SYSTEM DEVELOPMENT METHODOLOGY (SDM)

September 6, 2006
Version 2

REVISION LOG

Date	Revision/Created by	Description
3/1/2005	Rebecca Bolton	Edited OIT Interaction description on page 25 to meet the ITPRC critical rating. Specifically, stated that project managers should work with other OIT Divisions, and other departments/agencies if applicable, during project planning to understand the support needs during the Integrated Testing Phase.
6/20/2006 9/07/2006 9/15/2006	Mark A. Blanchette Rebecca Bolton Theresa Pare-Curtis Howard Roundy	Updated to incorporate preliminary security policies that impact the System Testing Phase.
9/15/2006	Leslie Williams	Changed from Best Practice to Procedure document

FINAL

TABLE OF CONTENTS

1.   PURPOSE

This document establishes a common and uniform standard for all application development for OIT Partner Agencies regarding the System Development Methodology (SDM). The SDM expands upon the Office of Information Technology (OIT) – Agency Software Division (ASD) – system development life cycle (SDLC) model for system development projects.

2.   BACKGROUND

Merging common and applicable components of existing SDM models and methodologies, ASD developed the SDM using the SDLC as the foundation for the methodology. The result is a life cycle model and system development methodology that is appropriate across state agencies.

This is a living document. Therefore, while it provides a description of the conceptual phases for ASD systems development projects along with the detailed methodology processes, deliverables, tools, and approvals, it is not intended to be representative of a mature SDM.   A fully mature SDM will evolve over time as the OIT-ASD organization matures.

3.   STANDARD

This standard describes the ASD Systems Development Methodology (SDM) that provides:

1) The methodology to build consistent and standard software applications and IT systems.
2) A systematic approach, focused on minimal rework and optimal performance that acts as the foundation for the design, development, test and implementation of software applications within ASD.
3) Alternatives to using the templates and processes within the SDM to meet the needs of different types of system development projects within ASD.
4) The ability to create homogeneous reporting points that will enable ASD to manage its project portfolio and resources with greater efficiency and effectiveness.
5) A framework that is easily integrated with OIT-wide processes, to reduce redundancy and streamline efforts.
6) A standard available to agencies that have yet to be phased into ASD.

Systems Development Life Cycle

Governing any systems development methodology is the defined life cycle of that development process. ASD has chosen to adopt a ten-phase development life cycle from project initiation to project wrap-up (shown below in Figure 1).

Main SDLC Phases

Request Initiation 01	→	Request Evaluation & Project Planning 02	→	Functional Design 03	→	System Design 04

Construction & Unit Testing 05	→	Integration Testing 06	→	System Testing 07	→	Acceptance Testing 08

