-2008 is a good general reference for SW development practices.
Develop Deployment Designs	Section of the System Design Specification (SDS)	This work product consists of documentation of any specialized design elements required to install and roll out the system of interest.
Develop Operations Designs	Section of the System Design Specification (SDS)	This work product consists of documentation of any specialized design elements required to operate and maintain the system of interest.
Update CDM with Information Assurance Attributes	UML/SysML Static Class Diagram or IDEF1X (inclusive of data dictionaries and mappings)	This work product consists of static class diagrams or IDEF1X diagrams used to identify and define the information classes associated with a system of interest and to describe the relationships between those classes of information. A CDM presents the information used by a system from the perspective of the business; i.e., the CDM is a functional description of the business domain – not a technical specification for implementing a database. The CDM can be minimally attributed to identify the need to address key information assurance handling requirements such as classified, privacy, financial, Title 13, records management, etc. The CDM baseline established during requirements analysis may need to be updated to reflect information discovered during the system design process.



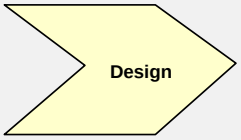
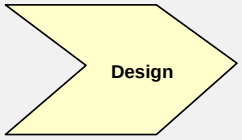


Table A.4-1. Design Tasks and Work Products

Task	Work Product Options	Description
Develop LDM	UML/SysML Static Class Diagram, IDEF1X, or Entity-Relationship Diagram (ERD) with the corresponding data dictionary and mapping tables	This work product consists of static class diagrams, IDEF1X diagrams, or ERDs used to identify and define the information classes or data entities associated with a system of interest - and describe the relationships between those classes of information. An LDM presents the data used by a system from the perspective of the system design; i.e., the LDM is a technical specification of data relationships used to guide implementation decisions for a database (relational or XML). The LDM is fully attributed and addresses key information-assurance handling requirements such as classified, privacy, financial, Title 13, or records management.
Define Development Plan	Development Plan Document	The Development Plan Document describes the strategy, methods, approach, schedule, and resources to be used to develop the system elements. It also shows how required specialty engineering activities (e.g., human factors, security, reliability and maintainability, etc.) will be integrated into the development process. For smaller systems, this information may be developed as a section within the PMP
Define Integration Plan	Integration Plan Document	The Integration Plan Document describes the strategy, methods, approach, schedule, and resources to be used to integrate all system elements into the composite system of interest. It also shows how interfaces between system elements and with external systems will be verified. For smaller systems, this information may be developed as a section within the PMP.
Define Verification Plan	Verification Plan Document	The Verification Plan Document describes the strategy, methods, approach, schedule,



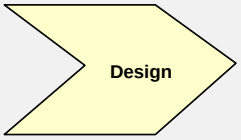
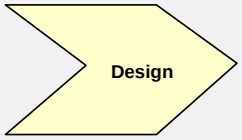


Table A.4-1. Design Tasks and Work Products

Task	Work Product Options	Description
		and resources to be used to verify system elements. Each system element must be verified against its requirements and design, using one or more verification techniques; i.e., inspection, analysis, test, demonstration, and certification. The Verification Plan must also address specialty engineering requirements (e.g., human factors, security, reliability and maintainability, etc.). For smaller systems, this information may be developed as a section within the PMP.
- Manage Requirements -		
Update Verification Criteria	System Requirements Specification (SRS)	One or more verification criteria must be established for and aligned with each system requirement. Verification criterion define what attributes will be evaluated to determine if a particular element of the system meets requirements and satisfies the design. Verification criterion must also identify the means for verification such as inspection, analysis, test, demonstration, or certification.
Update Requirements Verification and Traceability Matrix (RVTM)	RVTM	The RVTM is a matrix that cross-references all system requirements to their parent stakeholder requirement, their decomposed child requirements, and the validation / verification criteria for each requirement. As the system of interest progress through the lifecycle, the RVTM also identifies the functional and technical elements to which the requirements are allocated in the design. The RVTM is the primary work product used in requirements management, and is typically generated from a requirements management tool/database for all but the smallest systems.
Track Requirements	System Requirements	All additions, changes, and deletions of



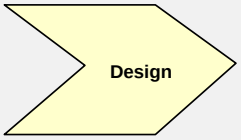
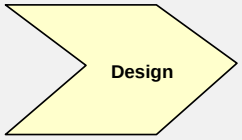


Table A.4-1. Design Tasks and Work Products

Task	Work Product Options	Description
Changes	Specification (SRS) and RVTM	requirements must be tracked, managed, and reported via the SRS and the RVTM.
- Manage Project -		
Update Mgmt. Plans/Work Breakdown Structure (WBS)	Project Management Plan, Risk Management Plan, Configuration Management Plan, Quality Assurance Plan, WBS	All baseline project management documents (as defined by the project concept activities) must be updated and maintained throughout the system development lifecycle.
Define/Schedule Increments	Increment or Release Plan	When an iterative approach to development / deployment is used, functions must be assigned to increments / releases and those releases scheduled in alignment with the deployment strategy for the system.
Update SSP	SRS/RVTM Extract	Information assurance requirements can be extracted from the SRS along with the functional modules to which they are allocated and the verification criteria that assess whether they have been addressed. Alternatively, the section of the SRS that documents information assurance requirements can simply be referenced.
Update Business Case	Updated Full Lifecycle Cost/Benefit Model, Project Plan, Concept documents, Acquisition Plan	These work products consists of revised cost models, updated CBA, and re-validated ROI estimates as a result of better understanding of actual system functions and costs for development. They also include/reference any updates to the system concept, project concept or acquisition approach.
Provide Project Status Reports/EVA	Project Status Reports	This work product consists of reports of project status, using any format appropriate to reporting progress and status for a project, according to the needs of the project manager.



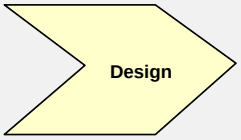


Table A.4-1. Design Tasks and Work Products

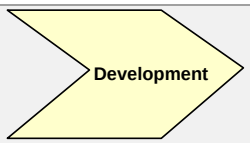
Task	Work Product Options	Description
	CPIC Quad Charts	This work product consists of reports summarizing project cost schedule, issues, and risks, using NARA's standard report format for project review meetings.
Manage Baselines	CM Reports	This work product consists of CM reports required by a project to track and manage versions and baselines of system elements and work products.
Develop Statement of Work (SOW), Request For Proposal (RFP), and Technical Direction Letters (TDLs)	Various Acquisition Documents	This work product consists of SOW, RFP, and TDL documentation typically associated with federal contracts.

A.5 Development

The purpose of the *Development* activity is to build the system elements that comprise the system solution - in accordance with the design. Development transforms design specifications into hardware, software, procedures, or training elements that are identified and tracked as Configuration Items (CIs). The expected outcomes of development include:

- Building, verifying, and integrating system CIs;
- Fully documenting the "as-built" specifications of all CIs;
- Documenting and managing changes to requirements; and
- Updating all project management documents as applicable to the project.

Table A.5-1 below lists the specific tasks that comprise the development activity, and briefly describes the corresponding work products that are produced. Projects managers and lead system engineers select the appropriate development tasks and work products when they tailor the SDLC to their specific project needs. NARA's SDLC provides templates for some of the more common work products and, in many cases, work product templates can be found online through vendors, system integrators, or professional associations. When available, templates describe the content of the work products in much greater detail.



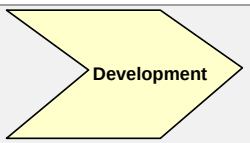
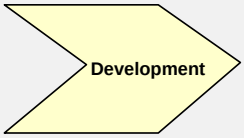


Table A.5-1. Development Tasks and Work Products

Task	Work Product Options	Description
- Develop System Configuration Items -		
Build System Elements	Work products will vary depending on the system.	These work products are the actual realization of the system design. These work products will generally fall into the categories of hardware, software, processes and procedures, or people/training.
Document System Elements	As-Built Specification Documents	The As-Built Specification Documents provide all technical information about the CIs as they are actually built, including information about the physical implementation of the CIs, the materials (or components) used to construct them, interfaces and sub-elements, how they are to be configured for integration and operation, and unit-level verification results.



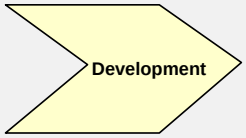
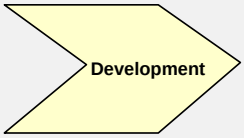


Table A.5-1. Development Tasks and Work Products

Task	Work Product Options	Description
	As-Built Specification Repository	In some cases, particularly with SW development, as-built information will be managed via a repository as part of an integrated development environment.
Develop Integration Procedures	Integration Procedure Documents	Integration Procedure Documents outline and describe the sequencing and approach to consolidating system elements into larger sub-systems. Formally documented integration procedures may or may not be required, depending on the complexity of the system of interest and the degree of integration that is required.
	SW Build Procedures and Routines	SW Build Procedures and Routines are typically used to integrate SW components into executable modules according to the SW design.
Integrate System Elements	Work products will vary depending on the system.	These work products combine sub-elements of a system into larger system elements, or into fully functioning sub-systems. Work products generally fall into the categories of hardware, software, processes and procedures, or people/training system elements.
Develop ICDs	Interface Control Documents (ICDs)	ICDs specify functional and technical characteristics of interfaces. A unique ICD must be developed for each interface. On completion of development, an ICD must fully describe the technical implementation of the interface. ICD for interfaces with external systems will typically be developed in conjunction with representatives from the participating systems. IEDPs should be developed for NIEM interfaces.



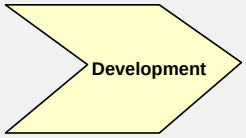
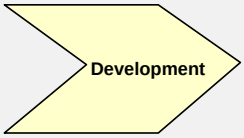


Table A.5-1. Development Tasks and Work Products

Task	Work Product Options	Description
Develop PDM	UML Static Class Diagram, Entity-Relationship Diagram (ERD) with the corresponding data dictionary	UML Static Class Diagrams or ERDs describe the physical implementation of the database. They represents the actual technical configuration of the data files, records, fields, and their physical attributes as implemented by the system.
Develop Data Conversion Routines	Work products will vary depending on the system.	Work products reflect the actual construction of system elements to convert or transform data into system-required formats, input the data in to the appropriate system elements, and verify that the converted data is correct and ready for use.
Verify System Elements	Work products will vary depending on the approach(es) used for verification.	These work products verify that system elements conform to their requirements and design specifications. Work products will vary depending upon the approach to verification that is utilized; i.e., inspection, analysis, test, demonstration, or certification.
Document Verification Reports	Inspection Results Report	The Inspection Results Report describes the results of inspections of system elements against the elements' verification criteria for conformance with requirements and design specifications. Inspection techniques are often used to verify the physical properties of system elements.
	Analysis Results Report	The Analysis Results Report describes the results of analyses of system elements against the elements' verification criteria for conformance with requirements and design specifications. Analysis techniques are often used to show theoretical compliance using analytical data or simulations under defined conditions. Verification by analysis is sometime appropriate when realistic test beds cannot be established or they are cost



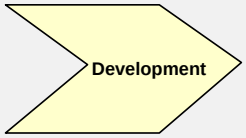
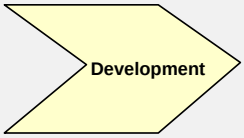


Table A.5-1. Development Tasks and Work Products

Task	Work Product Options	Description
		prohibitive.
	Test Results Report	The Test Results Report describes the results of test scenarios for system elements against the elements' verification criteria for conformance with requirements and design specifications. Testing techniques are used to verify the technical performance capabilities of system elements when subject to controlled conditions that are real or simulated.
	Demonstration Results Report	The Demonstration Results Report describes the results of demonstration scenarios for system elements against the elements' verification criteria for conformance with requirements and design specifications. Demonstration techniques are used to provide a qualitative exhibition of functional performance and behavior.
	Certification Results Report	The Certification Results Report provides assurance that a product or system element can perform its assigned functions in accordance with legal or industrial standards. Certification is often used to verify that commercially available components provide specific capabilities, and are technically verified against standards such as NIST, FCC, ISO, IEEE, and/or UL.
	System Verification Report Document	The System Verification Report Document consolidates all verification results into a comprehensive view of the system's verification process and outcomes, and summarizes the overall result of the verification for management review.
Perform Initial	Self-Study Training	This training provides manuals, videos,



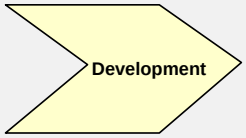
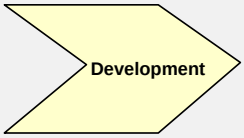


Table A.5-1. Development Tasks and Work Products

Task	Work Product Options	Description
Operator/Maintainer Training		books, or other physical training artifacts that trainees can use at their own pace to learn about the system.
	Computer-based Training	This training provides web-based courses, computer simulations, mock system exercises, web conferences, expert systems, or other interactive materials that trainees can use to learn about the system.
	Instructor-lead Training	This training provides traditional, structured, classroom-based training sessions for trainees. Classrooms can be physical or virtual, and often include aspects of self-study and computer-based training techniques.
Resolve Fit/gap issues	Work products will vary depending upon the system.	These work products generally fall into the categories of hardware, software, processes and procedures, or people/training system elements. These work products address specific elements of the system is in accordance with the Gap Remediation Plan.
Specify Initial Bill of Materials (BOM)	BOM Document	The BOM lists the specific components that must be purchased for a system. It identifies each component by model number, number of units, unit cost, and any other information that is necessary to specify the component and its cost. BOMs sometimes include diagrams or blueprints depicting the physical structure and configuration of the specified components.
- Manage Requirements -		
Update Requirements Verification and	RVTM	The RVTM is a matrix cross referencing all system requirements to their parent



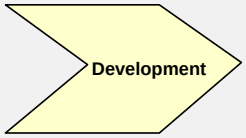
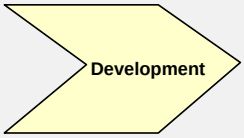


Table A.5-1. Development Tasks and Work Products

Task	Work Product Options	Description
Traceability Matrix (RVTM)		stakeholder requirement, their decomposed child requirements, and the validation / verification criteria for each requirement. As the system of interest progress through the lifecycle, the RVTM will also identify the functional and technical elements to which the requirements are allocated in the design. The RVTM is the primary work product used in requirements management, and is typically generated from a requirements management tool/database for all but the smallest systems.
Track Requirements Changes	System Requirements Specification (SRS) and RVTM	All additions, changes, and deletions of requirements must be tracked, managed, and reported via the SRS and the RVTM.
- Manage Project -		
Update Mgmt. Plans/Work Breakdown Structure (WBS)	Project Management Plan, Risk Management Plan, Configuration Management Plan, Quality Assurance Plan, WBS	All of the baseline project management documents (as defined by the project concept activities) must be updated and maintained throughout the system development lifecycle.
Update SSP	SRS/RVTM Extract	Information assurance requirements can be extracted from the SRS, along with the functional modules to which they are allocated and the verification criteria assessing whether they have been addressed. Alternatively, the section of the SRS documenting information assurance requirements can simply be referenced.
Provide Project Status Reports/EVA	Project Status Reports	This work product consists of reports of project status, using any format appropriate to reporting progress and status for a project, according to the needs of the project manager.



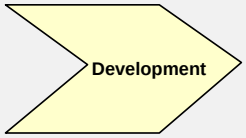


Table A.5-1. Development Tasks and Work Products

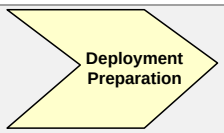
Task	Work Product Options	Description
	CPIC Quad Charts	This work product consists of reports summarizing project cost schedule, issues, and risks, using NARA's standard report format for project review meetings.
Manage Baselines	CM Reports	This work product consists of any and all working reports required by a project to track and manage versions and baselines of system elements and work products.
Develop Statement of Work (SOW), Request For Proposal (RFP), and Technical Direction Letters (TDLs)	Various Acquisition Documents	This work product consists of the SOW, RFP, and TDL documentation typically associated with federal contracts.

