Project Planning and Management (PPM) V2.0

User Guide

Execution & Control Phase

Version 1.0

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Contents

1. How Did We Get to the Execution & Control Phase?

Before the Execution & Control Phase can begin, the project must have passed successfully through the Project Baseline Review Control Gate at the end of the Planning Phase. At this review, Technical Review Sub-committee (TRC) members determined that the project should proceed with project execution and control activities including the development of the detailed technical design, test planning and test management, training development, solution configuration or development, and the implementation and release of the solution.

2. Execution & Control Phase Overview

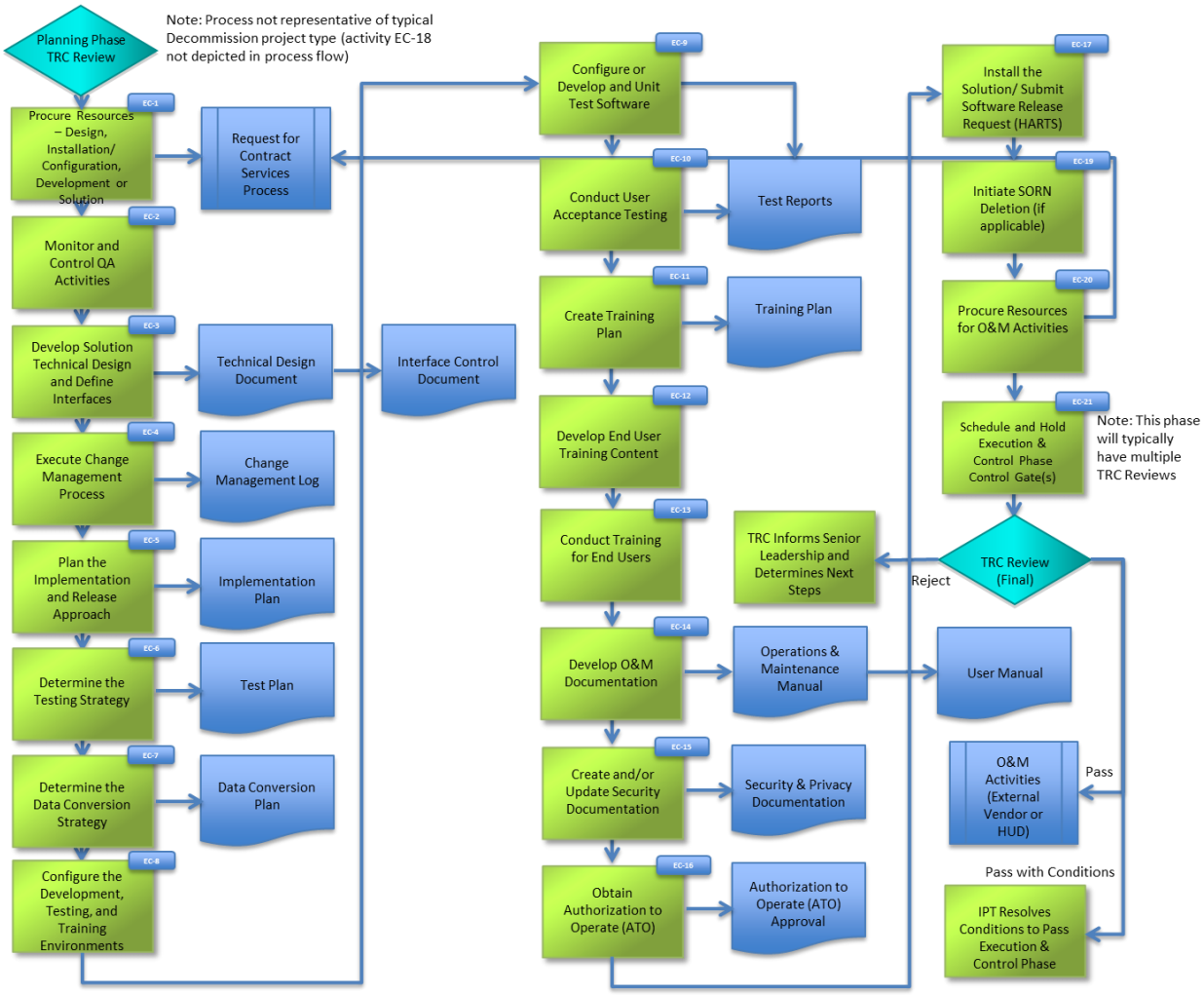
2.1 Execution & Control Phase Description

The Execution & Control Phase consists of those processes performed to complete the work defined in the Project Management Plan and Project Schedule to satisfy the project specifications. This involves coordinating people and resources, managing stakeholder expectations as well as integrating and performing the activities of the project. This phase includes the development of the technical design as well as the full execution of the design from planning to development, testing, and implementation.

The activities in this phase depend on the specific project type selected for implementation of the solution. In addition, project execution activities must include testing and project reviews. Only solutions that have been through the complete testing process and required project reviews can be approved for deployment.

Also, this phase establishes the solution in its production environment. If the solution is an information system, data is converted as needed, and functional testing is conducted to verify the system. Additionally, security certification is conducted and capital management reporting requirements must be met. The system or service must have a written authorization to operate in order to proceed prior to beginning operations and maintenance (O&M).

2.2 Execution & Control Phase Process Flow



3. Execution & Control Phase Key Activities and Descriptions

Execution & Control Phase activities depict the probable tasks that project teams will perform across most project types. PPM templates are where the output of the work performed by the IPT and any associated vendor support is documented. The following key activities summarize the work that is performed in the Execution & Control Phase.

- **EC-1 Procure Resources per the Acquisition Strategy (for Design, Installation, Configuration, Development Activities and/or Solution) (if applicable)**
  The procurement activities taking place within the Execution & Control Phase will depend on how the procurement was structured in the Planning Phase. If support was procured for requirements development tasks, then the procurement in this phase could be to cover actual software, hardware, and activities required to design, install, configure, and/or develop the solution. Methods of procurement of resources for this phase or the entire project may vary by project type and should be outlined in the Acquisition Strategy (for major systems/programs) and the Procurement Management Plan.

  Note: The Procurement Management Plan completed in the Initiation Phase describes how a project team will acquire goods and services from outside of HUD. Information within that document can be used as an input when completing the specific Acquisition Plan for each contract.

- **EC-2 Monitor and Control Quality Assurance (QA) Activities**
  In the Planning Phase, within the Project Management Plan, the project team documented the quality assurance approach for the project. In this activity, the IT PM, Business Lead, and IPT execute the quality assurance approach. The execution of quality monitoring and control will lead to less rework and defects. Typical monitoring and controlling tasks within quality assurance include:
  - Taking action to control the project
  - Determining acceptable quality levels for deliverables
  - Determining whether project processes are correct and effective
  - Measuring performance against other metrics in the Project Management Plan
  - Analyzing and evaluating performance
  - Determining if variances warrant a corrective action or other change request
  - Influencing factors that cause changes
  - Requesting changes

- **EC-3 Develop Solution Technical Design and Define Interfaces**
  The Enterprise Architecture Lead, Lead Solution Architect, Solution Development Lead, IT PM and other technical design team members all play a critical role in creating the Technical Design document.
  - Establish Architecture – The Enterprise Architecture Lead, Lead Solution Architect, and other technical design team members establish a high-level architecture of the solution. The architecture identifies items of hardware, software, and manual operations. All the solution requirements are allocated among the hardware and software configuration items. This information should be in alignment with the information supporting the purchase of hardware and software.