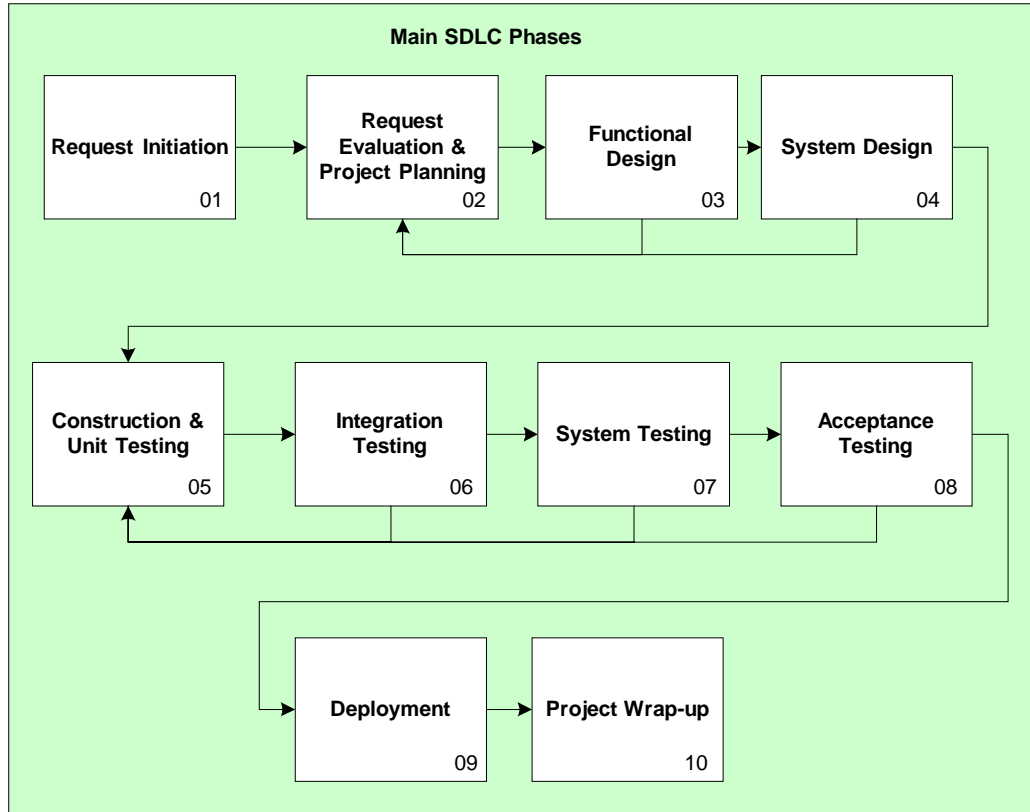| Deployment 09	→	Project Wrap-up 10

Figure 1. The process flow delineates each SDLC phase as a box with a corresponding number indicating typical sequence. Arrows show how a system development project should flow between phases.

Roles and Responsibilities

The success of any project is largely dependent upon the project team. A clear understanding and delineation of roles and expectations of team members is a substantial yet necessary task.
At the most generic level, OIT system development projects require the involvement of both agency and technical teams. Regardless of project type or vendor involvement, the anticipated participation rates of the agency team and technical team remain consistent; The agency team is heavily involved during project initiation, definition and acceptance testing while the technical team is mostly concentrated on developing the technical solution. Although our Agency partners are working towards completing the necessary activities within the Request Initiation Phase of the life cycle with little input from the Technical team, in practice Technical Role participation is sometimes needed.

Agency and OIT participation is depicted generically in Table 1 below. Agency and OIT participation varies depending upon a number of factors such as the project type, size, and complexity and it is difficult to define a "one size fits all" approach. It is understood that each Agency, ASD Team, and Project is somewhat unique and participation levels of Agency and Technical team members vary.

Throughout the testing phases, the project requires the expertise of the Agency to fully represent the requested requirements and ensure that the solution will adequately address the original agency business need. Agency representation during the Acceptance Testing phase is vital.

	Business Role	Technical Role
Request Initiation	80%	20%
Request Evaluation and Project Planning	40%	60%
Functional Design	45%	55%
System Design	40%	60%
Construction and Unit Testing	15%	85%
Integrated Testing	15%	85%
System Testing	10%	90%
Acceptance Testing	80%	20%
Deployment	40%	60%
Project Wrap-Up	20%	80%

Table 1. OIT system development projects require both agency and technical involvement at various stages of the project. It is the combined effort of both teams that ensures a successful project.

System development projects sometimes require outside vendor assistance within the project life cycle. Since vendor participation varies depending upon the project type, size, and complexity it is difficult to define a "one size fits all" approach. It is understood that each Agency, ASD Team, and Project is somewhat unique.