A.6 Deployment Preparation

The purpose of the *Deployment Preparation* activity is to prepare for the installation and rollout of the system. Deployment preparation assesses the impact of the as-built system elements on the current operating environment, installs the system in a pilot environment, validates the system installation, and trains and prepares all users, operators, and maintainers to use the system. The expected outcomes of deployment include:

- Completing operations engineering;
- Preparing for installation;
- Preparing for operations;
- Preparing for rollout;
- Training all system users, operators, and maintainers;
- Piloting and validating the installed system;
- Updating all applicable project management documents;
- Updating and validating the business case;
- Completing all necessary acquisition activities; and
- Obtaining Authority to Operate (ATO) the system.

Table A.6-1 below lists the specific tasks that comprise the deployment preparation activity, and briefly describes the corresponding work products that are produced. Projects managers and lead system engineers select the appropriate deployment preparation tasks and work products when they tailor the SDLC to their specific project needs. NARA's SDLC provides templates for some of the more common work products and, in many cases, work product templates can be found online through vendors, system integrators, or professional associations. When available, templates describe the content of the work products in much greater detail.



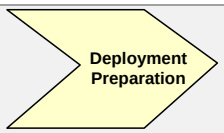
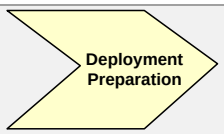


Table A.6-1. Deployment Preparation Tasks and Work Products

Task	Work Product Options	Description
- Perform Operations Engineering -		
Perform Operations Impact Analyses	Operations Impact Assessment Document	This document summarizes the results of operations engineering. Operations engineering examines the newly built, verified, and integrated system elements – as documented by the development/integration



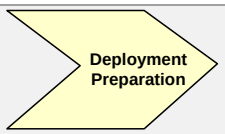
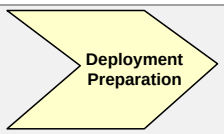


Table A.6-1. Deployment Preparation Tasks and Work Products

Task	Work Product Options	Description
		team – to determine the impact of installing those elements in the actual operations environment. Depending on risk and impact, operations engineering may be performed in an operations staging or operations test environment rather than in the actual production environment. The objective is to identify the needs for additional operations components or changes to existing components, ensure that installing the new components or making configuration changes does not cause regression faults in the operations environment, and determine how best to install the new system element(s).
Develop Installation Requirements	Installation Requirements Document (section of the SRS)	The Installation Requirements Document specifies all procedural and technical configuration requirements for the installation of new system elements into the production environment.
Document Operations Configurations	Component Configuration Files and Procedures	Component Configuration Files and Procedures define the specific configuration settings required to install the component in the operations environment. This information can be captured via documents or as comments within the configuration files for specific system components.
Update BOM	BOM Document	The BOM Document lists the specific components that must be purchased for a system. It identifies each component by model number, number of units, unit cost, and any other information necessary to identify the component and its cost. As part of deployment preparation, the BOM should be finalized based on the outcomes of all other operations engineering activities.



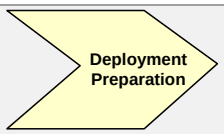
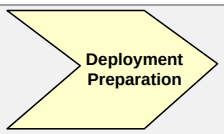


Table A.6-1. Deployment Preparation Tasks and Work Products

Task	Work Product Options	Description
	- Prepare for Installation -	
Develop Installation/Rollback Procedures	Installation Procedures Document	The Installation Procedures Document specifies how to install new system elements into the operations environment. It should: • specify any additions or changes required to prepare the operations environment; • explain how to install the new component(s); • describe how to determine that the installation was successful and did not adversely impact the operations environment; and • provide a procedure to roll-back the operations environment to the installation starting point should the installation fail or adversely impact operations in any way.
Develop Request For Changes (RFCs)/Request for Work (RFW)	RFC and RFW Forms	NARA's IT operations support organization requires that RFCs/RFWs Forms be completed for all proposed changes to the operations environment.
Perform Data Conversions	Staged Data Sets and/or Initialized Data Stores	Staged Data Sets and/or Initialized Data Stores result from the data conversion activity that transforms data into system required formats, inputs data into the appropriate system elements, and verifies that the converted data is correct and ready for use.
Collect/analyze Initial System performance Measure (SPM) & Technical performance Measure	SPM & TPM Reports	These reports are used to assess the initial performance of the installed system. On successful installation of the system, it may be necessary, in some cases, to review how the system is performing in the operations environment and whether or not the



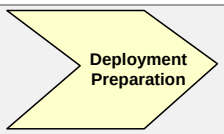
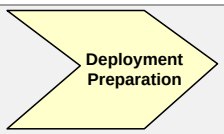


Table A.6-1. Deployment Preparation Tasks and Work Products

Task	Work Product Options	Description
(TPM) Data		instrumentation of the system elements can successfully capture, collect, and persist SPM and TPM data.
Validate System	System Validation Report Document	The System Validation Report Document consolidates all validation results into a comprehensive view of the system's validation process and outcomes - and summarizes the overall results of the validation and acceptance process for management review. Validation (sometimes called user acceptance), determines if the system, as installed and operating, meets the needs of the business as defined by the system validation criteria.
- Prepare for Operations, Training, & Rollout -		
Develop Standard Operation Procedures (SOPs)	SOP Documents	SOP Documents describe all procedures used to operate the system in the production environment.
Develop Maintenance Procedures	Maintenance Procedure Documents	Maintenance Procedure Documents describe the approach and schedule for maintaining the system. They address maintenance scheduling, technology refresh, and staffing and training considerations applicable to sustaining system capabilities.
Develop Rollout Plan	Rollout Plan Document	The Rollout Plan Document describes the approach and schedule for deploying the system to the production environment. Often, a number of pilot installations are implemented prior to full-scale rollout. The rollout plan is used to integrate installation, operations preparation, training, and business integration activities within and across business and technical organizations and facilities.



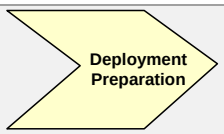
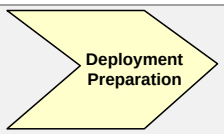


Table A.6-1. Deployment Preparation Tasks and Work Products

Task	Work Product Options	Description
Perform Operator/Maintainer Training	Training Schedules and Training Completion Form	Training Schedules and Training Completion Forms are usually necessary to establish schedules for all required training, identify when trainees are scheduled to complete their training, and document that training has been successfully completed as required for each trainee.
Install/Validate System Pilot(s)	Installed System	An installed system is the newly built system installed and operating in the production environment. Typically, systems having any degree of technical complexity or business impact will be installed as a pilot for a selected set of users prior to full-scale rollout. This allows the technical, operational, and business elements of the system to be reviewed in production prior to full-scale deployment.
Update Inventory/Property Systems	Inventory and Property System (asset management) Data Updates	All new assets acquired according to the BOM for the system must be entered into NARA inventory and asset management systems.
- Manage Requirements -		
Update Requirements Verification and Traceability Matrix (RVTM)	RVTM	The RVTM is a matrix cross-referencing all system requirements to their parent stakeholder requirement, their decomposed child requirements, and the validation / verification criteria for each requirement. As the system of interest progresses through the lifecycle, the RVTM will also identify the functional and technical elements to which the requirements are allocated in the design. The RVTM is the primary work product used in requirements management and is typically generated from a requirements management tool/database for all but the smallest systems.



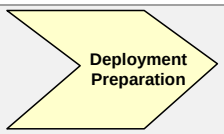
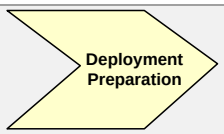


Table A.6-1. Deployment Preparation Tasks and Work Products

Task	Work Product Options	Description
Track Requirements Changes	System Requirements Specification (SRS) and RVTM	All additions, changes, and deletions of requirements must be tracked, managed, and reported via the SRS and the RVTM.
- Manage Project -		
Obtain Authority to Operate (ATO)	ATO Document	An ATO Document authorizes the deployment of the system to production operations once the validation process is complete and the validation report is documented,. In some cases, and interim ATO may be granted until the Pilot installation(s) is successfully completed.
Documents C&A and Update SSP	SRS/RVTM Extract	Verification and validation information can be extracted from the respective reports for C&C and SSP purposes. Verification of all information assurance requirements is part of the overall system verification and validation process.
Update Business Case	Updated Full Lifecycle Cost/Benefit Model, Project Plan, Concept documents, Acquisition Plan	These work products consists of revised cost models, updated CBA, and re-validated ROI estimates as a result of better understanding of actual system costs for deployment. They also include/reference any updates to the system concept, project concept or acquisition approach.
Provide Project Status Reports/EVA	Project Status Reports	This work product consists of reports of project status, using any format appropriate to reporting progress and status for a project, according to the needs of the project manager.
	CPIC Quad Charts	This work product consists of reports summarizing project cost schedule, issues, and risks, using NARA's standard report



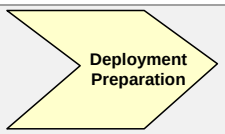


Table A.6-1. Deployment Preparation Tasks and Work Products

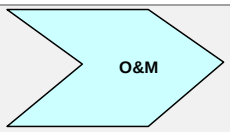
Task	Work Product Options	Description
		format for project review meetings.
Update Mgmt. Plans/Work Breakdown Structure (WBS)	Project Management Plan, Risk Management Plan, Configuration Management Plan, Quality Assurance Plan, WBS	All of the baseline project management documents (as defined by the project concept activities) must be updated and maintained throughout the system development lifecycle.
Manage Baselines	CM Reports	This work product consists of any and all working reports required by a project to track and manage versions and baselines of system elements and work products.
Submit Records Schedule	NARA Records Schedule	The NARA Records Schedule is the standards form for a NARA Records Schedule, conforming to records management requirements, as appropriate to the system.
Document Lessons Learned (Post Implementation Review [PIR])	CPIC PIR Report	The CPIC PIR Report is the standard PIR form used to capture and review lessons learned from the project.
Obtain Service Contracts	Various Acquisition Documents	This work product consists of the SOW, RFP, and TDL documentation typically associated with federal contracts.

A.7 Operations and Maintenance

The purpose of the *Operations and Maintenance* activity is to use the system in production operations and sustain the system's capabilities. Operations and Maintenance (O&M) uses the system to deliver its intended benefits, and ensures that the system's services and capabilities are maintained throughout its useful lifecycle. The expected outcomes of operations and maintenance include:

- Completing the rollout of the system;
- Using, monitoring, and evaluating the system's operating capabilities;
- Supporting and maintaining the system's services and capabilities until it is retired; and
- Ensuring that the system maintains an annual ATO.

Table A.7-1 below lists the specific tasks that comprise the operations and maintenance activity, and briefly describes the corresponding work products that are produced. Projects managers and lead system engineers select the appropriate operations and maintenance tasks and work products when they tailor the SDLC to their specific project needs. NARA's SDLC provides templates for some of the more common work products and, in many cases, work product templates can be found online through vendors, system integrators, or professional associations. When available, templates describe the content of the work products in much greater detail.



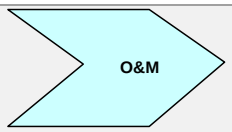
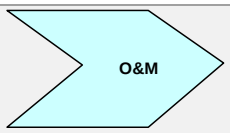


Table A.7-1. Operations and Maintenance Tasks and Work Products

Task	Work Product Options	Description
	- Use / Monitor System -	
Rollout System	Installation Tracking Reports	Installation Tracking Reports can be structured according to the needs of the IT operations group. They are intended to provide management summaries of the status, completeness, efficiency, and effectiveness of the system rollout. They should address both technical and management considerations.
Refine SOPs	SOP Documents	SOP Documents must be updated whenever procedures used to operate the system in the production environment are added, changed, or deleted.



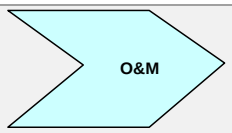
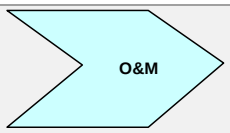


Table A.7-1. Operations and Maintenance Tasks and Work Products

Task	Work Product Options	Description
Collect/analyze Business Performance Measure (BPM) Data	BPM Reports	BPM Reports document operating results against the metrics established during the concept development stage to determine if the system meets business needs. These metrics will typically align to, and support, the agency's annual performance management processes.
Collect/analyze SPM & TPM Data	SPM & TPM Reports	SPM & TPM Reports document operating results against the metrics established to determine if the system is performing in accordance with prescribed performance baselines.
Identify & Resolve Faults	System Alerts and Alarms	Alerts and alarms typically result from instrumentation established within the system, and are based on thresholds or boundary conditions established by TPMs for discrete system components.
Manage Alerts/Alarms	Typical mechanisms include: email, pages, phone calls, web sites, automated maintenance routines.	Operations technicians can be dispatched to address operations problems according to the SOPs established for the system by IT operations.
Document Operations Reports	Operations Management Reports	Operations Management Reports can be structured according to the needs of the IT operations group. They are intended to provide management summaries that consolidate, analyze, and review the overall health of the system in production operations. The reports should address risks and issues, and make recommendations about changes that can improve the operation of the system. They should also anticipate and prescribe maintenance actions required to ensure operational stability.
Document Operations	Operations Analysis Reports	Operations Analysis Reports refer



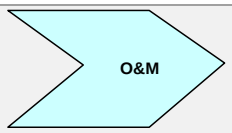
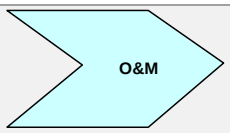


Table A.7-1. Operations and Maintenance Tasks and Work Products

Task	Work Product Options	Description
Analyses		specifically to the operations analysis prescribed by E-53 guidance. The information in this report is derived from the primary O&M data sources listed above and can be placed into any format required by OMB.
Safeguard/Archive Records	Stored Records Sets	Any records created must be stored / archived as appropriate according to the records schedule(s) established for the system.
- Maintain System / Application -		
Develop Engineering Change Requests (ECRs)	ECR Documents or Forms	This documentation identifies the changes requested to the system. Changes can be requested to fix bugs, add or change functionality, improve performance, change configurations, expand deployment, incorporate new technology, or address any other any operational need identified for the system.
Install/Validate Upgrades	Upgrade Validation Reports	These reports can be stand-alone reports validating specific system upgrades - or updates to the overall validation report for the system. The intent is to determine if the system update, as installed and operating, meets the needs of the business as defined by the system validation criteria established for that update.
Produce CM Reports	CM Reports	Any and all working reports required by a project to track and manage versions and baselines of system elements and work products as deployed to production.
Update Inventory/Property Systems	Inventory and Property System (asset management) Data Updates	All asset changes to the system must be entered into NARA inventory and asset management systems.



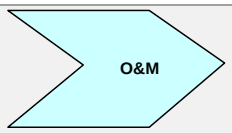


Table A.7-1. Operations and Maintenance Tasks and Work Products

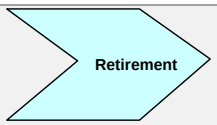
Task	Work Product Options	Description
Obtain Annual Authority to Operate (ATO)	ATO Document	Systems should be continuously monitored and ATO documentation updated and re-issued annually, in accordance with NIST guidelines.
Develop Disposal Plan	Disposal Plan Document	The Disposal Plan Document describes the methods, approach, schedule, and resources to be used to dispose of all system elements when the system is retired from production operations. The Plan addresses how hardware and software assets will be removed, how data and storage media will be protected and appropriately disposed of, and how records will be preserved.
Develop SOW/RFP/TDLs	Various Acquisition Documents	SOW, RFP, and TDL documentation typically associated with federal contracts or service agreements must be updated as necessary throughout the operational lifetime of the system.