- Establish Security Architecture – The Lead Solution Architect, IT Security Specialist, Enterprise Architecture Lead, and other technical design team members document the security architecture, including integrity controls.
- Create Detailed Design – The Lead Solution Architect, Enterprise Architecture Lead, and other technical design team members provide the information needed for the development team (for custom developed solutions) to actually build and integrate the hardware components and code, integrate the software modules, and interconnect the hardware and software segments into a functional product. Additionally and if applicable, they address the detailed procedures for combining separate commercial-off-the-shelf (COTS) packages into a single solution. The team maps every detailed requirement to the Requirement Definition document and Requirements Traceability Matrix.
- Document Technical Design – The Lead Solution Architect, Enterprise Architecture Lead, and other technical design team members use the Requirements Definition document and Solution Architecture document to create the Technical Design document.
- Identify System Interfaces – The IT Project Manager (IT PM), Lead Solution Architect, Enterprise Architecture Lead, and other IPT members identify the system's interfaces with other application software, including those from other operational organizations. This group also consults with the Business Lead and Solution Development Lead. For each interface, the team identifies:

  -Type of interface
  -Description of operational implications of data transfer, including security considerations
  -Data transfer requirements to and from the subject program (including data content, sequence, timing, format, volume, and processing)
  -Current formats of interchanged data
  -Interface procedures, including telecommunications considerations
  -Interface equipment
  -Data conversion requirements

- Document Interface Control – The Lead Solution Architect, Enterprise Architecture Lead, and other IPT members use the Requirements Definition document and Solution Architecture document to create the Interface Control Document (ICD).
- Conduct Interim Reviews – The IT PM, Lead Solution Architect, Enterprise Architecture Lead, and other IPT members conduct ongoing interim reviews of the solution design as it evolves through the Execution & Control Phase. This review determines whether the initial design concept is consistent with the overall architecture and satisfies the functional, security, and technical requirements in the Requirements Definition document.

- **EC-4 Execute Change Management Process**
  In the Planning Phase, within the Project Management Plan, the project team documented the processes for how the team will manage change. An effective change management process will cover approving and managing changes to items such as deliverables, organizational process assets, baselines, and project documents. Typically, formal change requests should be submitted

to the project Change Control Board (CCB) for review and approval. The Change Management Log, managed by the IT PM, is used to track changes to the project scope, schedule, and/or resources.

This process should commence at the time of Project Management Plan completion in the Planning Phase. Many changes will normally occur within the Execution & Control activities of a project which is why the activity is located within this phase.

- **EC-5 Plan the Implementation and Release Approach**
  All activities related to implementation planning are documented in the Implementation Plan. This involves:
  - Defining Activities, Roles, and Responsibilities – The IT PM and Release Manager, with input from the Business Lead and other IPT members, creates a list of activities and the project staff (HUD or contractor) responsible for deployment.
  - Identifying Hardware Requirements – The Release Manager, with input from the IT PM, Lead Solution Architect, Solution Development Lead, and other IPT members, creates a list of the equipment and hardware required to support the implementation. This may include computers, servers, peripheral equipment, simulators, emulators, diagnostic equipment, other non-computer equipment, as well as any network and data communication requirements. The list should also include items needed for testing activities. This list should be consistent with the hardware requirements identified in the Planning Phase. Once hardware requirements have been identified, the IT PM completes a HUD Request Management Board (HRMB) request to obtain all the necessary equipment.
  - Identifying Software Requirements – The Release Manager, with input from the IT PM, Lead Solution Architect, Solution Development Lead, and other IPT members, creates a list of the software, databases, compilers, operating systems, utilities, etc. required to support the implementation. The list should also include items needed for testing activities. This list should be consistent with the software requirements identified in the Planning Phase.

  The release approach is also documented within the Implementation Plan and defines if the project is following a phased or incremental approach for its development and implementation. The release approach must be aligned with HUD's configuration management practices. Both project leadership and the IPT members determine what portions of the solution functionality will be developed and implemented in which releases and the rationale for each release.

- **EC-6 Determine the Testing Strategy**
  The testing strategy is developed during this key activity and is documented in the Test Plan. The following list defines the detailed sub-tasks that take place when determining and developing the testing strategy:
  - Identify Testing Methods and Tools - The IT PM, Testing Lead, Business Lead, and Enterprise Architecture Lead analyze the requirements and design specifications to determine the appropriate methods for performing the unit, system, integration, user acceptance, and security tests. The team identifies all tools required to perform the tests and cross-references the methodologies and tools selected with the requirements

and design specifications to ensure all areas of the solution are thoroughly tested before production release.

- Describe Testing Tasks and Activities - Based on the determinations made in the analysis of the requirements and design specifications, the IT PM, Testing Lead, Business Lead, and Enterprise Architecture Lead describe the tasks and activities that will be performed. They cross-reference the tasks with the requirements and design documents to ensure that all necessary tasks and activities are covered.
- Identify Personnel Requirements - The IT PM, Business Lead, Testing Lead, and Enterprise Architecture Lead identify the personnel or groups of personnel required to perform the tests. The team identifies the specific task(s) the individual/group is required to perform, timeframe needed, and any special skills required (programming language, machine familiarity, etc.).
- Prepare a Testing Schedule - The IT PM, Testing Lead, and Business Lead prepare a testing schedule to reflect the unit, integration, security, and user acceptance tests and the time duration of each. This schedule reflects the personnel involved in the test effort and the site location.
- Identify Deliverable Materials - The IT PM and Testing Lead lists all deliverable materials, including technical and documentation, needed for the tests.
- Identify Any Security Considerations - The IT PM and Testing Lead prepares a list of requirements necessary to ensure the integrity of the testing procedures, data, and test site. The team also covers special security considerations such as passwords, classifications, security or monitoring software, or computer room badges.
- Identify Test Evaluation Criteria – The IT PM and Testing Lead works with the Business Lead and IT Security Specialist to determine the specific criteria that each segment of the system/subsystem must meet. Such criteria are described by the users of the system/subsystem and typically are a mix of functional, security, and performance requirements.
- Determine User System Acceptance Criteria - The IT PM and Testing Lead work with the Business Lead to determine the minimum function and performance criteria that must be met for the solution to be accepted as "fit for use" by the user or sponsoring organization.
- Obtain Concurrence(s) on Acceptance Criteria - The IT PM and Testing Lead work with the Business Lead to obtain the approval of the user or sponsoring organization on the minimum criteria the solution must meet for it to be accepted as "fit for use" by their organization.
- Develop the Test Plan – The IT PM and Testing Lead, along with the Business Lead and Enterprise Architecture Lead, develop the Test Plan using the information gathered in the above tasks.
- Update the Requirements Traceability Matrix - The IT PM and the Testing Lead update the Requirements Traceability Matrix (RTM) to ensure that all the test cases covered in the plan map to requirements in the RTM.