The three most likely project scenarios have been identified to help provide a baseline for establishing accurate project estimations and stakeholder expectation setting in regards to team member participation. This information should be used as a guideline, not as a final conclusion.
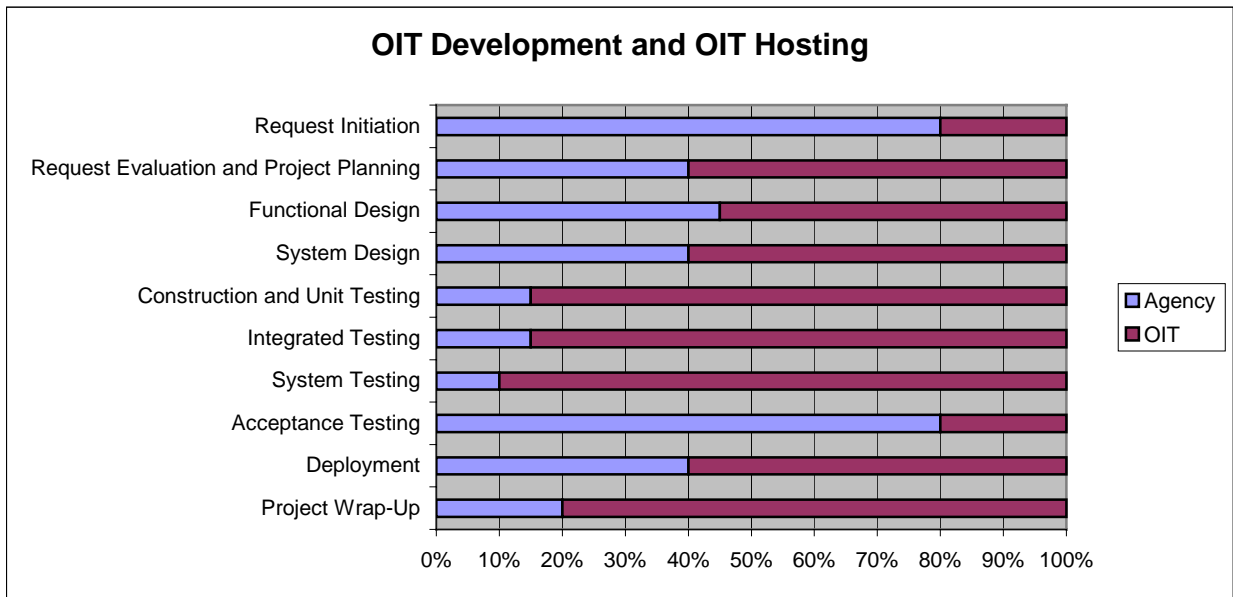
Figure 2. This approach is typically used when the entire project is going to be handled without the use of any outside vendor partnerships. The Office of Information Technology handles the entire technical project responsibilities. The development, hosting and on-going maintenance of the technical solutions will remain within the state and managed by the Office of Information Technology.
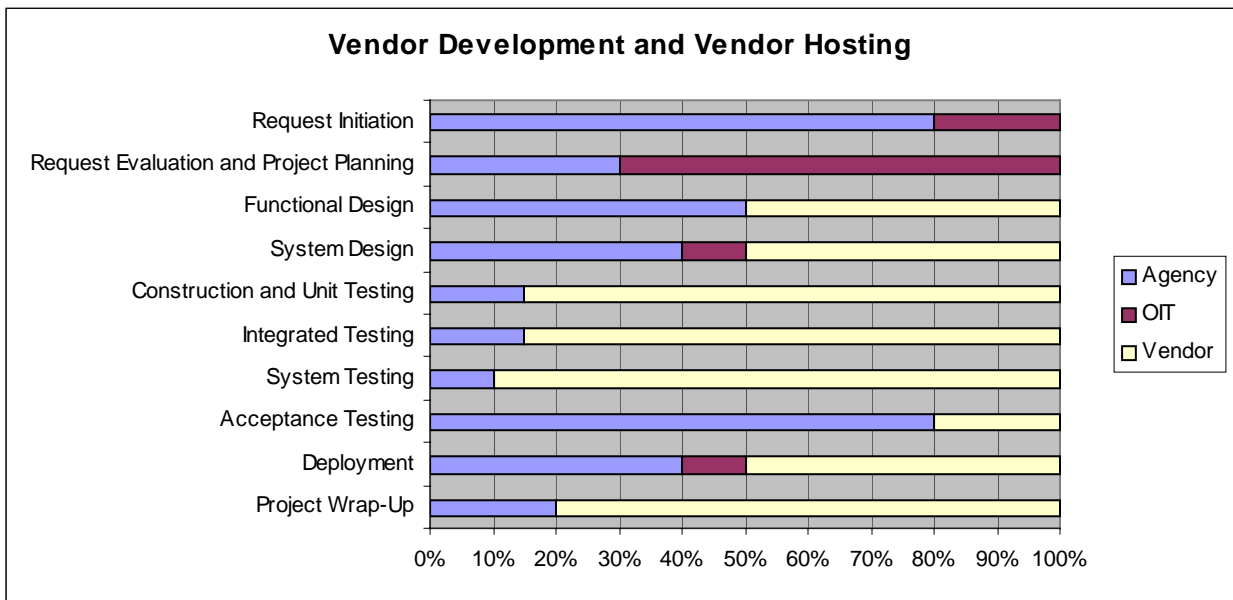
Figure 3. The Vendor Development and Vendor Hosting project scenario may be used when an IT project requires specialized skills and/or experience that internal technical staff do not have; the project is on a very tight schedule and internal resources are dedicated to other projects; or for a variety of other reasons. This model is typically used when the entire project is going to be handled by an outside vendor to satisfy the agency need. The Vendor will perform the development, hosting and on-going maintenance of the technical solutions.
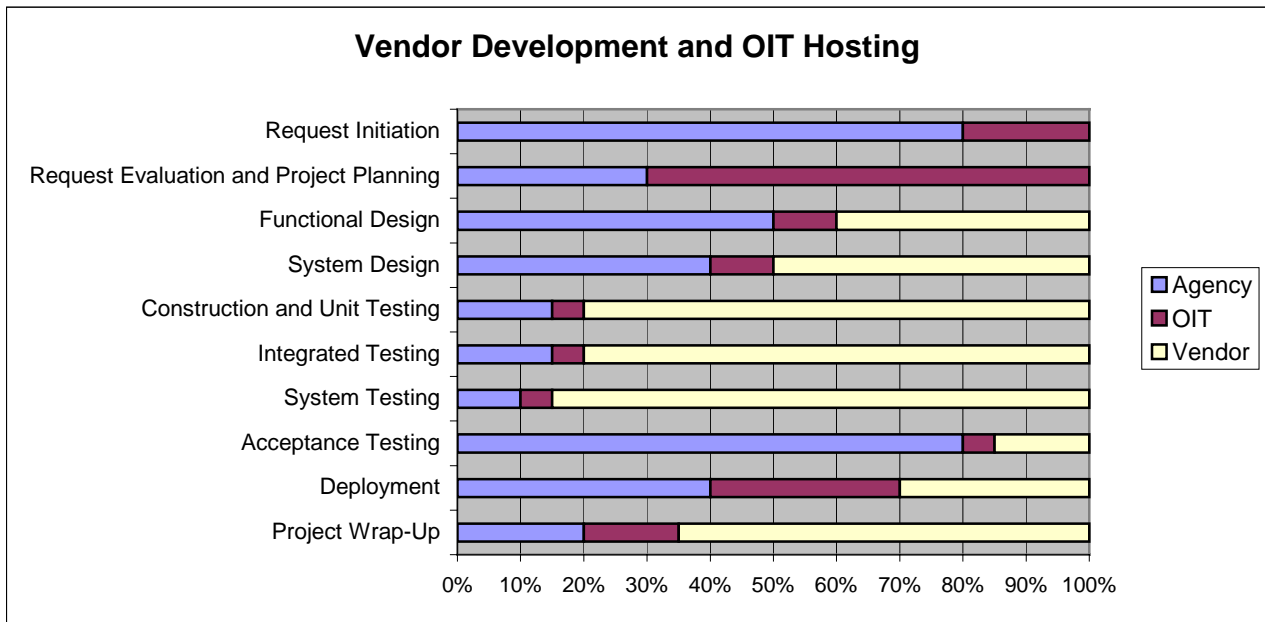
Figure 4. This project scenario is often used when seeking a combined approach for the technical solution. The Development is outsourced to a Vendor; and OIT staff provides ongoing maintenance and support. This model is often used when available funds for the project are limited, Hosting is not offered by the chosen vendor, or OIT offers a significant advantage from the Hosting perspective. The distinction in this scenario is that OIT participates in each phase of the system development life cycle, albeit to a lesser degree than with the OIT Development and OIT Hosting alternative.