A.8 Retirement

The purpose of the *Retirement* activity is to end the existence of a system. Retirement deactivates, disassembles, and removes all elements of a system from the operating environment. Retirement also ensures that all records, data, media, and removed system elements are disposed of and safeguarded in accordance with applicable laws, regulations, and policies. The expected outcomes of retirement include:

- Ensuring that all system elements are disposed of; and
- Verifying and documenting that the disposal complies with all applicable laws, regulations, and policies.

Table A.8-1 below lists the specific tasks that comprise the retirement activity, and briefly describes the corresponding work products that are produced. Projects managers and lead system engineers select the appropriate retirement tasks and work products when they tailor the SDLC to their specific project needs. NARA's SDLC provides templates for some of the more common work products and, in many cases, work product templates can be found online through vendors, system integrators, or professional associations. When available, templates describe the content of the work products in much greater detail.



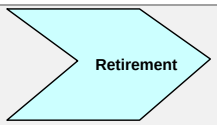
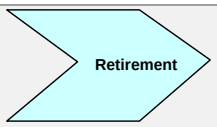


Table A.8-1. Retirement Tasks and Work Products

Task	Work Product Options	Description
	- Dispose of System -	
Perform Disposal Impact Analyses	Disposal Impact Assessment Document	The Disposal Impact Assessment Document describes the impact of removing all system elements, SOPs, data, and media from production operations. The document identifies any changes that are required to existing components, interfaces, or procedures that result from retiring the system. Performing and documenting the impact helps ensure that retiring the system does not cause regression faults in the operations environment.
Dispose of System Elements	Work products will vary depending on the system.	Work products generally fall into the categories of hardware, software, SOPs, contract terminations, and data/media. System elements are removed from operations and disposed of in accordance with all applicable, laws, regulations, and



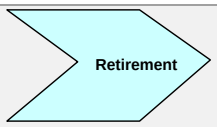


Table A.8-1. Retirement Tasks and Work Products

Task	Work Product Options	Description
		policies.
Safeguard/Archive Records	Stored Records Sets	Any records created must be stored / archived as appropriate, according to the records schedule(s) established for the system.
Update Inventory/Property Systems	Inventory and Property System (asset management) Data Updates	The removal of any and all assets associated with the system must be reflected in NARA's inventory and asset management systems.
- Verify Disposal -		
Verify Information Assurance Controls & Provide Information Assurance Report	Information Assurance System Disposal Report (or an Information Assurance section of the System Closeout Report).	The Information Assurance System Disposal Report documents that all system elements and components are disposed of in accordance with applicable laws, regulations, and policies.
Verify Data/Media Disposal & Provide Data/Media Disposal Verification Report	Data and Media Disposal Report (or a Data & Media section of the System Closeout Report).	The Data and Media Disposal Report documents that all data and media are disposed of in accordance with applicable laws, regulations, and policies. Documentation of data and media disposal is essential for all systems that handle sensitive information (e.g., classified, archival, PII, financial).
Document System Closeout Report	System Closeout Report Document	The System Closeout Report Document provides a management review and summary of all disposal activities and outcomes for a system of interest. The report addresses all organizational perspectives including Business, EA, CPIC, Information Assurance, Records Management, IT Operations, and Project Management.

Appendix B – SDLC Work Stream Templates

NARA's SDLC pre-defines seven work streams options that support the types of systems typically implemented at NARA. The work streams fall into two main categories: (1) business application work streams; and (2) IT infrastructure service work streams. The seven work streams provided in this appendix are color coded to match their descriptions in *Table 4.3.1-1* above. Work stream templates guide and facilitate the tailoring of the SDLC. The subsequent sections of this appendix define detailed work stream templates that can be used as a starting point for tailoring project tasks and their sequencing.

Project managers and lead system engineers can use the work stream templates to identify tasks and work products that are appropriate to their specific system and project needs. Tasks can be added, changed, deleted, or reordered depending of the nature of the system and the needs of the project. However, justification should be provided when tailoring out tasks; i.e., it is acceptable to make a determination that a specific task is not necessary as long as it is justifiable. Work stream tailoring is a prerequisite for developing the WBS of a project and estimating its cost. Using the work stream templates to think through all aspects of the full system life cycle at the onset of a project can greatly improve the accuracy of project plans, schedules, and cost analyses by helping to identify all necessary work activities.

It is important to note that the tasks defined in the work stream templates can be reordered and repeated as required by a project. Although the templates are presented in a sequential, waterfall, framework, they are not meant to imply a waterfall approach to system implementation. Most projects will adopt iterative, incremental, and concurrent system engineering approaches – or combinations thereof. Incremental and iterative approaches use SDLC activities (e.g., Requirements Analysis, Design, and Development) multiple times to gradually evolve the capabilities of a system over a number of increments (or iterations) – with each increment adding additional capabilities to the system. Concurrent approaches use SDLC activities at the same time, in an overlapping manner, for different elements of a system. Projects are free to select the approach that best suits their needs and should tailor the work streams accordingly.

B.1 New Custom Developed or COTS Application Work Stream Template

New Custom Developed or COTS Application Work Stream – SDLC Work Activities				
Business Needs Analysis	**Concept**	**Requirements Analysis / Design**	**Development / Deployment Preparation**	**O&M / Retirement**
<----------Optional Iteration---------->				
♦ Approval to Plan Project	♦ Approval to Design System	♦ Approval to Develop System	♦ Approval to Install & Operate System	♦ System Disposal
Activities Required for all New Custom Developed or COTS Application Projects				
Summarize Need • Identify Business Sponsor • Validate System Need • Assess EA Impact • Document Business Needs Summary • Obtain ARB Approval *Analyze Need* • Estimate Budget Needs • Identify Funding Source & Specify Funding Constraints • Define Initiative Activities & Timeframes • Identify Strategic Goals or LRPTs Supported • Identify Business Processes Supported • Define Measures of Success	*Develop System Concept* • Develop CONOPS • Define Stakeholder Requirements • Document Validation Criteria • Document Initial RVTM • Develop System Architecture Concept • Develop Software Architecture Concept • Perform Preliminary Information Assurance Assessment • Perform Market Surveys *Develop Project Concept* • Tailor SDLC and Define Software Development Approach (Waterfall,	*Develop Functional Specifications* • Identify & Define System Functions • Describe System Functions • Define Functional Interfaces • Develop CDM with Information Assurance Attributes • Define Information Flows • Develop Use Cases • Define System Performance Measures (SPMs) • Update Stakeholder Requirements • Define Functional Requirements *Define Non-functional Requirements*	*Develop System Configuration Items* • Build System Elements • Document System Elements • Develop Integration Procedures • Integrate System Elements • Develop ICDs • Develop PDM • Develop Data Conversion Routines • Verify System Elements • Document Verification Report • Develop Initial Operator/Maintainer Training Materials	*Use System* • Rollout System • Monitor System • Identify & Resolve Faults • Manage Alerts/Alarms *Maintain System / Application* • Develop ECRs • Install/Validate Upgrades • Produce CM Reports • Update Inventory/Property Systems • Obtain Annual ATO • Develop Disposal Plan • Develop

New Custom Developed or COTS Application Work Stream – SDLC Work Activities

Business Needs Analysis	Concept	Requirements Analysis / Design	Development / Deployment Preparation	O&M / Retirement
		<---------- *Optional Iteration*---------->		
♦ Approval to Plan Project	♦ Approval to Design System	♦ Approval to Develop System	♦ Approval to Install & Operate System	♦ System Disposal
• Define Risks & Opportunities Being Addressed • Document Business Needs Analysis • Assign a Project Manager	Incremental, Lean, Agile) • Develop Project Management Plan (PMP) including WBS & Schedule • Develop Project Risk Management Plan *Verify EA Conformance* • Perform EA Impact Analysis • Develop EA CRs *Develop Business Case* • Define Resource Needs • Define Staffing Needs • Perform CBA • Define Business Performance Measures • Document CPIC Business Case *Determine Acquisition Approach* • Identify Source Selection Authority • Develop SOW/RFP/TDLs	• Define Information Assurance Requirements including Records Management, Security, Privacy, Business Continuity, Compliance & Audit, Title 13, HIPAA • Define Training Requirements • Define O&M Requirements • Define Deployment Requirements • Define Disposal Rqmts. • Identify Constraints on Design *Manage Requirements* • Track Requirements Changes • Define Verification Criteria • Update the RVTM *Design System* • Define System Architecture • Perform Fit/Gap Analyses (if	• Resolve Fit/gap issues *Manage Requirements* • Update RTVM • Track requirements Changes *Perform Operations Engineering* • Perform Operations Impact Analyses • Develop Installation Requirements • Document Operations Configurations • Develop BOM *Prepare for Installation* • Develop Installation / Rollback Procedures • Develop RFCs/RFWs • Perform Data Conversions • Validate System	SOW/RFP/TDLs

New Custom Developed or COTS Application Work Stream – SDLC Work Activities				
Business Needs Analysis	**Concept**	**Requirements Analysis / Design**	**Development / Deployment Preparation**	**O&M / Retirement**
		<---------- ***Optional Iteration***---------->		
	♦ **Approval to Plan Project**	♦ **Approval to Design System**	♦ **Approval to Develop System**	♦ **Approval to Install & Operate System** ♦ **System Disposal**
		integrating COTS) • Remediate Gaps (if integrating COTS) • Specify Interface Rqmts. • Design Interfaces • Specify System Elements • Allocate Requirements to System Elements • Define System Behavior & Control Flows • Define TPMs • Design SW • Develop Deployment Designs • Develop Operations Designs • Develop LDM • Update CDM with Information Assurance Attributes • Define Development Plan • Define Integration Plan • Define Verification Plan *Manage Project* • Update Mgmt. Plans/WBS • Provide Project Status	*Prepare for Operations, Training, & Rollout* • Develop Rollout Plan • Perform Operator / Maintainer Training • Install/Validate System Pilot(s) • Update Inventory / Property Systems *Manage Project* • Provide Project Status Reports • Update Mgmt. Plans/WBS • Update SSP • Manage Baselines • Develop SOW/RFP/TDLs • Obtain ATO • Document C&A and Update SSP • Update Business Case	

New Custom Developed or COTS Application Work Stream – SDLC Work Activities

Business Needs Analysis	Concept	Requirements Analysis / Design	Development / Deployment Preparation	O&M / Retirement
		<---------- *Optional Iteration*---------->		
		♦ Approval to Plan Project	♦ Approval to Design System	♦ Approval to Develop System
			♦ Approval to Install & Operate System	♦ System Disposal
		Reports • Document Initial SSP • Manage Baselines • Update the Business Case Upon Completion of Design • Develop SOW/RFP/TDLs	• Submit Records Schedule • Document Lessons Learned (PIR) • Obtain Service Contracts	
Additional Activities Required for Projects of Medium or High Complexity				
	Develop System Concept • Perform BPAs • Perform Proof of Concept Analyses • Perform Initial Fit/Gap Analysis (if integrating COTS) • Define Iteration Approach • Develop Concepts of Deployment & Support • Develop COTS Refresh Concept (if integrating COTS) *Develop Project Concept* • Document IPT Charter • Develop CM Plan/Repository • Develop QA Plan	*Perform Design Analyses* • Develop Models & Prototypes • Perform Trade Studies *Design System* • Develop Integration Plan • Develop Verification Plan *Manage Project* • Define/Schedule Increments • Perform EVA • Develop WBS Tasks, Validation Reviews, and Governance Reviews for Increments	*Develop System Configuration Items* • Provision the Development and Verification Environments *Prepare for Operations, Training, & Rollout* • Develop SOPs • Develop Maintenance Procedures • Develop Contingency Plan • Collect/analyze Initial SPM & TPM Data	*Use System* • Refine SOPs • Collect/analyze Business Performance Measure (BPM) Data • Collect/analyze SPM Data • Collect/analyze TPM Data • Document Operations Reports • Document Operations Analyses

New Custom Developed or COTS Application Work Stream – SDLC Work Activities				
Business Needs Analysis	**Concept**	**Requirements Analysis / Design**	**Development / Deployment Preparation**	**O&M / Retirement**
		<---------- Optional Iteration---------->		
	♦ **Approval to Plan Project**	♦ **Approval to Design System**	♦ **Approval to Develop System**	♦ **Approval to Install & Operate System** ♦ **System Disposal**
	Develop Business Case • Perform Analysis of Alternatives (AoA) *Determine Acquisition Approach* • Develop Acquisition Plan		• Provide Operator/Maintainer Training *Manage Project* • Manage Increments • Perform EVA • Manage Validation Reviews and Governance Reviews for Increments	
Additional Activities Required for Projects with High Information Assurance Risk				
	• Develop Concepts of Deployment & Support • Develop IV&V Plan	• Review Concepts of Deployment & Support • Review Validation Criteria • IV&V Verification Plan • IV&V Information Assurance Requirements • IV&V Updated Business Case • IV&V Gap Remediation Plan (if integrating COTS)	• IV&V Verification & Validation Reports • IV&V Operational Readiness • IV&V Information Assurance Requirements • IV&V Updated Business Case	• Safeguard/Archive Records • IV&V Inventory / Property System Updates • IV&V Security/Privacy Verification Report

B.2 New SaaS Application Work Stream Template

New SaaS Application Work Stream – SDLC Work Activities					
Business Needs Analysis	**Concept**	**Requirements Analysis / Design**	**Development / Deployment Preparation**	**O&M / Retirement**	
		<---------- *Optional Iteration*---------->			
		♦	♦	♦	♦
	Approval to Plan Project	**Approval to Design System**	**Approval to Develop System**	**Approval to Install & Operate System**	**System Disposal**
Activities Required for all New SaaS Application Projects					
Summarize Need • Identify Business Sponsor • Validate System Need • Assess EA Impact • Document Business Needs Summary • Obtain ARB Approval *Analyze Need* • Estimate Budget Needs • Identify Funding Source & Specify Funding Constraints • Define Initiative Activities & Timeframes • Identify Strategic Goals or LRPTs Supported • Identify Business Processes Supported • Define Measures of Success	*Develop System Concept* • Develop CONOPS • Identify & Characterize Use Cases • Define Stakeholder Requirements • Perform Preliminary Information Assurance Assessment • Perform Market Surveys • Develop System Architecture Concept • Develop Service Exit Strategy • Define Business Performance Measures • Document Validation Criteria • Document Initial RVTM	*Develop Functional Specifications* • Develop Use Cases • Define Data Management & Data Conversion Requirements • Define System Performance Measures (SPMs) *Define Non-functional Requirements* • Define Information Assurance Requirements including Records Management, Security, Privacy, Business Continuity, Compliance & Audit, Title 13, HIPAA • Define End-User Training Requirements	*Develop System Configuration Items* • Develop Data Management / Conversion Procedures • Develop End-User Training *Manage Requirements* • Update RTVM • Track requirements Changes *Prepare for Installation* • Initialize Service • Perform Data Conversions • Validate System • Train End-Users	*Use System* • Provision Service • Provide End-User Training • Monitor SLA's • Collect/analyze Business Performance Measure (BPM) Data • Obtain Annual ATO *Dispose of System* • Develop Service Termination Plan • Terminate Service • Archive Records • Dispose of Data/Media *Verify Disposal* • Verify Information Assurance