- **EC-7 Create the Data Conversion Strategy (if applicable)**
  The data conversion strategy is developed and documented in the Data Conversion Plan. The Data Conversion Plan describes the strategy, preparation, and specifications for converting and/or migrating data from the source system or systems to the new system. The Enterprise Architecture Lead, Lead Solution Architect, and IT PM author or contribute to the development of the Data Conversion Plan. They also reach out to the owners of the source data to help define the data conversion strategy. Activities required to create the strategy include:
    - Identify the overall approach, assumptions, and processes that will be used in the data conversion.
    - Develop an inventory and cross-reference of source and target data elements, schema, metadata, and all self-describing files.
    - Specify the extract, transform, and load (ETL) components and functions for each data source.
    - Determine the tools needed to execute the conversion.
    - Develop a strategy for data quality assurance and control including remediation strategies for gaps, orphans, duplicates, etc. If necessary, include a pilot or trial execution of the target application with the converted data.
    - Identify the fall back and contingency strategies.
    - Determine the impact on business operations.
    - Schedule meetings with stakeholders involved in sending and receiving files of the system. Discuss objectives and proposed data conversion schedule.

- **EC-8 Configure the Development, Testing, & Training Environments (if applicable**)

  Within this task, the hardware and software environments are configured to support other activities within this phase. Verification must take place that the development, test, and training environments mirror each other and are ready for the activities to be conducted throughout this phase.

    - Install and Configure the Hardware and Software – The IT PM coordinates with HUD's infrastructure team, IT Operations Manager, Solution Development Lead, and other technical team members to configure existing and newly acquired hardware and software components.

    - Setup Access Privileges – The IT PM, with input from the Testing Lead and the Solution Development Lead, identifies developers and testers who need access to the configuration management tools. The IT PM coordinates with the relevant HUD entities to establish the necessary access rights. This is not to be confused with the CHAMPS request process for development, test, and production applications.

    - Create Physical Database (if applicable) – Within this activity, the database structure defined in the Technical Design document is created and verified. The IT Operations Manager and Solution Development Lead create and deploy the database in the development environment. The team will typically load the database, execute any applicable data conversion procedures, and validate that the installed and populated database meets the solution requirements and HUD's data management standards. The team also verifies that the converted data meets business requirements and supports development and unit testing efforts. Also, the IT PM will work with the Lead Solution

Architect and Solution Development Lead to update the database specifications in the Technical Design document to reflect any necessary modifications to the database structure.

- **EC-9 Configure or Develop and Unit Test Software**
  During this part of the project, the business requirements captured in the Requirements Definition document and Requirements Traceability Matrix and the specifications in the Technical Design document are transformed into software code. The software code also is unit and system tested. For COTS/GOTS solutions, the software is configured and unit and system tested.

  The team must follow the controls listed below for this task's sub-activities:
  - HUD coding and development standards (e.g., Oracle/SQL Server and Java coding standards)
  - Section 508 compliance standards
  - HUD IT security and privacy standards and guidelines
  - Federal IT security and privacy standards and guidelines
  - PPM Templates for Requirements Traceability Matrix, Solution Architecture, Technical Design, and Interface Control

  Detailed activities include:

  - Configure and/or Develop Software – The Solution Development Lead and solution developers select, tailor, and use those standards, methods, tools, and computer programming languages that are documented, appropriate, and established by HUD for performing software configuration and/or development activities. The developers transform the business requirements and design specifications into software components, modules, and code that adhere to HUD coding standards and the project's quality assurance expectations. Development of code is done within the established HUD development environment.
  - Perform Configuration Control –The Solution Development Lead follows HUD's configuration management processes to identify the baseline software objects to be deployed into the development environment.
  - Execute Data Conversion Plan – The Solution Development Lead and solution developers execute the data conversion scripts to verify that the converted data is compatible with the developed software and to facilitate unit testing.
  - Conduct Unit Testing – The Solution Development Lead and solution developers configure and/or code each module, ensure that it compiles without error and adheres to coding standards, and then test it as a standalone entity. This unit testing of software modules and programs uses both valid and invalid data developed specifically for the execution of the test. Unit testing employs dynamic testing techniques that execute the software module with both expected and erroneous data and compares actual with expected results. The goal of unit testing is to exercise all functions of the software module and all logic paths within the module.

- Assess Readiness for Formal Acceptance Testing – The IT PM, Testing Lead, and Solution Development Lead review the unit test results to provide assurance that the software has completed thorough unit testing during the development stage and is ready for turnover to the formal, controlled test environment. The scope of the review is to inspect the test products and test results obtained during development testing for completeness and accuracy, and to verify that test planning, test cases, scenarios, and scripts provide adequate coverage of documented solution requirements. In addition, the team reviews the test environment, test setup, and test data to ensure they are adequately prepared for validation testing.
- Update Design Documents – The IT PM updates the Solution Architecture, Technical Design, and Interface Control documents to reflect changes necessary to clarify and refine the initial specifications.

  Note: These changes cannot result in a modification to the scope of the project or requirements specifications. Any such changes must be processed, typically in the form of change requests, through the project's change management procedures, protocols, and project-level Change Control Board.

- **EC-10 Conduct User Acceptance Testing (UAT)**

  Before UAT can begin, test sites and environments must have been configured. User acceptance testing is conducted in accordance with the Test Plan and by a group that does not include the team that, if a custom developed solution, developed the software.

  The Testing Lead coordinates test environment configuration activities and ensures that the correct version of the software components is deployed to the test environment. The Testing Lead and other IPT members verify that the environment is ready for UAT. The Testing Lead ensures that the UAT participants have the necessary access rights, guidelines, and resources (including test scripts) to complete the testing activities. The IPT supports the UAT participants, reviews the UAT results, addresses reported defects, and assesses solution readiness for deployment to production. Specific sub-tasks include:

  - Establish UAT Environment – The Testing Lead ensures that the required software components are installed in the UAT environment and that the environment is ready for UAT. This includes verifying the successful completion of any required data conversion. The team verifies the integrity of all configuration items and initiates UAT monitoring functions.
  - Facilitate UAT – The Testing Lead provides the UAT participants with the required access rights, test scripts, and other resources to execute the tests. UAT participants most times consist of program area stakeholders. The Testing Lead also provides the UAT participants with directions for recording test results, identifying defects, and obtaining assistance during the test cycles. The directions provided to the participants include detailed test case specifications that describe the purpose and manner of each specific test, the required inputs and expected results for the test, step-by-step procedures for executing the test, and the pass/fail criteria for determining acceptance. The IPT notifies affected personnel and organizations about the upcoming testing activities and schedules meetings to ensure that all affected personnel are aware of any procedural changes.