New SaaS Application Work Stream – SDLC Work Activities

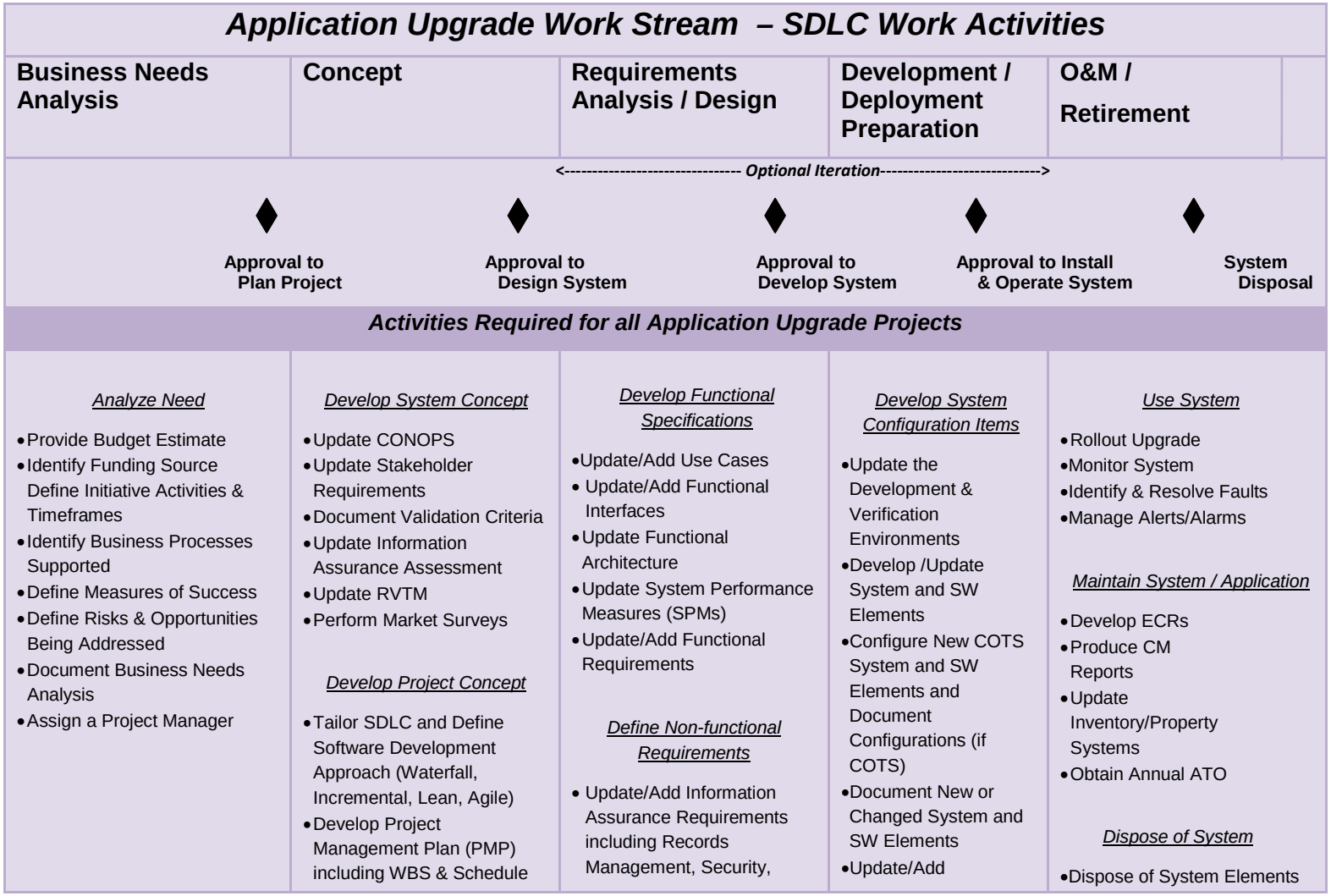
Business Needs Analysis	Concept	Requirements Analysis / Design	Development / Deployment Preparation	O&M / Retirement
		<---------- *Optional Iteration*---------->		
♦ Approval to Plan Project	♦ Approval to Design System	♦ Approval to Develop System	♦ Approval to Install & Operate System	♦ System Disposal
• Define Risks & Opportunities Being Addressed • Document Business Needs Analysis • Assign a Project Manager	*Develop Project Concept* • Tailor SDLC • Develop Project Management Plan (PMP) including WBS & Schedule • Develop Project Risk Management Plan *Verify EA Conformance* • Perform EA Impact Analysis • Develop EA CRs *Develop Business Case* • Define Resource Needs • Define Staffing Needs • Perform CBA • Define Business Performance Measures • Perform Analysis of Alternatives (AoA) • Document CPIC Business Case *Determine Acquisition*	• Identify Constraints on Design *Manage Requirements* • Track Requirements Changes • Update the RVTM *Design System* • Define System Architecture • Perform Fit/Gap Analyses • Align SLAs to SPMs • Define CDM with Information Assurance Attributes • Perform Operations Impact Analyses *Manage Project* • Update Mgmt. Plans/WBS • Provide Project Status Reports • Document Initial SSP • Update the Business Case	*Manage Project* • Provide Project Status Reports • Update Mgmt. Plans/WBS • Update SSP • Obtain ATO • Update Business Case • Submit Records Schedule • Document Lessons Learned (PIR)	Controls & Provide Information Assurance Report • Verify Data/Media Disposal & Provide Data/Media Disposal Verification Report • Document System Closeout Report

New SaaS Application Work Stream – SDLC Work Activities

Business Needs Analysis	Concept	Requirements Analysis / Design	Development / Deployment Preparation	O&M / Retirement
	<---------- *Optional Iteration*---------->			
	♦ Approval to Plan Project	♦ Approval to Design System	♦ Approval to Develop System	♦ Approval to Install & Operate System ♦ System Disposal
	Approach •Identify Source Selection Authority •Develop SOW/RFP/TDLs	•Develop SOW/RFP/TDLs		
Additional Activities Required for Projects of Medium or High Complexity				
	Develop System Concept •Perform BPAs •Perform Proof of Concept Analyses •Define Iteration Approach •Develop Concepts of Deployment & Support *Develop Project Concept* •Document IPT Charter •Develop CM Plan/Repository •Develop QA Plan *Determine Acquisition Approach* •Develop Acquisition Plan	*Define Non-functional Requirements* • Specify Interface Rqmts. • Define O&M Requirements • Define Deployment Requirements • Define Verification Criteria *Perform Design Analyses* •Develop Prototypes •Perform Trade Studies *Design System* • Design Interfaces •Develop Integration Plan •Develop Verification Plan	*Develop System Configuration Items* •Specify BOM *Prepare for Operations, Training, & Rollout* •Develop Contingency Plans •Collect/Analyze Initial SLA data *Manage Project* •Manage Increments •Perform EVA •Manage Validation Reviews and	*Use System* •Update SLAs •Identify & Resolve Faults •Manage Alerts/Alarms *Dispose of System* • Perform Disposal Impact Analyses

New SaaS Application Work Stream – SDLC Work Activities					
Business Needs Analysis	**Concept**	**Requirements Analysis / Design**	**Development / Deployment Preparation**	**O&M / Retirement**	
		<---------- ***Optional Iteration***---------->			
	♦ **Approval to Plan Project**	♦ **Approval to Design System**	♦ **Approval to Develop System**	♦ **Approval to Install & Operate System**	♦ **System Disposal**
		Manage Project • Define/Schedule Increments • Perform EVA • Develop WBS Tasks, Validation Reviews, and Governance Reviews for Increments • Manage Baselines	Governance Reviews for Increments • Manage Baselines		
Additional Activities Required for Projects with High Information Assurance Risk					
	• Develop Concepts of Deployment & Support • Develop IV&V Plan	• Review Concepts of Deployment & Support • Review Validation Criteria • IV&V Information Assurance Requirements • IV&V Updated Business Case	• IV&V Verification & Validation Reports • IV&V Information Assurance Requirements • IV&V Updated Business Case	• Safeguard/Archive Records • IV&V Disposal Plan • IV&V Security/Privacy Verification Report • IV&V Data/Media Disposal Verification Report	

B.3 Application Upgrade Work Stream Template



Application Upgrade Work Stream – SDLC Work Activities				
Business Needs Analysis	**Concept**	**Requirements Analysis / Design**	**Development / Deployment Preparation**	**O&M / Retirement**
<-------- *Optional Iteration*-------->				
♦ **Approval to Plan Project**	♦ **Approval to Design System**	♦ **Approval to Develop System**	♦ **Approval to Install & Operate System**	♦ **System Disposal**
Activities Required for all Application Upgrade Projects				
Analyze Need • Provide Budget Estimate • Identify Funding Source Define Initiative Activities & Timeframes • Identify Business Processes Supported • Define Measures of Success • Define Risks & Opportunities Being Addressed • Document Business Needs Analysis • Assign a Project Manager	*Develop System Concept* • Update CONOPS • Update Stakeholder Requirements • Document Validation Criteria • Update Information Assurance Assessment • Update RVTM • Perform Market Surveys *Develop Project Concept* • Tailor SDLC and Define Software Development Approach (Waterfall, Incremental, Lean, Agile) • Develop Project Management Plan (PMP) including WBS & Schedule	*Develop Functional Specifications* • Update/Add Use Cases • Update/Add Functional Interfaces • Update Functional Architecture • Update System Performance Measures (SPMs) • Update/Add Functional Requirements *Define Non-functional Requirements* • Update/Add Information Assurance Requirements including Records Management, Security,	*Develop System Configuration Items* • Update the Development & Verification Environments • Develop /Update System and SW Elements • Configure New COTS System and SW Elements and Document Configurations (if COTS) • Document New or Changed System and SW Elements • Update/Add	*Use System* • Rollout Upgrade • Monitor System • Identify & Resolve Faults • Manage Alerts/Alarms *Maintain System / Application* • Develop ECRs • Produce CM Reports • Update Inventory/Property Systems • Obtain Annual ATO *Dispose of System* • Dispose of System Elements

Application Upgrade Work Stream – SDLC Work Activities

Business Needs Analysis	Concept	Requirements Analysis / Design	Development / Deployment Preparation	O&M / Retirement
	<---------- *Optional Iteration*---------->			
	♦ Approval to Plan Project	♦ Approval to Design System	♦ Approval to Develop System	♦ Approval to Install & Operate System ♦ System Disposal
	• Update Risk Management Plan *Verify EA Conformance* • Perform EA Impact Analysis • Develop EA CRs *Develop Business Case* • Define Resource Needs • Define Staffing Needs • Perform CBA • Update Business Performance Measures • Document CPIC Business Case *Determine Acquisition Approach* • Identify Source Selection Authority • Develop SOW/RFP/TDLs	Privacy, Business Continuity, Compliance & Audit, Title 13, HIPAA • Update Training Requirements • Update/Add O&M Requirements • Update/Add Deployment Requirements • Update/Add Constraints on Design *Manage Requirements* • Track Requirements Changes • Update/Add Verification Criteria • Update the RVTM *Design System* • Update System Architecture • Update Software Architecture • Assess Development Environment	Integration Procedures • Integrate System Elements • Develop/Add ICDs New/Changed Interfaces • Update PDM • Update/Add Data Conversion Routines • Verify System Elements/ Regression Test • Document Verification Report • Update Operator/Maint. Training Materials • Resolve Fit/gap issues • Perform Disposal Impact Analysis (if retiring system) • Develop Disposal Plan (if retiring system)	• Update Inventory/Property Systems *Verify Disposal* • Verify Information Assurance Controls & Provide Information Assurance Report • Verify Data/Media Disposal & Provide Data/Media Disposal Verification Report • Document System Closeout Report

Application Upgrade Work Stream – SDLC Work Activities

Business Needs Analysis	Concept	Requirements Analysis / Design	Development / Deployment Preparation	O&M / Retirement	
		<---------- *Optional Iteration*---------->			
		♦ Approval to Plan Project	♦ Approval to Design System	♦ Approval to Develop System	♦ Approval to Install & Operate System ♦ System Disposal
		• Perform Fit/Gap Analyses (if integrating COTS) • Remediate Gaps (if integrating COTS) • Specify Interface Rqmts. • Update/Add Interface Designs • Update System Element Specifications • Allocate New Requirements to System Elements • Update/Add System Behavior & Control Flows • Update/Add TPMs • Update/Add SW Element Designs • Update LDM • Update CDM with Information Assurance Attributes *Manage Project* • Provide Project Status Reports • Update Mgmt. Plans/WBS • Update SSP • Manage Baselines	*Manage Requirements* • Track requirements Changes • Update RTVM *Perform Operations Engineering* • Perform Operations Impact Analyses • Develop Upgrade Installation Requirements • Specify Operations Configurations for Upgrade • Develop BOM *Prepare for Installation* • Develop Installation / Rollback Procedures • Develop RFCs/RFWs • Perform Data Conversions • Validate System Upgrade *Prepare for Operations, Training,*		

Application Upgrade Work Stream – SDLC Work Activities					
Business Needs Analysis	**Concept**	**Requirements Analysis / Design**	**Development / Deployment Preparation**	**O&M / Retirement**	
		<---------- ***Optional Iteration*** ---------->			
	♦ **Approval to Plan Project**	♦ **Approval to Design System**	♦ **Approval to Develop System**	♦ **Approval to Install & Operate System**	♦ **System Disposal**
		• Develop SOW/RFP/TDLs	*<u>& Rollout</u>* • Develop Rollout Plan • Perform Operator / Maintainer Training • Install/Validate Upgrade Pilot(s) • Update Inventory / Property Systems *<u>Manage Project</u>* • Provide Project Status Reports • Update Mgmt. Plans/WBS • Update SSP • Manage Baselines • Develop SOW/RFP/TDLs • Obtain ATO • Document C&A and Update SSP • Update Records Schedule • Document Lessons Learned (PIR)		

Application Upgrade Work Stream – SDLC Work Activities

Business Needs Analysis	Concept	Requirements Analysis / Design	Development / Deployment Preparation	O&M / Retirement
	<---------- *Optional Iteration*---------->			
	♦ Approval to Plan Project	♦ Approval to Design System	♦ Approval to Develop System	♦ Approval to Install & Operate System
				♦ System Disposal
Additional Activities Required for Projects of Medium or High Complexity				
	Develop System Concept • Perform BPAs • Perform Proof of Concept Analyses • Perform Initial Fit/Gap Analysis (if integrating new COTS elements) • Define Iteration Approach • Develop Concepts of Deployment & Support • Develop COTS Refresh Concept (if integrating new COTS) *Develop Project Concept* • Update CM Plan/Repository • Update QA Plan *Develop Business Case* • Perform Analysis of Alternatives (AoA)	*Perform Design Analyses* • Develop Models & Prototypes • Perform Trade Studies *Design System* • Develop Integration Plan • Develop Verification Plan • Develop Deployment Designs • Develop Operations Designs *Manage Project* • Define/Schedule Increments • Perform EVA • Develop WBS Tasks, Validation Reviews, and Governance Reviews for Increments	*Develop System Configuration Items* • Provision the Development and Verification Environments *Prepare for Operations, Training, & Rollout* • Update Operations Plan • Add/Update SOPs • Update Maintenance Procedures • Update Contingency Plan • Collect/analyze SPM & TPM Data • Provide Additional Operator/Maintainer Training	*Use System* • Refine SOPs • Collect/analyze Business Performance Measure (BPM) Data • Collect/analyze SPM Data • Collect/analyze TPM Data • Document Operations Reports • Document Operations Analyses *Dispose of System*

Application Upgrade Work Stream – SDLC Work Activities					
Business Needs Analysis	**Concept**	**Requirements Analysis / Design**	**Development / Deployment Preparation**	**O&M / Retirement**	
		<---------- ***Optional Iteration*** ---------->			
	♦ **Approval to Plan Project**	♦ **Approval to Design System**	♦ **Approval to Develop System**	♦ **Approval to Install & Operate System**	♦ **System Disposal**
	Determine Acquisition Approach •Develop Acquisition Plan		*Manage Project* •Manage Increments •Perform EVA •Manage Validation Reviews and Governance Reviews for Increments		
Additional Activities Required for Projects with High Information Assurance Risk					
	•Develop Concepts of Deployment & Support •Develop IV&V Plan	•Review Concepts of Deployment & Support •Review Validation Criteria •IV&V Verification Plan •IV&V Information Assurance Requirements •IV&V Gap Remediation Plan (if integrating new COTS)	•IV&V Verification & Validation Reports •IV&V Operational Readiness •IV&V Information Assurance Requirements	•Safeguard/Archive Records •IV&V Disposal Plan •IV&V Inventory / Property System Updates •IV&V Security/Privacy Verification Report •IV&V Data/Media Disposal Verification Report	

B.4 Application Maintenance Work Stream Template

Application Maintenance Work Stream – SDLC Work Activities					
Business Needs Analysis	**Concept**	**Requirements Analysis / Design**	**Development / Deployment Preparation**	**O&M / Retirement**	
		<---------- ***Optional Iteration*** ---------->			
	Approval to Plan Project	**Approval to Design System**	**Approval to Develop System**	**Approval to Install & Operate System**	**System Disposal**
Activities Required for all Application Maintenance Projects					
Analyze Need • Estimate Cost • Verify O&M Funding Availability	*Develop System Concept* • Update Stakeholder Requirements • Document Validation Criteria • Update Information Assurance Assessment • Update RVTM *Manage Project* • Tailor SDLC • Develop WBS & Schedule • Update Risk Management Plan • Develop TDLs	*Develop Functional Specifications* • Update/Add Use Cases • Update/Add Functional Requirements • Update System Performance Measures (SPMs) *Define Non-functional Requirements* • Update/Add Information Assurance Requirements including Records Management, Security, Privacy, Business Continuity, Compliance & Audit, Title 13, HIPAA • Update Training Requirements • Update/Add O&M	*Develop System Configuration Items* • Develop /Update System and SW Elements • Document New or Changed System and SW Elements • Integrate System Elements • Develop/Add ICDs New/Changed Interfaces • Update PDM • Update/Add Data Conversion Routines • Verify System Elements/ Regression Test Document Verification Report	*Use System* • Rollout Upgrade • Monitor System • Identify & Resolve Faults • Manage Alerts/Alarms *Maintain System / Application* • Develop ECRs • Produce CM Reports	

Application Maintenance Work Stream – SDLC Work Activities

Business Needs Analysis	Concept	Requirements Analysis / Design	Development / Deployment Preparation	O&M / Retirement	
		<---------- *Optional Iteration*---------->			
		♦ Approval to Plan Project	♦ Approval to Design System	♦ Approval to Develop System	♦ Approval to Install & Operate System ♦ System Disposal
		Requirements *Manage Requirements* •Track Requirements Changes •Update/Add Verification Criteria •Update the RVTM *Design System* • Update/Add Interface Designs • Update System Element Specifications • Update/Add SW Element Designs • Update/Add TPMs • Update LDM • Update CDM with Information Assurance Attributes *Manage Project* •Provide Project Status	*Manage Requirements* •Track requirements Changes •Update RTVM *Perform Operations Engineering* •Develop Upgrade Installation Requirements •Specify Operations Configurations for Upgrade *Prepare for Installation* •Develop Installation / Rollback Procedures •Develop RFCs/RFWs •Validate System Upgrade *Prepare for Operations, Training, & Rollout* •Develop Rollout Plan •Install/Validate		

Application Maintenance Work Stream – SDLC Work Activities					
Business Needs Analysis	**Concept**	**Requirements Analysis / Design**	**Development / Deployment Preparation**	**O&M / Retirement**	
		<---------- Optional Iteration ----------->			
	♦ **Approval to Plan Project**	♦ **Approval to Design System**	♦ **Approval to Develop System**	♦ **Approval to Install & Operate System**	♦ **System Disposal**
		Reports • Update WBS • Update SSP • Manage Baselines • Develop TDLs	Upgrade Pilot(s) *Manage Project* • Provide Project Status Reports • Update WBS • Update SSP • Manage Baselines • Develop TDLs • Update SSP		
Additional Activities Required for Projects of Medium or High Complexity					
	Develop Project Concept • Update CM Plan/Repository • Update QA Plan	*Perform Design Analyses* • Develop/Update Performance Models/Simulations *Design System* • Update Integration Plan • Update Verification Plan	*Develop System Configuration Items* • Provision the Development and Verification Environments *Prepare for Operations, Training,*	*Use System* • Refine SOPs • Collect/analyze Business Performance Measure (BPM) Data • Collect/analyze SPM Data • Collect/analyze TPM Data • Document Operations Reports • Document Operations	

Application Maintenance Work Stream – SDLC Work Activities

Business Needs Analysis	**Concept**	**Requirements Analysis / Design**	**Development / Deployment Preparation**	**O&M / Retirement**
		<---------- *Optional Iteration*---------->		
		♦ **Approval to Plan Project**	♦ **Approval to Design System**	♦ **Approval to Develop System** ♦ **Approval to Install & Operate System** ♦ **System Disposal**
			<u>& Rollout</u> •Add/Update SOPs •Update Maintenance Procedures •Update Contingency Plan •Collect/analyze SPM & TPM Data	Analyses
Additional Activities Required for Projects with High Information Assurance Risk				
	•Update Concepts of Deployment & Support •Update IV&V Plan	•Review Validation Criteria •IV&V Verification Plan •IV&V Information Assurance Requirements	•IV&V Verification & Validation Reports •IV&V Operational Readiness •IV&V Information Assurance Requirements	•Safeguard/Archive Records •IV&V Inventory / Property System Updates •IV&V Security/Privacy Verification Report

B.5 New IT Infrastructure Capability Work Stream Template

New IT Infrastructure Capability Work Stream – SDLC Work Activities					
Business Needs Analysis	**Concept**	**Requirements Analysis / Design**	**Development / Deployment Preparation**	**O&M / Retirement**	
		<---------- ***Optional Iteration*** ---------->			
	♦ **Approval to Plan Project**	♦ **Approval to Design System**	♦ **Approval to Develop System**	♦ **Approval to Install & Operate System**	♦ **System Disposal**
Activities Required for all New IT Infrastructure Capability Projects					
Summarize Need • Identify Business Sponsor • Validate System Need • Assess EA Impact • Document Business Needs Summary • Obtain ARB Approval *Analyze Need* • Estimate Budget Needs • Identify Funding Source & Specify Funding Constraints • Define Initiative Activities & Timeframes • Identify Strategic Goals or LRPTs Supported • Identify Business Processes Supported • Define Measures of Success	*Develop System Concept* • Develop CONOPS • Define Stakeholder Requirements • Document Validation Criteria • Document Initial RVTM • Develop System Architecture Concept • Perform Preliminary Information Assurance Assessment • Perform Market Surveys *Develop Project Concept* • Tailor SDLC • Develop Project Management Plan (PMP) including WBS & Schedule • Develop Project Risk	*Develop Functional Specifications* • Develop Use Cases • Define System Performance Measures (SPMs) • Develop Functional Requirements *Define Non-functional Requirements* • Define Information Assurance Requirements including Records Management, Security, Privacy, Business Continuity, Compliance & Audit, Title 13, HIPAA • Define Training Requirements • Define O&M Requirements	*Develop System Configuration Items* • Develop Integration Procedures • Integrate System Elements • Develop ICDs • Verify System Elements • Document Verification Report • Develop Initial Operator/ Maintainer Training Materials • Resolve Fit/gap issues *Manage Requirements* • Update RTVM • Track requirements	*Use System* • Rollout System • Monitor System • Identify & Resolve Faults • Manage Alerts/Alarms *Maintain System / Application* • Develop ECRs • Install/Validate Upgrades • Produce CM Reports • Update Inventory/Property Systems • Obtain Annual ATO	

New IT Infrastructure Capability Work Stream – SDLC Work Activities

Business Needs Analysis	Concept	Requirements Analysis / Design	Development / Deployment Preparation	O&M / Retirement	
<----------**Optional Iteration**---------->					
♦ **Approval to Plan Project**	♦ **Approval to Design System**	♦ **Approval to Develop System**	♦ **Approval to Install & Operate System**	♦ **System Disposal**	
• Define Risks & Opportunities Being Addressed • Document Business Needs Analysis • Assign a Project Manager	Management Plan *Verify EA Conformance* • Perform EA Impact Analysis • Develop EA CRs *Develop Business Case* • Define Resource Needs • Define Staffing Needs • Perform CBA • Define Business Performance Measures • Document CPIC Business Case *Determine Acquisition Approach* • Identify Source Selection Authority • Develop SOW/RFP/TDLs	• Define Deployment Requirements • Define Disposal Rqmts. • Identify Constraints on Design *Manage Requirements* • Track Requirements Changes • Define Verification Criteria • Update the RVTM *Design System* • Define System Architecture • Perform Fit/Gap Analyses (if integrating COTS) • Remediate Gaps (if integrating COTS) • Specify Interface Rqmts. • Design Interfaces • Specify System Elements • Allocate Requirements to System Elements • Define System Behavior & Control Flows	Changes *Perform Operations Engineering* • Perform Operations Impact Analyses • Develop Installation Requirements • Document Operations Configurations • Develop BOM Prepare for Operations, Training, & Rollout • Develop SOPs • Develop Maintenance Procedures • Develop Rollout Plan • Perform Operator / Maint. Training • Install/Validate System Pilot(s)		

New IT Infrastructure Capability Work Stream – SDLC Work Activities

Business Needs Analysis	Concept	Requirements Analysis / Design	Development / Deployment Preparation	O&M / Retirement	
		<---------- *Optional Iteration*---------->			
		♦ Approval to Plan Project	♦ Approval to Design System	♦ Approval to Develop System	♦ Approval to Install & Operate System ♦ System Disposal
		• Define TPMs • Develop Deployment Designs •Develop Operations Designs •Define Integration Plan •Define Verification Plan *Manage Project* •Update Mgmt. Plans/WBS •Provide Project Status Reports •Document Initial SSP •Manage Baselines •Update the Business Case Upon Completion of Design •Develop SOW/RFP/TDLs	Update Inventory/Property Systems *Manage Project Installation* •Develop Installation / Rollback Procedures •Develop RFCs/RFWs •Validate System *Prepare for Operations, Training, & Rollout* •Develop Rollout Plan •Install/Validate System Pilot(s) •Update Inventory / Property Systems *Manage Project* •Provide Project Status Reports •Update Mgmt. Plans/WBS		

New IT Infrastructure Capability Work Stream – SDLC Work Activities					
Business Needs Analysis	**Concept**	**Requirements Analysis / Design**	**Development / Deployment Preparation**	**O&M / Retirement**	
		<---------- Optional Iteration----------->			
	♦ **Approval to Plan Project**	♦ **Approval to Design System**	♦ **Approval to Develop System**	♦ **Approval to Install & Operate System**	♦ **System Disposal**
			•Update SSP •Manage Baselines •Develop SOW/RFP/TDLs •Obtain ATO •Document C&A and Update SSP •Update Business Case •Document Lessons Learned (PIR) •Obtain Service Contracts		
Additional Activities Required for Projects of Medium or High Complexity					
	Develop System Concept •Perform Proof of Concept Analyses •Perform Initial Fit/Gap •Define Iteration Approach •Develop Concepts of Deployment & Support *Develop Project Concept*	*Perform Design Analyses* •Develop Models & Prototypes •Perform Trade Studies *Design System* •Develop Integration Plan •Develop Verification Plan	*Develop System Configuration Items* •Provision the Verification Environment *Prepare for Operations, Training,*	*Use System* •Refine SOPs • Collect/analyze Business Performance Measure (BPM) Data •Collect/analyze SPM Data •Collect/analyze TPM Data • Document Operations Reports	

New IT Infrastructure Capability Work Stream – SDLC Work Activities

Business Needs Analysis	Concept	Requirements Analysis / Design	Development / Deployment Preparation	O&M / Retirement
	<---------- *Optional Iteration*---------->			
	♦ Approval to Plan Project	♦ Approval to Design System	♦ Approval to Develop System	♦ Approval to Install & Operate System ♦ System Disposal
	•Document IPT Charter •Develop CM Plan/Repository •Develop QA Plan *Develop Business Case* •Perform Analysis of Alternatives (AoA) *Determine Acquisition Approach* •Develop Acquisition Plan	*Manage Project* •Perform EVA	*& Rollout* •Develop SOPs •Develop Maintenance Procedures •Develop Contingency Plans •Collect/analyze Initial SPM & TPM Data •Provide Operator/Maintainer Training *Manage Project* •Perform EVA	•Document Operations Analyses
Additional Activities Required for Projects with High Information Assurance Risk				
	•Develop Concepts of Deployment & Support •Develop IV&V Plan	•Review Concepts of Deployment & Support •Review Validation Criteria •IV&V Verification Plan •IV&V Information Assurance Requirements •IV&V Updated Business	•IV&V Verification & Validation Reports •IV&V Operational Readiness •IV&V Information Assurance Requirements	•Safeguard/Archive Records •IV&V Inventory / Property System Updates •IV&V Security/Privacy Verification Report

New IT Infrastructure Capability Work Stream – SDLC Work Activities					
Business Needs Analysis	**Concept**	**Requirements Analysis / Design**	**Development / Deployment Preparation**	**O&M / Retirement**	
		<---------- Optional Iteration---------->			
		♦ **Approval to Design System**	♦ **Approval to Develop System**	♦ **Approval to Install & Operate System**	♦ **System Disposal**
♦ **Approval to Plan Project**					
		Case • IV&V Gap Remediation Plan (if integrating COTS)	• IV&V Updated Business Case		

B.6 New Platform as a Service (PaaS) / Infrastructure as a Service (IaaS) Work Stream Template

New PaaS / IaaS Work Stream – SDLC Work Activities					
Business Needs Analysis	**Concept**	**Requirements Analysis / Design**	**Development / Deployment Preparation**	**O&M / Retirement**	
		<---------- ***Optional Iteration*** ---------->			
	Approval to Plan Project	**Approval to Design System**	**Approval to Develop System**	**Approval to Install & Operate System**	**System Disposal**
Activities Required for all New Paas/ IaaS Projects					
Summarize Need • Identify Business Sponsor • Validate System Need • Assess EA Impact • Document Business Needs Summary • Obtain ARB Approval *Analyze Need* • Estimate Budget Needs • Identify Funding Source & Specify Funding Constraints • Define Initiative Activities & Timeframes • Identify Strategic Goals or LRPTs Supported • Identify Business Processes Supported • Define Measures of Success • Define Risks & Opportunities	*Develop System Concept* • Develop CONOPS • Identify & Characterize Use Cases • Define Stakeholder Requirements • Perform Preliminary Information Assurance Assessment • Perform Market Surveys • Develop System Architecture Concept • Develop Service Exit Strategy • Define Business Performance Measures • Document Validation Criteria • Document Initial RVTM *Develop Project Concept*	*Develop Functional Specifications* • Develop Use Cases • Define System Performance Measures (SPMs) and Technical Performance Measures (TPMs) *Define Non-functional Requirements* • Define Information Assurance Requirements including Records Management, Security, Privacy, Business Continuity, Compliance & Audit, Title 13, HIPAA • Identify Constraints on Design	*Develop System Configuration Items* • Develop Data Management / Conversion Procedures • Develop Integration and Provisioning Procedures • Develop ICDs • Verify Service Elements • Document Verification Report • Develop Initial Service Management Training • Resolve Service Fit/Gap Issues *Manage Requirements* • Update RTVM	*Use System* • Fully Provision Service • Provide End-User Training • Monitor SLA's • Collect/analyze Business Performance Measure (BPM) Data • Obtain Annual ATO *Dispose of System* • Develop Service Termination Plan • Terminate Service • Archive Records • Dispose of Data/Media *Verify Disposal* • Verify Information Assurance Controls & Provide