- Monitor UAT Environment – The Testing Lead, who consults with the Solution Development Lead, closely monitors all aspects of system performance, including the effectiveness of security controls, for compliance with relevant system requirements and addresses any deviations.
- Document Results and Make Recommendations – The Testing Lead documents the results of the UAT in the Test Report. Additionally, the team captures any reported defects in a defect tracking repository or a defect log. The Business Lead closely reviews the results to assess whether the system satisfies business needs and performance measures. The Testing Lead ensures that all reported defects are correctly prioritized, and are mitigated and/or accepted as residual risk by the Project Sponsor or other appropriate authority. The team develops and documents any recommendations for improving system performance.

- **EC-11 Create the Training Plan**

  The Training Plan describes the types of training that will be provided, how the training will be developed and delivered, the schedule, and any other information needed to ensure that users at all levels are prepared to use the system effectively. The amount of training will differ by project type. For example, in a modifications and/or enhancements project, a smaller training footprint will be needed as opposed to a large-scale, COTS/Government-off-the-Shelf (GOTS), Software-as-a-Service (SaaS), or custom-developed solution.

  The Training Plan also outlines the overall objectives, strategy, and activities for designing and developing curricula and supporting materials to train users, operators, administrators, and support staff on the solution. It describes the methods and schedule for implementing the training, processes for evaluation and continuous improvement, and helps to ensure that stakeholders are properly trained for their specific job function.

  The Training Plan should also provide methods of evaluation to determine the effectiveness of the training. This can include pre- and post-training questionnaires and other means of collecting information on the participants training experience, the content that was learned, and the impact of the training on work performance.

- **EC-12 Develop End User Training Content**

  The Business Lead, in conjunction with the IPT, IT PM, and many times the program area stakeholders, develops the training materials, which are any resources created to support the Training Plan including the documentation associated with the deployment of the solution. This includes, but is not limited to, instructor and student guides, audio-visual aids, and computer-based or other media used to disseminate information about the solution to the target audience that is in need of the instruction.

  Operations and maintenance (O&M) personnel may also need training on how to install, operate, and maintain the solution. In this case, the more technical team members would assist in training content development.

  The type of training approach used will vary from project to project. Course developers must understand how people learn and be familiar with different teaching styles, tools, and materials, as well as the organization's culture and the training's audience type. Consideration must also be made to ensure compliance with Federal regulations, policies, and standards as they relate to

items such as Section 508 of the Rehabilitation Act of 1973, 29 U.S.C. § 794d (Section 508), records management, privacy, and security. Training materials may include items such as:

- Seminars
- Presentations
- Workbooks
- Self-study tutorials
- Training instructor guides
- Student training materials
- Audio and visual aids
- User manuals
- Computer-based and other media

After identifying objectives and defining the most appropriate approach for training delivery (classroom, online, workshop, multi-media), the Business Lead, IT PM, and IPT decide on an appropriate duration for the training. It may be necessary to plan, develop, and execute a series of courses to achieve the training objectives. The IPT considers what staffing and skill requirements are necessary to develop and implement the planned training curriculum. The Business Lead should utilize the Training Plan to document the training requirements and how such requirements will be met. Course developers should work with system analysts, testers, and other stakeholders to develop the training curriculum and associated support materials. Outsourcing course development and training to a specialized external training developer is one possible option.

Training material development should begin with the creation of a content outline. Once the training outline is completed, develop the most appropriate training curriculum, with materials, for the target audience. This can be accomplished by identifying the most likely job functions of the typical course attendee and what prerequisite skills/training may be required.

- **EC-13 Conduct Training for End Users**
  In this activity, the Business Lead ensures the training sessions are conducted in accordance with the Training Plan. Training activities are monitored to determine if the training techniques and materials achieve the desired results. Sub-tasks for this activity include:

  - Finalize Training Schedule – The Business Lead completes the scheduling of training sessions for all required personnel and develops the training rosters and attendance sheets for each session. The Business Lead notifies all training participants about the time and location of their respective sessions and ensures that the training facilities and equipment have been reserved in advance.
  - Conduct Training Sessions – The training provider carries out the approved training sessions in accordance with the Training Plan. At the completion of each training session, the Business Lead should request feedback from attendees to ensure that training objectives are being met.
  - Evaluate Effectiveness of Training – The Business Lead, IT PM, and IPT analyze all feedback received from personnel attending training sessions. Based on this analysis,

the team makes recommendations for changes to training procedures or materials to ensure training objectives, as described in the Training Plan, are met.

- Modify Training Materials as Necessary – The Business Lead responds to recommendations made as a result of analyzing feedback. The Business Lead, with input from other IPT members, updates or changes training materials and course procedures to ensure compliance with all approved recommendations received. Changes to the solution itself may also require updating the Training Plan and related courses and materials.

Once the solution is operational, it is important to ensure all users are trained on both current and new processes. This is accomplished by establishing a course curriculum that supports information relevant for initial training as well as recurring refresher training. The IPT should maintain training program metrics and leverage such metrics to continually improve the training curriculum and its supporting materials.

- **EC-14 Develop Operations & Maintenance (O&M) Documentation (if applicable)**
  O&M documentation consists primarily of the O&M Manual and User Manual. The O&M Manual contains information and strategies designed to guide stakeholders in the normal use and maintenance of the IT system. The manual facilitates actions and responses to events that may arise during normal solution operations and maintenance and contains detailed information on the control requirements, scheduling information, and operating procedures necessary to successfully initiate and run the solution. It also provides maintenance personnel with the information necessary to maintain the solution effectively. The manual provides the definition of the software support environment, the roles and responsibilities of maintenance personnel, and the regular activities essential to the support and maintenance of program modules, job streams, and database structures. This activity may not occur for all project types if the solution is a service and O&M activities are conducted by the service provider.
  The User Manual is written using non-technical language and includes the key features and or functions of the solution. The manual should explain how a business user operates the solution and should include sufficient detail and plain language such that all levels of business users can easily understand how to use the solution.

- **EC-15 Create and/or Update Security Artifacts**
  In this activity, the project continues the creation, update, review, and approval of additional security documentation pertaining to the solution. The IT Security Specialist on the IPT is responsible for ensuring the information provided is valid. The need for each of the items will vary by project type and are described below:

Security Assessment and Authorization to Operate (ATO) Request **Note: This requirement may vary depending on the type of information in the system. Security IPT members will help determine what artifacts are needed based on the particulars of the solution.*	Information systems software, hardware and equipment developed by or sold to Federal agencies must undergo a security assessment and receive an Authorization to Operate (ATO) before the system is operational. This is a mandatory requirement. The process was recently revised and now culminates in the signing of the Authorization to Operate (ATO) request by HUD's Chief Information Security Officer (CISO). The artifacts required for the ATO package may vary based on the details of the solution. Generally, the package will include information within artifacts such as: 1) System Security Plan: Provides an overview of the security requirements of the system and describes the controls in place or planned for meeting those requirements. OMB requires all Federal agencies to incorporate a security plan that is

	consistent with NIST guidance on security planning. 2) Security Risk Assessment: Provides the inputs for the development of the Security Plan. 3) Security Test and Evaluation Plan/Report: Security Test and Evaluation (ST&E) (often times referred to as Certification Test & Evaluation) is a requirement within all certification and accreditation (C&A) processes. ST&E is the Independent Verification and Validation (IV&V) of a security control on a system to determine if it was properly implemented and if it is working correctly. While providing this service, organizations must leverage a variety of standards such as NIST 800-115 to properly perform the testing. 4) Business Impact Analysis (BIA): The BIA is a key step in the contingency planning process. The BIA enables the project team to fully characterize the system requirements, processes, and interdependencies and use this information to determine contingency requirements and priorities. The purpose of the BIA is to correlate specific system components with the critical services that they provide, and based on that information, to characterize the consequences of a disruption to the system components. Key steps are listing critical IT resources, identifying disruption impacts and allowable outage times, and developing recovery priorities. 5) Contingency Plan: Contingency planning establishes thorough plans, procedures, and technical measures that can enable a system to be recovered quickly and effectively following a service disruption or disaster. For custom-developed solutions specifically, contingency planning also covers continuity of the availability of the vendor who led the code development activities and to other questions: • What happens if the vendor goes out of business and no longer supports the product? How does HUD conduct knowledge transfer? • What happens if the solution owner wants to switch to another solution? 6) E-Authentication Risk Assessment: OMB requires agencies to review new and existing electronic transactions to ensure the authentication processes provide the appropriate level of assurance. Criteria for an e-authentication application include: 1) is web-based 2) requires authentication 3) extends beyond the borders of the enterprise (e.g. multi-agency, government-wide, or public facing). 7) Memorandum of Understanding (MOU): The MOU defines the responsibilities of the participating organizations involved with a system interconnection. The organizations that own and operate the connected systems should establish an MOU that defines the responsibilities of both parties in establishing, operating, and securing the interconnection. An interconnection could, for example, be a link from the system to Pay.gov. 8) Interconnection Security Agreement (ISA): The ISA is a security document that specifies the technical and security requirements for establishing, operating, and maintaining a system interconnection with an external information system, i.e., residing outside the HUD infrastructure. A system interconnection is defined as the direct connection of two or more IT systems for the purpose of sharing data and other information resources. ISAs are used for planning, establishing, maintaining, and terminating interconnections between IT systems that are owned and operated by different organizations, including organizations within a single Federal agency.

	9) Authorization to Operate (ATO) Request: All IT systems are required to obtain a signed ATO prior to full start up. The ATO represents the formal management approval to authorize operation of an information system and to explicitly accept the risk to organizational operations and assets based on the implementation of an agreed-upon set of security controls.

- **EC-16 Obtain Authorization to Operate (ATO)**
  All IT systems are required to obtain a signed ATO prior to full start up. The ATO represents the formal management approval to authorize operation of an information system and to explicitly accept the risk to organizational operations and assets based on the implementation of an agreed-upon set of security controls.

- **EC-17 Install the Solution/ Submit the Software Release Request (HARTS)**
  If the solution is a system or an application, the software release request is submitted to the HUD Test Center (HTC) for processing. The IT PM or Release Manager submits the HUD Application Release Tracking System (HARTS) request and coordinates with the HTC to obtain approval. The HTC forwards the software release to the team managing HUD's infrastructure for deployment. More specifically:

  - Submit HARTS Request – The IT PM or Release Manager completes an Application Release Request Form in HARTS and submits it to the HTC. The HARTS request must be submitted at least 14 calendar days prior to the scheduled deployment date and include test scripts, documentation, and configuration management instructions. The IT PM, Release Manager, and other IPT members coordinate with the HTC staff to resolve any issues with the submitted request.
  - Obtain Test Center Approval –The HTC Specialist installs the software using the installation instructions submitted by the IT PM or Release Manager and verifies that the software meets all installation and connectivity requirements. Based on the application, the HTC Specialist may perform other tests including stress, field installation, acceptance, functionality, environment impact, security, and deployment before the application is released. If the application receives HTC approval, the Test Center Manager forwards the software release to the team managing HUD's infrastructure for deployment.

  In some projects, the solution is installed at a pilot site. All pilot installations must still use the HARTS request process. The Solution Development Lead monitors the solution during operation at the pilot site and documents the results. The IPT uses the documented results to determine the solution's readiness for the production environment. The Release Manager, Solution Development Lead, and other IPT members support the installation and configuration of the hardware and software. The team facilitates the pilot testing of the solution, assesses feedback, and generates recommendations for improvements and/or deployment to production.

  Key pilot activities include:

  - Ensure Pilot Environment is Correctly Established
  - Execute Implementation Plan and Data Conversion Plan
  - Provide Access to the Test Environment
  - Conduct Pilot Site Training (Optional)

- Operate Solution in the Pilot Environment
- Document Results and Make Recommendations
- Make Decision to Move Pilot Into Production

Whether as the result of a pilot or not, the solution is deployed into the production environment. The Release Manager posts system alerts regarding the scheduled deployment. The HUD infrastructure team releases the solution into the production environment. The IPT, specifically the Business Lead and Solution Development Lead verify the installed solution meets expectations.

Detailed sub-tasks include:

- Notify Affected Organizations –The Release Manager notifies the affected organizations and user groups to ensure they are aware of the cutover date for the production release. The Release Manager ensures that alerts are posted on applicable HUD intranet and internet sites accessible to internal and external stakeholders. The alerts communicate the release schedule and any expected disruptions to existing systems.
- Ensure Production Environment is Correctly Established – The Release Manager coordinates with HUD's infrastructure team and any other relevant stakeholders to ensure that the production environment is ready for the installation of the hardware and/or software. If applicable and appropriate, existing related solutions are taken offline to facilitate the production release.
- Execute Implementation Plan and Conversion Plan – The IT PM and Release Manager coordinate with HUD's infrastructure team and any other relevant stakeholders to install the solution in the production environment. They ensure that the installation is carried out in accordance with the procedures described within the installation release notes and Implementation Plan. The IPT also coordinates and verifies the loading and conversion of any data required to support operation of the solution. The procedures described in the Data Conversion Plan are used to guide the data conversion activities.
- Conduct Operational Readiness Review – The Release Manager coordinates with HUD's infrastructure team to provide limited access to the production environment for testing. The designated testers (typically, representatives of the development team and the business community) conduct tests to verify correct integration and functioning of the installed components. The objective is to determine if the IT solution that has been installed is ready for release into the production environment for sustained operations. At the discretion of the Project Sponsor or the governance bodies, this may be a more formal and detailed review.