New PaaS / IaaS Work Stream – SDLC Work Activities

Business Needs Analysis	Concept	Requirements Analysis / Design	Development / Deployment Preparation	O&M / Retirement
<----------**Optional Iteration**---------->				
♦ **Approval to Plan Project**	♦ **Approval to Design System**	♦ **Approval to Develop System**	♦ **Approval to Install & Operate System**	♦ **System Disposal**
Being Addressed • Document Business Needs Analysis • Assign a Project Manager	• Tailor SDLC • Develop Project Management Plan (PMP) including WBS & Schedule • Develop Project Risk Management Plan *Verify EA Conformance* • Perform EA Impact Analysis • Develop EA CRs *Develop Business Case* • Define Resource Needs • Define Staffing Needs • Perform CBA • Define Business Performance Measures • Perform Analysis of Alternatives (AoA) • Document CPIC Business Case *Determine Acquisition Approach* • Identify Source Selection	*Manage Requirements* • Track Requirements Changes • Update the RVTM *Design System* • Define System Architecture • Specify Service Elements • Perform Fit/Gap Analyses • Remediate Gaps • Specify Service Elements • Allocate Requirements to Service Elements • Align SLAs to SPMs & TPMs • Perform Operations and Integration Impact Analyses *Manage Project* • Update Mgmt. Plans/WBS • Provide Project Status Reports • Document Initial SSP • Update the Business Case	• Track requirements Changes *Prepare for Installation* • Initialize Service • Perform Data Conversions • Integrate Service • Validate Service Integration • Train Service Users *Manage Project* • Provide Project Status Reports • Update Mgmt. Plans/WBS • Update SSP • Obtain ATO • Update Business Case • Document Lessons Learned (PIR)	Information Assurance Report • Verify Data/Media Disposal & Provide Data/Media Disposal Verification Report • Document System Closeout Report

New PaaS / IaaS Work Stream – SDLC Work Activities

Business Needs Analysis	Concept	Requirements Analysis / Design	Development / Deployment Preparation	O&M / Retirement
	<---------- *Optional Iteration*---------->			
	♦ Approval to Plan Project	♦ Approval to Design System	♦ Approval to Develop System	♦ Approval to Install & Operate System ♦ System Disposal
	Authority •Develop SOW/RFP/TDLs	•Develop SOW/RFP/TDLs		
Additional Activities Required for Projects of Medium or High Complexity				
	Develop System Concept •Perform Proof of Concept Analyses •Define Iteration Approach •Develop Concepts of Deployment & Support *Develop Project Concept* •Document IPT Charter •Develop CM Plan/Repository •Develop QA Plan *Determine Acquisition Approach* •Develop Acquisition Plan	*Define Non-functional Requirements* • Specify Service Interface Rqmts. • Define O&M Requirements • Define Deployment Requirements • Define Verification Criteria *Perform Design Analyses* •Develop Prototypes •Perform Trade Studies *Design System* •Design Interfaces •Develop Integration Plan •Develop Verification Plan *Manage Project*	*Develop System Configuration Items* •Specify BOM *Prepare for Operations, Training, & Rollout* •Develop Contingency Plans •Collect/Analyze Initial SLA data *Manage Project* •Manage Increments •Perform EVA •Manage Validation Reviews and Governance Reviews for Increments •Manage Baselines	*Use System* •Update SLAs •Identify & Resolve Faults •Manage Alerts/Alarms *Dispose of System* • Perform Disposal Impact Analyses

New PaaS / IaaS Work Stream – SDLC Work Activities					
Business Needs Analysis	**Concept**	**Requirements Analysis / Design**	**Development / Deployment Preparation**	**O&M / Retirement**	
		<---------- Optional Iteration---------->			
	Approval to Plan Project	**Approval to Design System**	**Approval to Develop System**	**Approval to Install & Operate System**	**System Disposal**
		• Define/Schedule Increments • Perform EVA • Develop WBS Tasks, Validation Reviews, and Governance Reviews for Increments • Manage Baselines			
Additional Activities Required for Projects with High Information Assurance Risk					
	• Develop Concepts of Deployment & Support • Develop IV&V Plan	• Review Concepts of Deployment & Support • Review Validation Criteria • IV&V Information Assurance Requirements • IV&V Updated Business Case	• IV&V Verification & Validation Reports • IV&V Information Assurance Requirements • IV&V Updated Business Case	• Safeguard/Archive Records • IV&V Disposal Plan • IV&V ecurity/Privacy Verification Report • IV&V Data/Media Disposal Verification Report	

B.7 Major IT Infrastructure Upgrade Work Stream Template

Major IT Infrastructure Upgrade Work Stream – SDLC Work Activities					
Business Needs Analysis	**Concept**	**Requirements Analysis / Design**	**Development / Deployment Preparation**	**O&M / Retirement**	
		<---------- ***Optional Iteration*** ---------->			
♦ **Approval to Plan Project**	♦ **Approval to Design System**	♦ **Approval to Develop System**	♦ **Approval to Install & Operate System**	♦ **System Disposal**	
Activities Required for all Major IT Infrastructure Upgrade Projects					
Summarize Need • Identify Business Sponsor • Validate System Need • Document Business Needs Summary *Analyze Need* • Estimate Budget Needs • Identify Funding Source & Specify Funding Constraints • Define Initiative Activities & Timeframes • Identify Strategic Goals or LRPTs Supported • Identify Business Processes Supported • Define Measures of Success • Define Risks & Opportunities Being Addressed	*Develop System Concept* • Update CONOPS • Update Stakeholder Requirements • Update Validation Criteria • Update RVTM • Update System Architecture Concept • Update Information Assurance Assessment • Perform Market Surveys *Develop Project Concept* • Tailor SDLC • Develop Project Management Plan (PMP) including WBS & Schedule • Develop Project Risk Management Plan	*Develop Functional Specifications* • Update/Add Use Cases • Update System Performance Measures (SPMs) • Update Functional Requirements *Define Non-functional Requirements* • Update Information Assurance Requirements including Records Management, Security, Privacy, Business Continuity, Compliance & Audit, Title 13, HIPAA • Define New Training Requirements • Update O&M Requirements	*Develop System Configuration Items* • Develop Integration Procedures • Integrate System Elements • Develop New/Update ICDs • Verify System Elements • Document Verification Report • Update Operator/ Maintainer Training Materials • Resolve Fit/gap issues • Perform Disposal Impact Analysis (if retiring system) • Develop Disposal	*Use System* • Rollout System • Monitor System • Identify & Resolve Faults • Manage Alerts/Alarms *Maintain System / Application* • Develop ECRs • Install/Validate Upgrades • Produce CM Reports • Update Inventory/Property Systems • Obtain Annual ATO *Dispose of System*	

Major IT Infrastructure Upgrade Work Stream – SDLC Work Activities

Business Needs Analysis	Concept	Requirements Analysis / Design	Development / Deployment Preparation	O&M / Retirement
<----------**Optional Iteration**---------->				
Approval to Plan Project	**Approval to Design System**	**Approval to Develop System**	**Approval to Install & Operate System**	**System Disposal**
• Document Business Needs Analysis • Assign a Project Manager	*Verify EA Conformance* • Perform EA Impact Analysis • Develop EA CRs *Develop Business Case* • Define Resource Needs • Define Staffing Needs • Perform CBA • Update Business Performance Measures • Document CPIC Business Case *Determine Acquisition Approach* • Identify Source Selection Authority • Develop SOW/RFP/TDLs	• Define Deployment Requirements • Define Disposal Rqmts. • Update Constraints on Design *Manage Requirements* • Track Requirements Changes • Update Verification Criteria • Update the RVTM *Design System* • Update System Architecture • Perform Fit/Gap Analyses (if integrating COTS) • Remediate Gaps (if integrating COTS) • Specify New Interface Rqmts. • Design New Interfaces • Specify Update/New System Elements • Allocate New Requirements to System Elements	Plan (if retiring system) *Manage Requirements* • Update RTVM • Track requirements Changes *Perform Operations Engineering* • Perform Operations Impact Analyses • Develop Installation Requirements • Document Operations Configurations • Develop BOM *Prepare for Installation* • Develop Installation / Rollback Procedures • Develop RFCs/RFWs • Validate System *Prepare for Operations, Training, & Rollout*	• Dispose of System Elements • Update Inventory/Property Systems *Verify Disposal* • Verify Information Assurance Controls & Provide Information Assurance Report • Verify Data/Media Disposal & Provide Data/Media Disposal Verification Report • Document System Closeout Report

Major IT Infrastructure Upgrade Work Stream – SDLC Work Activities					
Business Needs Analysis	**Concept**	**Requirements Analysis / Design**	**Development / Deployment Preparation**	**O&M / Retirement**	
		<---------- ***Optional Iteration*** ---------->			
	♦ **Approval to Plan Project**	♦ **Approval to Design System**	♦ **Approval to Develop System**	♦ **Approval to Install & Operate System**	♦ **System Disposal**
		• Update TPMs • Develop Deployment Designs •Develop Operations Designs •Define Integration Plan •Define Verification Plan *Manage Project* •Update Mgmt. Plans/WBS •Provide Project Status Reports •Update SSP •Manage Baselines •Update the Business Case Upon Completion of Design •Develop SOW/RFP/TDLs	•Develop Rollout Plan •Perform Operator / Maintainer Training •Install/Validate System Pilot(s) •Update Inventory / Property Systems *Manage Project* •Provide Project Status Reports •Update Mgmt. Plans/WBS •Update SSP •Manage Baselines •Develop SOW/RFP/TDLs •Obtain ATO •Document C&A and Update SSP •Update Business Case •Document Lessons Learned (PIR) •Obtain Service Contracts		

Major IT Infrastructure Upgrade Work Stream – SDLC Work Activities

Business Needs Analysis	Concept	Requirements Analysis / Design	Development / Deployment Preparation	O&M / Retirement	
	<---------- *Optional Iteration*---------->				
	♦ Approval to Plan Project	♦ Approval to Design System	♦ Approval to Develop System	♦ Approval to Install & Operate System	♦ System Disposal
Additional Activities Required for Projects of Medium or High Complexity					
	Develop System Concept • Perform Proof of Concept Analyses • Perform Fit/Gap Analysis (if integrating COTS) • Develop Concepts of Deployment & Support *Develop Project Concept* • Document IPT Charter • Develop CM Plan/Repository • Develop QA Plan *Develop Business Case* • Perform Analysis of Alternatives (AoA) *Determine Acquisition Approach* • Develop Acquisition Plan	*Perform Design Analyses* • Develop Models & Prototypes • Perform Trade Studies *Design System* • Develop Integration Plan • Develop Verification Plan *Manage Project* • Perform EVA	*Develop System Configuration Items* • Provision the Verification Environment *Prepare for Operations, Training, & Rollout* • Develop SOPs • Develop Maintenance Procedures • Develop Contingency Plan • Collect/analyze Initial SPM & TPM Data • Provide Operator/Maintainer Training	*Use System* • Refine SOPs • Collect/analyze Business Performance Measure (BPM) Data • Collect/analyze SPM Data • Collect/analyze TPM Data • Document Operations Reports • Document Operations Analyses	

Major IT Infrastructure Upgrade Work Stream – SDLC Work Activities					
Business Needs Analysis	**Concept**	**Requirements Analysis / Design**	**Development / Deployment Preparation**	**O&M / Retirement**	
		<---------- Optional Iteration----------->			
	♦ **Approval to Plan Project**	♦ **Approval to Design System**	♦ **Approval to Develop System**	♦ **Approval to Install & Operate System**	♦ **System Disposal**
			Manage Project • Perform EVA		
Additional Activities Required for Projects with High Information Assurance Risk					
	• Develop Concepts of Deployment & Support • Develop IV&V Plan	• Review Concepts of Deployment & Support • Review Validation Criteria • IV&V Verification Plan • IV&V Information Assurance Requirements • IV&V Updated Business Case • IV&V Gap Remediation Plan (if integrating COTS)	• IV&V Verification & Validation Reports • IV&V Operational Readiness • IV&V Information Assurance Requirements • IV&V Updated Business Case	• Safeguard/Archive Records • IV&V Disposal Plan • IV&V Inventory / Property System Updates • IV&V Security/Privacy Verification Report • IV&V Data/Media Disposal Verification Report	

B.8 IT Infrastructure Refresh Work Stream Template

IT Infrastructure Refresh Work Stream – SDLC Work Activities					
Business Needs Analysis	**Concept**	**Requirements Analysis / Design**	**Development / Deployment Preparation**	**O&M / Retirement**	
		<---------- ***Optional Iteration*** ---------->			
	♦ **Approval to Plan Project**	♦ **Approval to Design System**	♦ **Approval to Develop System**	♦ **Approval to Install & Operate System**	♦ **System Disposal**
Activities Required for all IT Infrastructure Refresh Projects					
Analyze Need • Assign a Project Manager • Estimate Cost • Verify O&M Funding Availability • Define Project Activities & Timeframes	*Develop System Concept* • Update Stakeholder Requirements • Document Validation Criteria • Update Information Assurance Assessment • Update RVTM *Manage Project* • Tailor SDLC • Develop WBS & Schedule • Update Risk Management Plan • Develop RFP/SOW/TDLs	*Define Non-functional Requirements* • Perform Operations Impact Analysis • Update Non-Functional Requirements • Update/Add Information Assurance Requirements including Records Management, Security, Privacy, Business Continuity, Compliance & Audit, Title 13, HIPAA • Update/Add Training Requirements • Update/Add O&M Requirements *Manage Requirements*	*Develop System Configuration Items* • Determine/Document System Element Configurations • Develop Integration Procedures • Integrate System Elements • Verify System Elements • Document Verification Report • Update Operator/Maintainer Training Materials *Manage Requirements* • Update RTVM • Track requirements	*Use System* • Rollout System • Monitor System • Identify & Resolve Faults • Manage Alerts/Alarms *Maintain System / Application* • Develop ECRs • Install/Validate Upgrades • Produce CM Reports • Update Inventory/Property Systems • Obtain Annual ATO	

IT Infrastructure Refresh Work Stream – SDLC Work Activities					
Business Needs Analysis	**Concept**	**Requirements Analysis / Design**	**Development / Deployment Preparation**	**O&M / Retirement**	
		<---------- Optional Iteration---------->			
	Approval to Plan Project	**Approval to Design System**	**Approval to Develop System**	**Approval to Install & Operate System**	**System Disposal**
		• Track Requirements Changes • Update/Add Verification Criteria • Update the RVTM *Design System* • Update System Element Specifications • Update/Add TPMs *Manage Project* • Provide Project Status Reports • Update WBS • Update SSP • Manage Baselines • Develop TDLs	Changes *Perform Operations Engineering* • Develop Installation Requirements • Document Operations Configurations • Develop BOM *Prepare for Installation* • Develop Installation / Rollback Procedures • Develop RFCs/RFWs • Validate System *Prepare for Operations, Training, & Rollout* • Develop Rollout Plan • Perform Operator / Maintainer Training • Install/Validate System Pilot(s) • Update Inventory / Property Systems		