- **EC-18 Submit the Request for Decommissioning of Legacy System(s) (if applicable)**
  For the decommissioning of a system in the Decommission project type, the primary activity within this phase is to submit the request for decommissioning. The Application System Retirement Request describes the work needed to remove a HUD mainframe application when the application is no longer useful. This document needs to be submitted to the "DPPD Release Request" mailbox when completed. The IAS Inactivation Form data (request for inactivation) will

be entered directly into the IAS application in WebCenter. This form is used to remove a HUD open source application when the application is no longer useful.

- **EC-19 Initiate the Deletion of the SORN (System of Records Notice) (if applicable)**
  A System of Records Notice is prepared in accordance with the requirements of the Privacy Act of 1974. This activity only applies to the Decommission project type and those systems with a System of Records Notice (SORN) published in the Federal Register. If the records retention schedule requires that the system records be retained for a specified period after the system no longer exists, the SORN may not be deleted until after the records retention schedule has been satisfied. The notice of deletion includes:
    - The system identification number/code and name
    - The reason for the deleting the SORN from the Federal Register
    - If the system is eliminated through replacement or integration, an identification of the successor system or systems
    - The effective date of the deletion
- **EC-20 Procure Resources for O&M Activities**

  In this activity, the project procures resources specifically for the O&M phase of the solution's life cycle. The approach to managing O&M will differ based on the project type chosen.
- **EC-21 Schedule and Hold Phase Control Gates**
  In order to pass through the Execution & Control Phase to the Close Out Phase, a project team needs to receive approval from the TRC through one or more control gate reviews. Depending on the project type, project approach (e.g., iterative or agile development for custom-developed solutions), project health/ performance, and other characteristics, more control gates may be deemed necessary by the TRC, the governance entity that conducts control gate reviews. For example, if a project is using an iterative, incremental development approach, the TRC may require reviews over the series of mini-design and development efforts. The Operational Readiness Review, the control gate held before a system is deployed into production is mandatory.

  During this activity, the IT PM schedules a control gate review meeting using the TRC's scheduling process. The lead time on this effort is approximately two weeks which should be built into the project schedule lead times. The two weeks provides the TRC members the chance to review the work completed and prepare comments ahead of the meeting. During this activity, the IT PM should also ensure all deliverables are signed and reviewed by the proper team members prior to submission.

4. Project Type Differentiators

Execution & Control Phase differentiators may exist based on the type of project the team is following to achieve the desired solution. The table below summarizes where differences exist by project type.

PPM V2.0 Project Type	Execution & Control Phase Differentiators
Modifications/Enhancements to Existing System	Similar to the Planning Phase, many opportunities exist to consolidate content into fewer deliverables based on the nature of the modifications and/or enhancements. For this project type, a matrix is used to classify the projects by project cost and by a

	summary level (high, medium, low) classification of project complexity, project risk, and mission criticality. Based on where the project falls, different guidance is offered. Most of the guidance is also focused on updating current documentation if the modifications and/or enhancements affect what is in place. For example, the Interface Control Document may not be required if the modifications and/or enhancements do not affect existing interfaces. As a result, many deliverables are only needed if updates need to be made. Standard deliverables would typically include an Implementation Plan for the larger-size efforts and evidence of a Test Plan and approach and test reports highlighting the results. Even for IT Security, items may not need to be updated if the changes made to the solution do not affect the existing security determinations.
Custom Development	For small, mini-development projects, the project team can review the list of deliverables expected for the phase and submit a recommendation for tailoring that makes the work more commensurate with the size and scope. For example, in a smaller custom development effort, the Training Plan activities can be incorporated as part of the implementation activities depicted in the Implementation Plan.
COTS/GOTS	Content associated with the planning of training activities for a COTS/GOTS project can be combined with the training reference in the Implementation Plan. In COTS/GOTS projects, the solution provider may have to provide documentation that satisfies several of HUD's security requirements. When this occurs, that information may potentially be substituted in lieu of HUD-specific documentation. The IT Security Specialist on the IPT should instruct the team on where the potential may occur.
Software-as-a-Service (SaaS)	If a SaaS project is one that leverages a Federal government shared services solution, e.g., shared service line of business, many of the security requirements may be documented at the lead agency. Projects may be able to leverage or substitute that information in lieu of HUD-specific documentation. The IT Security Specialist on the IPT should instruct the team on how to proceed. Also, for SaaS projects there is no need to assemble an Operations & Maintenance (O&M) Manual since HUD will not be involved with the maintenance of the IT solution. Content associated with the planning of training activities for a SaaS project can be combined with the training reference in the Implementation Plan. Test planning is the practice of preparing for the testing phase of

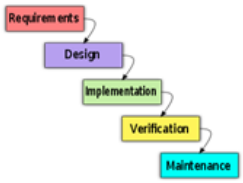
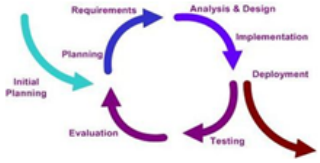
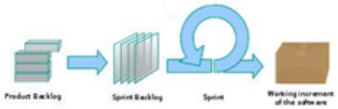
	product development/configuration to ensure that the solution/service satisfies the customer's requirements as agreed upon in the requirements and design specification documents. Test Reports summarize the results of the different types of testing performed for an automated system (e.g. unit testing, system testing, user acceptance testing, ad hoc testing, regression testing, performance and/or stress testing, and end-to-end testing). If the SaaS application requires effort on HUD's side for integration and/or adding functionality to HUD applications, then testing will be required on that functionality and any interfaces, etc. If the vendor is only performing activities such as provisioning HUD system administrators and activating the hosted system licenses, then testing is minimal (conducted from the vendor) and no documentation is required for PPM, unless otherwise directed by the TRC. Be aware that with a SaaS application, periodic vendor releases may entail minimal testing activity on the customer side. Several other streams of work may or may not be applicable in a SaaS project such as the: • Data Conversion Plan • Interface Control Document (ICD) • Technical Design Document In each instance, the IPT should use good judgment in making the determination for their proposal in the Project Tailoring Agreement (PTA). For example, the ICD presents the information required to define the SaaS application interface(s) with other systems (if applicable), as well as any rules for communicating with those interfacing systems. If there are no interfaces with other systems, then there is no need for this work to be performed. From a data conversion perspective, SaaS implementations tend to be simpler and thus the process is usually more condensed. That is, the standard process for SaaS data conversion is to convert the data once and to convert only baseline information. More detailed data imports can be done but are typically outside the norm. This planning effort will not be needed if there is no initial migration/ conversion of data to the tool. A SaaS implementation will require less design effort and decision-making given that the web-based software already exists and may not allow for customization or significant configuration. SaaS implementation efforts, however, may still require design activities to ensure that data conversion and implementation methodologies and tools are defined and that system interfaces are designed.
Decommission	Execution & Control Phase activities for a Decommission project are aligned with the actual submission of an inactivation or retirement request for the application; as a result, only this request is expected

	during the Execution & Control Phase of this project type. Two types of forms exist – one for HUD mainframe applications and one for HUD open source applications. In addition, the project team may need to delete a System of Records Notice (SORN) and should work with the privacy representative on the IPT to determine if this should occur.

5. Iterative Development Differentiators

Iterative and incremental development utilizes both an iterative design approach and other rapid methodologies for development. The approach has been widely suggested for large development efforts and is currently promoted as the optimal path to take when executing custom development projects in the Federal government. Iterative development combines both project management and software development practices and focuses on delivering key business value quickly through "sprint" cycles.

The most popular approaches project teams take when delivering a custom-developed solution include:

	Waterfall	Iterative	Agile
Overview	▪ Majority of software features delivered in one release at the end (often after 3-12 months) ▪ Sequential process where each stage is completed before proceeding to the next 	▪ Working solution is extended and refined through a set of incremental changes ▪ Multiple releases managed in parallel with each at different points of development lifecycle 	▪ Adheres to basic Iterative principles (e.g., refinement of working solution) ▪ Places even greater emphasis on flexibility and co-development of product with product owner 
Key differences	▪ No scope changes due to sequential execution of development phases ▪ Testing occurs once development is completed	▪ Scope is flexible but changes do not occur mid-sprint ▪ Testing occurs during defined phase at end of each iteration	▪ Scope changes occur at any time based on business feedback ▪ Testing is performed continuously during development
When to use	▪ Large, complex systems with high technical risk ▪ Rollout of new architecture/ replacement of core technologies ▪ Premium quality prioritized over predictable timelines	▪ Complex development tasks (e.g., front-end applications with numerous user interactions) ▪ Known technology/architecture ▪ Volatile/changing requirements ▪ Fast time to market required	▪ Numerous, small feature increments ▪ Known technology/architecture ▪ Volatile/changing requirements ▪ Fast time to market required

Source: NGMS Iterative Operating Model and Playbook, July 2013

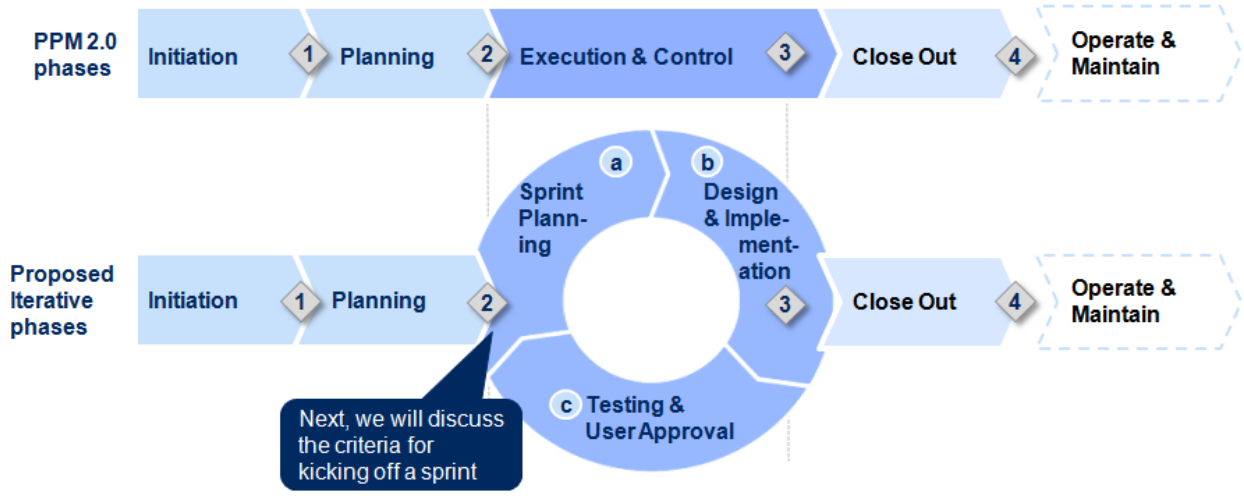
PPM V1.0 followed a more traditional waterfall approach to custom development. With the changes in the industry, PPM V2.0 has been constructed to account for all three types of development including the more popular iterative and agile approaches.

The combination of the PPM V1.0 Design Phase, Execution of Solution Phase, and Deployment Phase into one Execution & Control Phase in PPM V2.0 gives projects the flexibility to tailor with the TRC the amount of times they need to come to a control gate as well as what deliverables are expected at each. In an agile environment, for example, the TRC may want to have control gate check-in meetings at various times throughout the deployment of sprints to check progression.

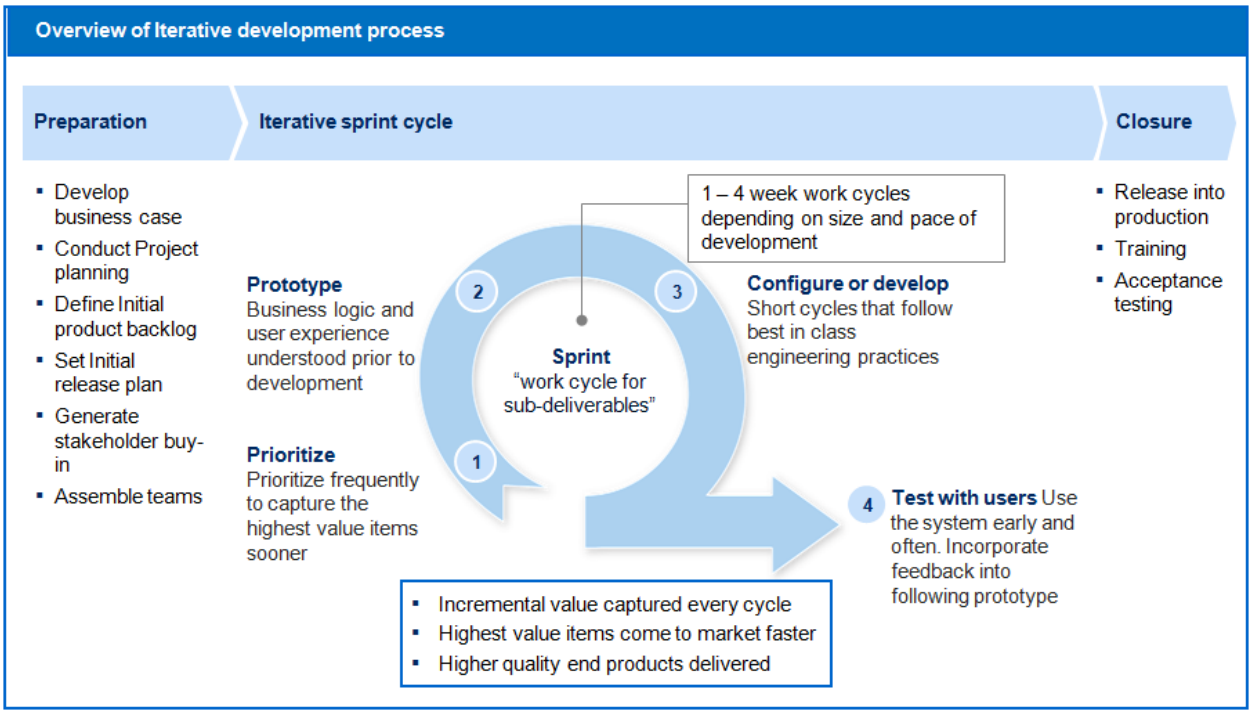
When a project follows an iterative or agile approach for custom development, the major impact to the Execution & Control Phase is that the project team will not be performing project activities in a sequential fashion and will leverage sets of sprints. As such, the control gate format needs to be flexible where, after learning the project approach and implementation plan; the TRC can inform a project team when the desired control gates should be held for the phase. In addition, many of the deliverables produced within this phase may not be fully complete. The sprint cycles, for example, will each have their own set of test planning and execution activities which will be run several times. The testing strategy should allow for the interim releases associated with sprints. This is in contrast to the more traditional waterfall approach where user acceptance testing is done at one point during the project life cycle.