IT Infrastructure Refresh Work Stream – SDLC Work Activities					
Business Needs Analysis	**Concept**	**Requirements Analysis / Design**	**Development / Deployment Preparation**	**O&M / Retirement**	
		<---------- Optional Iteration----------->			
	♦ **Approval to Plan Project**	♦ **Approval to Design System**	♦ **Approval to Develop System**	♦ **Approval to Install & Operate System**	♦ **System Disposal**
			Manage Project • Provide Project Status Reports • Update Mgmt. Plans/WBS • Manage Baselines • Develop SOW /TDLs • Obtain ATO • Document C&A and Update SSP		
Additional Activities Required for Projects of Medium or High Complexity					
	• N/A	• N/A	• N/A	• N/A	
Additional Activities Required for Projects with High Information Assurance Risk					
	• Develop Concepts of Deployment & Support	• Review Concepts of Deployment & Support	• IV&V Verification & Validation Reports	• Safeguard/Archive Records • IV&V Installed System	

IT Infrastructure Refresh Work Stream – SDLC Work Activities					
Business Needs Analysis	**Concept**	**Requirements Analysis / Design**	**Development / Deployment Preparation**	**O&M / Retirement**	
		<---------- ***Optional Iteration***---------->			
	♦ **Approval to Plan Project**	♦ **Approval to Design System**	♦ **Approval to Develop System**	♦ **Approval to Install & Operate System**	♦ **System Disposal**
	• Develop IV&V Plan	• Review Validation Criteria • IV&V Verification Plan • IV&V Information Assurance Requirements	• IV&V Operational Readiness • IV&V Information Assurance Requirements • IV&V SSP	• IV&V Inventory / Property System Updates • IV&V Security/Privacy Verification Report	

Appendix C – SDLC Tailoring Plan Worksheets

These worksheets can be used to document a project's Tailoring Plan. After the selected work stream template has been redlined to reflect the specific SDLC tasks that will be performed in each life cycle stage, those tasks can be transferred to the *Tailoring Plan Worksheet*. The project team can then use the information in *Appendix A* to determine the work products that will be developed. The selected work products can be added to this worksheet in alignment with the SDLC tasks that produce them. In some cases, multiple work activities may be required to address a stage gate completion criterion, and multiple work products may get developed in conjunction with performing an SDLC task. Additionally, multiple instances of this worksheet can be used to capture information associated with multiple increments of a system or multiple iterations of project activities. Additional gate reviews and multiple iterations of a gate review can be added at any point deemed appropriate for a project. Sample gate review patterns for common approaches to system implementation are included at the end of this appendix. Tailored-out tasks can be documented in the *Rationale for "Tailored-out" Tasks Worksheet* below.

<System Name> Tailoring Plan Worksheet			
Stage Gate Completion Criteria	**SDLC Tasks Required to Satisfy Criteria**	**Work Products to be Developed**	**Notes/Comments**
Business Needs Analysis Stage			
Business Sponsor Identified	Summarize Need	N/A	Determined by the business office that is proposing the system
Business Need Summarized	Summarize Need	Business Needs Summary Document	
EA Impact Assessed	Summarize Need	Business Needs Summary Document	This activity will require assistance from the EA team
System Need Validated	Summarize Need	Business Needs Summary Document	This activity will require assistance from the EA team

<System Name> Tailoring Plan Worksheet			
Stage Gate Completion Criteria	**SDLC Tasks Required to Satisfy Criteria**	**Work Products to be Developed**	**Notes/Comments**
Business Needs Summary Document Approved by ARB	Summarize Need	N/A	Documented in ARB meeting minutes
Business Needs Fully Analyzed & Documented	Analyze Need	Business Needs Analysis Document	
Project Manager Assigned	Analyze Need	N/A	
♦ **Approval to Plan Project – Gate Review Schedule xx/xx/xxxx**			
Concept Stage			
System Concept Developed & Documented			
Project Concept Developed & Documented			
EA Conformance Verified			
Business Case Developed & Documented			
Acquisition Approach Documented			

<System Name> Tailoring Plan Worksheet			
Stage Gate Completion Criteria	**SDLC Tasks Required to Satisfy Criteria**	**Work Products to be Developed**	**Notes/Comments**
♦ **Approval to Design System– Gate Review Schedule xx/xx/xxxx**			
Design Stage			
Functional Design Developed			
Functional Requirements Specified			
Non-functional Requirements Specified			
Design Trade-off Analyses Completed			
System Design Specified			
Requirements Traceability Established			
Project Management Documents Updated			
Business Case Updated and Validated			

<System Name> Tailoring Plan Worksheet			
Stage Gate Completion Criteria	**SDLC Tasks Required to Satisfy Criteria**	**Work Products to be Developed**	**Notes/Comments**
Next Stage Acquisition Activities Completed			
♦ **Approval to Build System– Gate Review Schedule xx/xx/xxxx**			
Build Stage			
System Configuration Items (CIs) Built, Verified & Integrated			
CI Specifications Documented			
Installation Preparation Completed			
Operations Preparation Completed			
Rollout Preparation Completed			
Training Preparation Completed			
Pilot System(s) Installed/Validated			

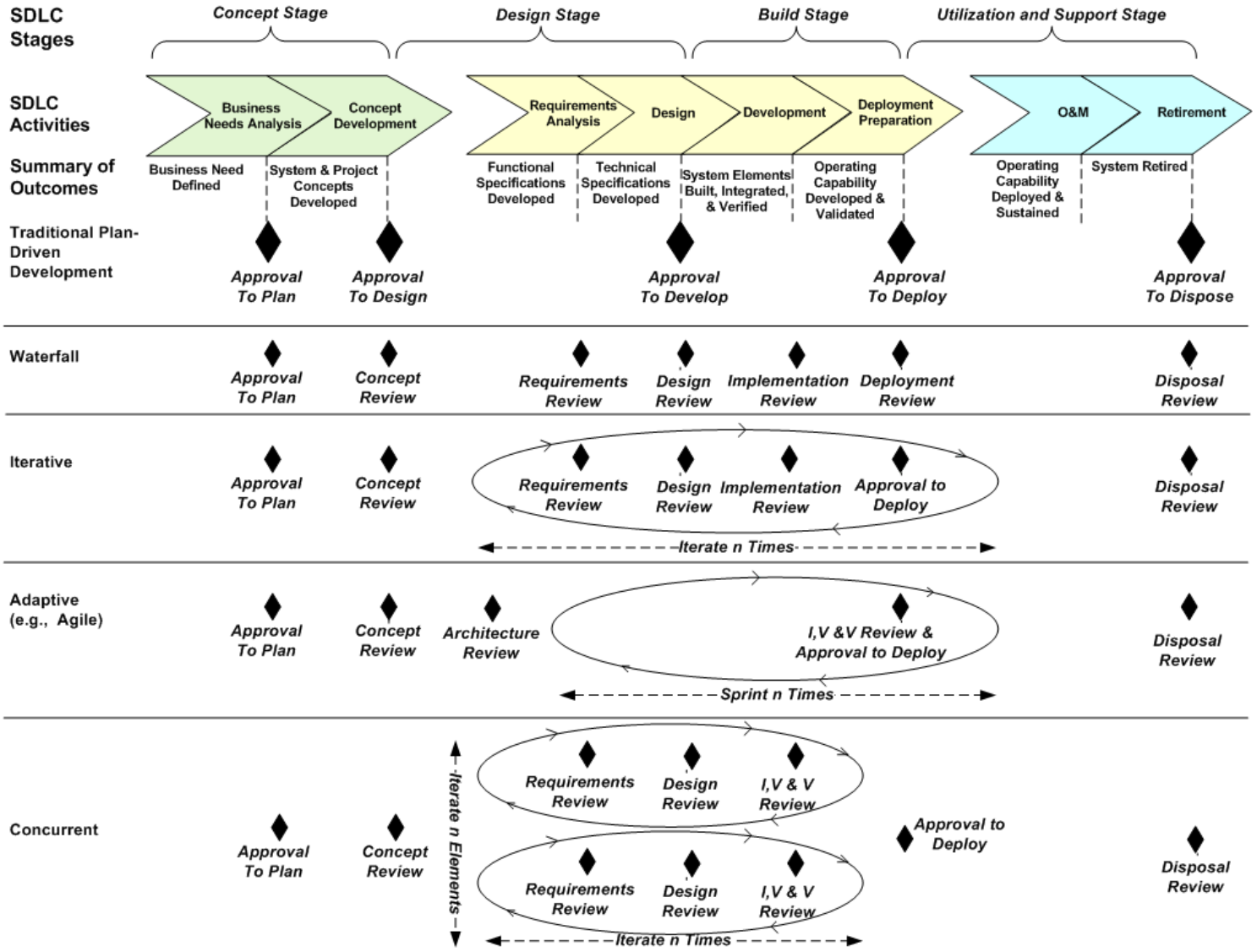
<System Name> Tailoring Plan Worksheet			
Stage Gate Completion Criteria	**SDLC Tasks Required to Satisfy Criteria**	**Work Products to be Developed**	**Notes/Comments**
Project Management Documents Updated			
Business Case Updated and Validated			
Next Stage Acquisition Activities Completed			
ATO Obtained			
♦ **Approval to Install and Operate System– Gate Review Schedule xx/xx/xxxx**			
Operations & Maintenance Stage			
System Rollout Completed			
System Use Monitored and Evaluated			
System Supported and Maintained			
Annual ATO Maintained			
System Elements Disposed Of			

<System Name> Tailoring Plan Worksheet			
Stage Gate Completion Criteria	**SDLC Tasks Required to Satisfy Criteria**	**Work Products to be Developed**	**Notes/Comments**
Disposal Documentation Verified			
♦ **Approval to Dispose of System – Gate Review Schedule xx/xx/xxxx**			

<System Name> -- Rationale for "Tailored-out" Tasks Worksheet		
SDLC Activity	**"Tailored-out' Tasks**	**Rationale for Removal**
Concept Development Stage		
Concept Development		
Build Stage - Requirements Analysis / Design		
Requirements Analysis / Design		

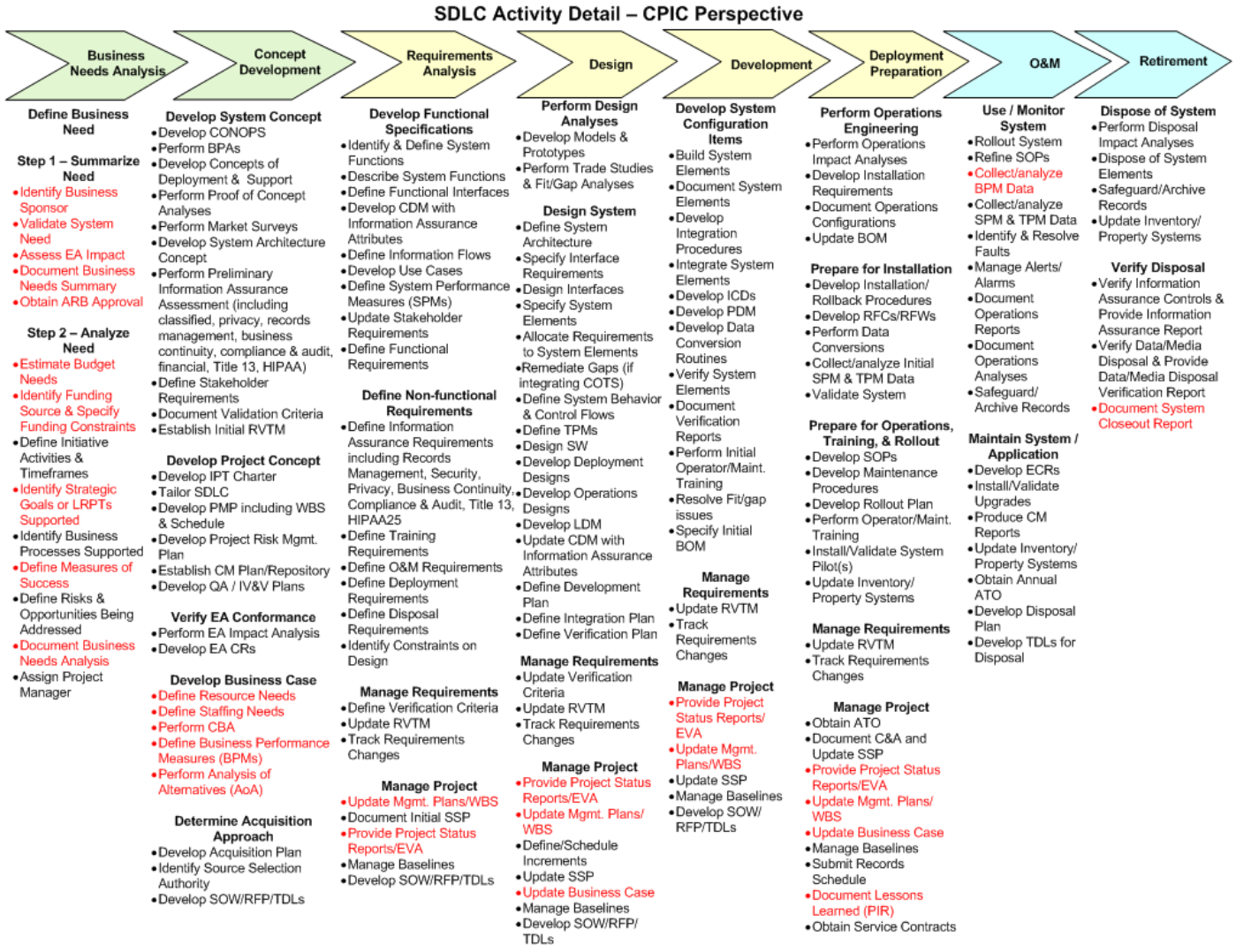
<System Name> -- Rationale for "Tailored-out" Tasks Worksheet		
SDLC Activity	**"Tailored-out' Tasks**	**Rationale for Removal**
Build Stage - Development / Deployment Planning		
Development / Deployment Planning		
Utilization & Support Stage - O&M / Retirement		
O&M / Retirement		