Also, the design of the solution may be changed during the sprint process and as a result, the solution technical design may not be completed fully at the beginning of the phase (as opposed to design activities for a waterfall approach where the major deliverable and work effort is the determination and finalization of the solution technical design). Again, as mentioned in the Planning Phase User Guide, to initiate a development sprint, projects are expected to have the business requirements mostly final and only initial functional requirements completed. The sprint cycles will help inform when the business requirements can be final as well as the functional and technical requirements. The TRC therefore cannot expect a final version of any requirements deliverable at the Project Baseline Review. The Requirements Definition document then would be submitted at an early point within the Execution & Control Phase.

The graphic below depicts the incorporation of the sprint cycle activities into the Execution & Control Phase of PPM V2.0. The second graphic details key activities within the life cycle of a sprint:



Source: NGMS Iterative Operating Model and Playbook, July 2013



Source: NGMS Iterative Operating Model and Playbook, July 2013

6. Artifact Subject Matter Experts and Signoffs

The following table lists the resulting set of deliverables that may get completed as part of the Execution & Control Phase based on the project type being followed. In addition, it references the actual source template content owner and the artifact-by-artifact signoffs needed before submission for a control gate. The purpose of signoffs is to ensure that the IPT member(s) who are responsible and accountable for the specific functional knowledge support the work effort and resulting deliverable that the work effort produced.

PPM V2.0 Execution & Control Phase Artifacts	Subject Matter Expert (SME)/Template Owner	Signoffs Prior to Control Gate Submission (SME)
Technical Design Document	OCRPM – Enterprise Architecture	• Enterprise Architecture IPT • IT Project Manager • Lead Solution Architect
Implementation Plan	OCRPM – EPMD/ PMO	• IT Project Manager • Release Manager
Data Conversion Plan	OCRPM – Enterprise Architecture	• Enterprise Architecture IPT • IT Project Manager • Lead Solution Architect
Training Plan	OCRPM – EPMD/ PMO	• Business Lead • IT Project Manager
Change Management Log	OCRPM – EPMD/ PMO	• IT Project Manager • Project Change Control Board (CCB) Designee
Test Plan/ Test Reports	OCRPM – EPMD/ PMO	• IT Project Manager

		• Business Lead • Requirements Lead/ Testing Lead
Interface Control Document	OCRPM – Enterprise Architecture	• Enterprise Architecture IPT • IT Project Manager • Lead Solution Architect
User Manual	OCRPM – EPMD/ PMO	• Business Lead • IT Project Manager
Operations & Maintenance Manual	OCRPM – EPMD/ PMO	• IT Project Manager • Solution Development Lead • Business Lead
Security Artifacts	IT Security	• Work with Security IPT member to determine

Note: All items submitted will require a summary-level signature from the IT Project Manager. If the artifact is a project management document by nature, then it will call out a specific signature required by the IT Project Manager at the artifact level.

7. Program vs. Project Level Artifacts in the Execution & Control Phase

It is important to recognize that some of the outputs of activities performed during a project can be leveraged and implemented at a level higher than the project level. At HUD, this can mean a "program-level" or "initiative-level." Many times teams spend unnecessary efforts producing documentation at too low a level, when in fact, the information can be leveraged at a higher level. The table below outlines artifacts that are appropriate for leveraging across a program or initiative, or even an investment depending on the scale. Be sure to note in the PTA when the project intends to leverage an artifact in this fashion.

PPM V2.0 Initiative-Level Candidate Artifacts	Rationale
Data Conversion Plan	The Data Conversion Plan describes the strategy, preparation, and specifications for converting and/or migrating data from the source system or systems to the new solution. The structure of the initiative or program will dictate the potential to document the plan at a summary level with specifics related to sub-components called out as needed or at a project level if the projects themselves represent independent solutions requiring data conversion activities.
Implementation Plan	The Implementation Plan is an outline of the activities necessary to ensure that the solution is available for use by its end-users as originally planned, including planned releases. Depending on the scope and structure of the initiative or program, this deliverable could include the overarching plan for implementation with specifics related to sub-components called out as needed. The project team should use its best judgment in determining the tradeoffs between documenting the implementation at a summary level vs. a project level and be

	prepared to justify the recommendation.
User Manual	The User Manual explains how a business unit operates the solution and should include sufficient detail such that all levels of business users can easily understand how to use the solution. Depending on the scope and structure of the initiative or program, the User Manual can be at the initiative- or program-level for an overall integrated system if the subcomponents are being managed as individual projects.
Operations & Maintenance (O&M) Manual	The O&M Manual contains information and strategies designed to guide stakeholders in the normal use and maintenance of the IT solution. It facilitates actions and responses to events that may arise during normal solution operations and maintenance. Similar to the User Manual, depending on the scope and structure of the initiative or program, the O&M Manual can be at the initiative- or program-level for an overall integrated system if the subcomponents are being managed as individual projects.

8. What's Needed for the Next Phase?

The TRC, based on project type, project health, and other characteristics, will determine how many times a project should come before the committee for review. This most likely will occur during the Execution & Control Phase based on the project type approach and software development approach (if applicable). One control gate must consist of an Operational Readiness Review. If a project is using an iterative, incremental development approach, the TRC may require reviews over the several series of mini-design and deployment efforts.

Once a project has received a "pass" or "pass with conditions" vote from the TRC for the Operational Readiness Review as well as other reviews required within the phase, the project can begin its deployment and project close out activities. In a "pass with conditions" vote, the TRC will determine how and when it would like the project to address the deficiencies identified. In this phase, the likely option is to require projects to address the deficiencies prior to completing any other project-related tasks and activities since the next phase includes project close out activities.