Figure C-1. Sample Gate Review Patterns



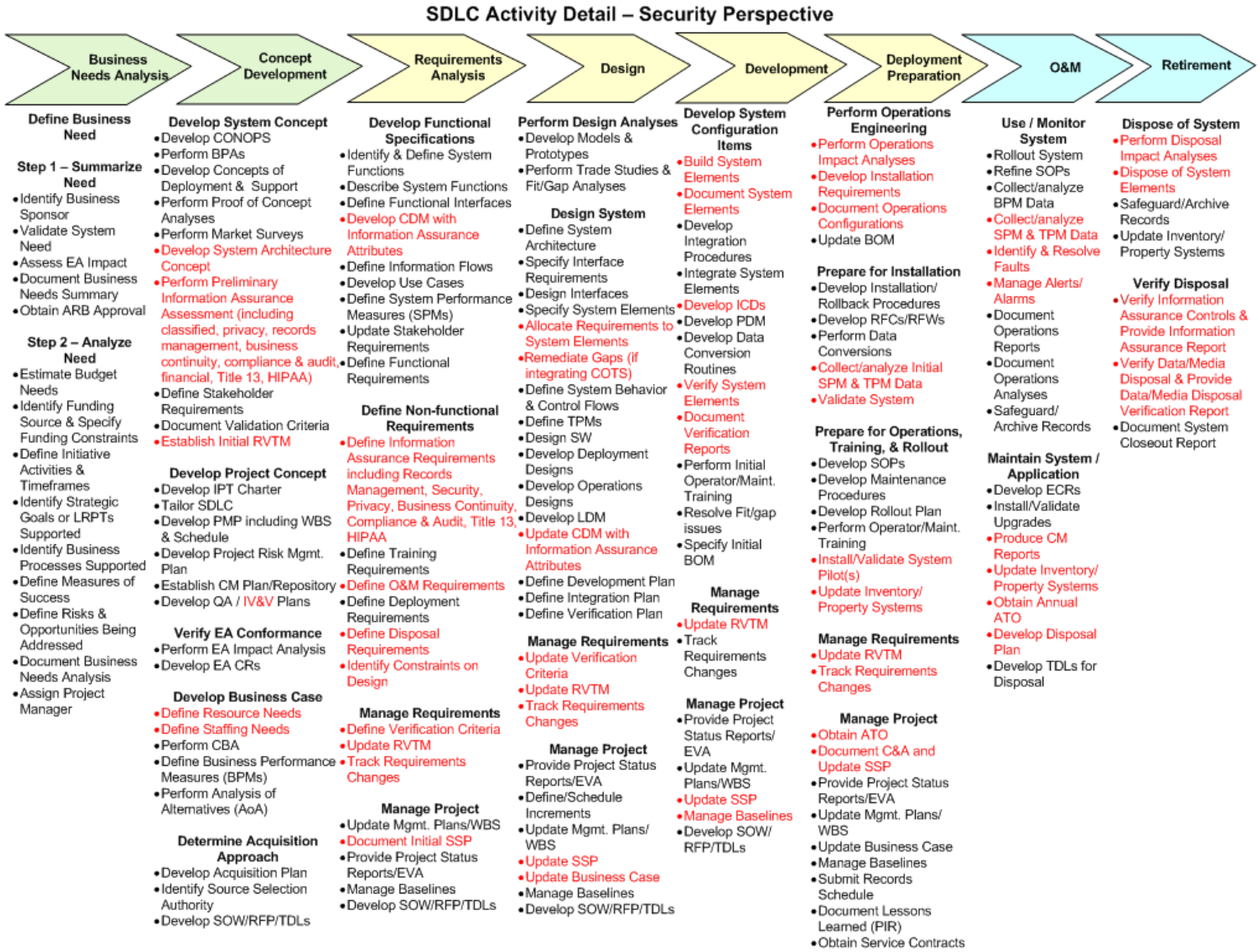
Appendix D – NARA Stakeholder Perspectives on SDLC Tasks

D.1 CPIC Perspective on SDLC Tasks



D.2 Data Administration Perspective on SDLC Tasks

D.3 Security Perspective on SDLC Tasks



D.4 Records Management Perspective on SDLC Tasks

D.5 IT Operations Perspective on SDLC Tasks

Appendix E – Terms and Acronyms

SDLC Terms and Acronyms		
Term	**Acronym**	**Notes**
Architecture Review Board	**ARB**	The Architecture Review Board is NARA's governance board for reviewing changes to NARA's Enterprise Architecture and IT system portfolio. In the context of the SDLC, the ARB is responsible approving IT system and project concepts prior to initiating system acquisitions.
Authority to Operate	**ATO**	The Authority to Operate document, provided by the CIO, approves the deployment of a newly-developed system or system version to production operations. Prerequisites for granting ATO include items such as comprehensive TTO (transition to Operations) planning, successful Verification/Validation of the system, and submission of the system's Record Schedule.
Business Case	**(none)**	A Business Case fully documents the financial justification for making an investment in an information system. Developing a comprehensive business case encompasses: (a) performing all financial analyses required to estimate the full life cycle cost of a system/project; (b) determining the return on investment and cost/benefit of pursuing a system acquisition; performing analyses to compare the costs/benefit of alternative acquisition approaches; and (d) performing any prudent and applicable financial sensitivity analyses. The business case provides information that is required by the Capital Planning and Investment Control (CPIC) process (NARA 801). From NARA's perspective, the business case for a system/project cannot be assessed or validated in a meaningful way without also reviewing the information used to provide the basis for project and system cost estimates (i.e., the system concept, the project concept, and the acquisition approach).
Business Impact Assessment	**BIA**	The Business Impact Assessment identifies the impacts of a disaster or catastrophic event (e.g., hurricane, terrorist attack) on the enterprise system, operations and facilities required to serve customer needs. The BIA is an important input to the each investment's Disaster Recovery Plan.
Business Performance	**(none)**	The agency process that establishes both Annual Performance Plan and internal performance targets, tracks performance against those targets, and influences approval of IT projects to

SDLC Terms and Acronyms		
Term	**Acronym**	**Notes**
Management		improve meeting performance targets.
Business Performance Measures	**BPM**	BPMs show how the system achieves the mission or operational objectives it was intended to meet.
Business Process Analysis	**BPA**	Business Process Analysis is any set of work activities used to review and analyze the business processes used by an organization to develop and manage its products and services – and deliver those products and services to customers. BPAs can range from formal models and simulations to informal meetings and working papers.
Certification & Accreditation	**C&A**	**Certification** "The official management decision given by a senior agency official to authorize operation of an information system and to explicitly accept the risk to agency operations (including mission, functions, image, or reputation), agency assets, or individuals, based on the implementation of an agreed-upon set of security controls." [NIST 800-37] **Accreditation** "A comprehensive assessment of the … security controls in an information system... to determine the extent to which the controls are implemented correctly, operating as intended, and producing the desired outcome with respect to …the security requirements for the system. " [NIST 800-37]
Cost Benefit Analysis	**CBA**	A Cost Benefit Analysis compares the financial costs and benefits of different technical alternatives for implementing a system. CBA information is one element of the overall Business Case for an investment decision, and provides source data to the Capital Planning and Investment Control (CPIC) process (NARA 801). The CBA is reviewed at the system development and the system utilization and support control gates to verify that it is still accurate and valid.

SDLC Terms and Acronyms		
Term	**Acronym**	**Notes**
Conceptual Data Model	**CDM**	A CDM represents the information used by a system from the perspective of the business. It is a static, functional description of a business domain - not a technical specification for implementing a database. A CDM can be minimally attributed to identify the need to address key information assurance requirements or any other requirements germane to understanding the business.
Configuration Management Plan	**CM Plan**	A CM Plan describes the methods used to: (a) generate and store configuration identifiers (CIs) for system elements; (b) review and approve/reject proposed changes to CIs; and (c) audit whether production configurations conform to the current approved configurations.
Enterprise Architecture (EA) Change Request	**EA CR**	An EA CR is a formal request to make changes to the Enterprise Architecture based upon emerging business or system needs.
Engineering Change Request	**ECR**	An engineering change request is a formal request from a system stakeholder (e.g., end-user, help desk agent, or customer) to modify the system to address a perceived defect or enhance system capabilities.
Earned Value Analysis	**EVA or EVM**	Earned Value Analysis (also known as Earned Value Management) is a project management technique that evaluates “actual vs. projected spending”, by factoring in the amount of work completed in conjunction with the actual spending that was incurred. EVA is used to help identify project cost and schedule overruns.
Federal Information Processing Standard 199	**FIPS-199**	FIPS-199 is the standard government framework for categorizing an information system in terms of confidentiality, integrity, and availability.

SDLC Terms and Acronyms		
Term	**Acronym**	**Notes**
Interface Control Document	**ICD**	An ICD is a document containing drawings and descriptions of a functional and physical interface within a system. ICDs require concurrence from the representatives of interfacing system elements and/or external systems regarding the design, implementation, and management of the interface.
Initial Privacy Review	**IPR**	An IPR asks systems owners to indicate whether a system under development contains information about individuals, and whether such information can be associated with specific individuals.
Integrated Project Team	**IPT**	An Integrated Project team is comprised of representatives from all system stakeholders and developers. The team has the responsibility and authority to define, develop, produce and support a system. Typically, IPTs have three sub-teams, a System Engineering and Integration team concerned with external interfaces, a product Integration Team focusing on high-level subsystem interfaces and a Product Development team focusing on the lowest level system elements.
Logical Data Model	**LDM**	An LDM represents the data used by a system from the perspective of the system design. It is a technical specification of data relationships used to guide implementation decisions for a database (relational or XML). An LDM is fully attributed.
Long Range Performance Target	**LRTP**	A business performance objective defined in the *NARA Strategic Plan.*
National Information Exchange Model	**NIEM**	NIEM is a collaborative partnership of agencies and organizations across all levels of government (federal, state, tribal, and local) and with private industry. The purpose of this partnership is to effectively and efficiently share critical information at key decision points throughout the whole of the justice, public safety, emergency and disaster management, intelligence, and homeland security enterprise.

SDLC Terms and Acronyms		
Term	**Acronym**	**Notes**
Non-functional Requirements	**(none)**	Non-functional requirements cover important overall qualities of a system that are not constrained to a particular functional requirement. Examples of non-functional requirement may include availability, reliability, maintainability, and other specialty engineering requirements such as human factors, mass properties, integrated logistics support, environmental impact, security, etc.
Open Archival Information System	**OAIS**	An Archive, consisting of an organization, which may be part of a larger organization, of people and systems, that has accepted the responsibility to preserve information and make it available for a Designated Community.
Operations & Maintenance	**O&M**	An SDLC technical process and the corresponding activities used to address the utilization, maintenance, and support of a system of interest in throughout its lifecycle.
Operations Engineering	**(none)**	Operations engineering is a process used to examine newly built, verified, and integrated system elements – as documented by the development/integration team – to determine the impact of installing those elements in the actual operations environment. Depending on risk and impact, operations engineering may be performed in an operations staging or operations test environment rather than in the actual production environment. The objective is to identify the needs for additional operations components or changes to existing components, ensure that installing the new components or making configuration changes does not cause regression faults in the operations environment, and determine how best to install the new system element(s).
Pilot	**(none)**	A pilot is a limited rollout of a system that has been built, integrated, verified, and installed - but must be assessed and validated for production readiness prior to full-scale rollout.
Prototype	**(none)**	A prototype is an exploratory implementation of a system used to: (a) obtain a better understanding of system requirements; (b) evaluate system design alternatives; (c) assess performance capabilities; or (d) evaluate interfaces with other systems.

SDLC Terms and Acronyms		
Term	**Acronym**	**Notes**
Physical Data Model	**PDM**	A PDM describes the physical implementation of a database. It represents the actual technical configuration of the data files, records, fields and their physical attributes as implemented by the system.
Privacy Impact Assessment	**PIA**	A PIA is an analysis of how information is handled, to: (i) ensure handling conforms to applicable legal, regulatory, and policy requirements regarding privacy; (ii) determine the risks and effects of collecting, maintaining, and disseminating information in identifiable form in an electronic information system; and (iii) examine and evaluate protections and alternative processes for handling information to mitigate potential privacy risks. [From NIST 800-18]
Post Implementation Review	**PIR**	A PIR is a CPIC activity used to evaluate the outcomes of a completed project across several dimensions. The evaluation dimensions include: (a) achievement of mission benefits; (b) actual costs incurred and anticipated future maintenance costs; (c) satisfaction of records management requirements;, (d) lessons learned about NARA process effectiveness (e.g., CPIC and SDLC); and (e) the effectiveness of training and documentation.
Project Management Plan	**PMP**	The Project Management Plan describes how the project will be managed throughout the lifecycle of the current release. It identifies the project's stakeholders, business objectives, management approach, development methodology, milestones (including gate reviews), schedule, resources, reporting/communication plan and risk management plan.
Quality Assurance Plan	**QA Plan**	The Quality Assurance Plan describes the strategy and methods the project will use to ensure that the project is managed in accordance with applicable policies and standards,- and will provide outcomes and deliverables of acceptable quality.
Request for Change	**RFC**	A form used by NARA's IT operations organization to initiate a change to the IT operations environment.

SDLC Terms and Acronyms		
Term	**Acronym**	**Notes**
Request for Proposal	**RFP**	Document issued by the purchaser of sealed-bid procurements to inform the potential suppliers of the: (a) statement and scope of work; (b) schedules or timelines; (c) contract type; (d) terms and conditions; (e) description of goods and/or services being procured; (f) general criteria to be in bid evaluation; and (g) instructions for preparation of technical, management, and/or cost proposals.
Request for Work	**RFW**	A form used by NARA's IT operations organization to initiate a work effort with NARA's IT operations contractor.
Return on Investment	**ROI**	ROI is the ratio of economic value gained or lost on an investment relative to the amount of money invested. Gains are usually derived from labor savings, equipment savings, and revenue.
Requirements Verification and Traceability Matrix	**RVTM**	The RVTM is a table that cross references all system requirements to their parent stakeholder requirement, their decomposed child requirements, and the validation / verification criteria for each requirement. As a system of interest progress through the lifecycle, the RVTM will also identify the functional and technical elements to which the requirements are allocated in the design.
System	**(none)**	An integrated set of elements, subsystems, or assemblies that accomplish a defined objective. These elements include products (hardware, software, firmware), processes, people, information, techniques, facilities, services, and other support elements.
System Element	**(none)**	A system element is a member of a set of elements that constitutes a system. It is a discrete part of a system that can be implemented to fulfill specified requirements.
Standard Operating Procedure	**SOP**	Detailed documentation of the sequence or work steps required to perform a specified task . SOPs for maintaining/configuring IT and other technical products tend to be highly specific because the computer or machine only permits manipulations to be done in specific ways.

SDLC Terms and Acronyms		
Term	**Acronym**	**Notes**
Statement of Work	**SOW**	A detailed description of the specific services or tasks a contractor is required to perform under a contract. The SOW is usually incorporated in a contract, indirectly by reference or directly as an attachment.
System Performance Measures	**SPM**	SPMs are measures of physical or functional attributes related to system operation used to determine whether a system meets design or performance requirements.
System Security Plan	**SSP**	Formal document that provides an overview of the security requirements for the information system and describes the security controls in place or planned for meeting those requirements.
Software (SW) Design	**SW Design**	The SW design specifies the architecture, behavior, structure, and function of the SW elements that are to be developed as part of a system of interest.
Tailoring Plan	**(none)**	A planning document used in conjunction with the project management plan. It addresses items such as defining the tailoring approach to the technical processes used on the project and establishing the technical criteria for exit reviews. The Tailoring Plan also identifies the work products required by the project.
Technical Direction Letter	**TDL**	An acquisition letter used to define and initiate technical tasks under a contract.
Technical Performance Measure	**TPM**	Measures of critical technical thresholds or parameters of an element of a system as it is designed and implemented.
Transition to Operations	**TTO**	TTO is a set of work activities that are performed to prepare a system for deployment to the production operating environment. The major types of TTO activities include: (a) operations engineering; (b) installation preparation; and (c) operations, training and rollout preparation.

SDLC Terms and Acronyms		
Term	**Acronym**	**Notes**
Validation	**(none)**	Validation ensures that the built, integrated, and deployed system meets user needs as specified by the stakeholder requirements. Validation answer the question "Was the Right System Built". Validation is often time referred to as "user acceptance".
Verification	**(none)**	Verification ensures that system elements as built satisfy the system requirements (functional, non-functional, performance, and constraints on design) that are allocated to them - and function in accordance with the design. It answers the question "Is the system built right". Approaches to verification include inspection, analysis, demonstration, test, and certification.
Work Breakdown Schedule	**WBS**	A Work Breakdown Structure is a hierarchical decomposition of a systems project into a schedule of tasks or work units. Each task is assigned a start date, end date, cost and (where appropriate) dependency on prior tasks. The project schedule is derived from the WBS.