OIT Interaction and Hand-off Points

Project success is dependant upon addressing logistic issues during the initial phases of the project and not waiting until the technical specification design phase. As the first OIT Division involved in many Agency project request, ASD is responsible for involving other OIT Divisions and Bureaus. Involving representatives from other OIT Divisions and Bureaus ensures all subject matter experts have reviewed vital project components, e.g. hardware purchases, network requirements, operational and help desk support.

The subsequent sections of this document that detail SDM standards by the ten phases of the SDLC also contain information that explains when and how to engage the various OIT Divisions and Bureaus. These sections are titled *"OIT Interactions"*.

Please note: All OIT Interaction and Hand-off points are indicated throughout the SDM by the preceding icon. It is expected that ASD will initiate communication at the interaction points. In the event that an interaction point results in the identification of additional tasks, these tasks are to be included in the ASD project plan. ASD project managers are required to incorporate OIT Interaction activities into every project, either through direct inclusion or by "linking", of these subproject tasks into the primary project schedule. Team member groups such as OIT Divisions and Bureaus and Vendor Groups are required to provide task list submission, timelines, task management, resource assignment and management as well as status updates to the ASD project manager.

Request Initiation--01

Supporting Materials/Artifacts

Work performed by the agency prior to OIT involvement in the effort.

```
              SDLC Phases
 ┌──────────────────┐  ┌────┬────┬────┐
 │   Phase--01      │  │ 02 │ 03 │ 04 │
 │                  │  ├────┼────┼────┤
 │ Request Initiation │ │ 05 │ 06 │ 07 │
 │                  │  ├────┼────┼────┤
 │                  │  │ 08 │ 09 │ 10 │
 └──────────────────┘  └────┴────┴────┘
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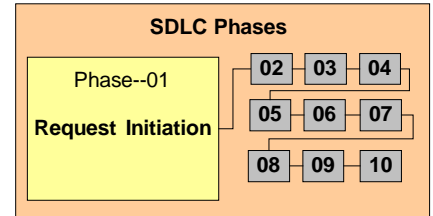
Purpose

The Request Initiation Phase is a business driven process step that defines, from an Agency perspective, the purpose, goal, and scope of the project, problem fix, enhancement, maintenance, upgrade, or change. The Request Initiation Phase also identifies the Key Stakeholders with the following main objectives in mind:

- To describe clearly the request from an Agency perspective, and to document the goals, the justification, the risks, and the success criteria
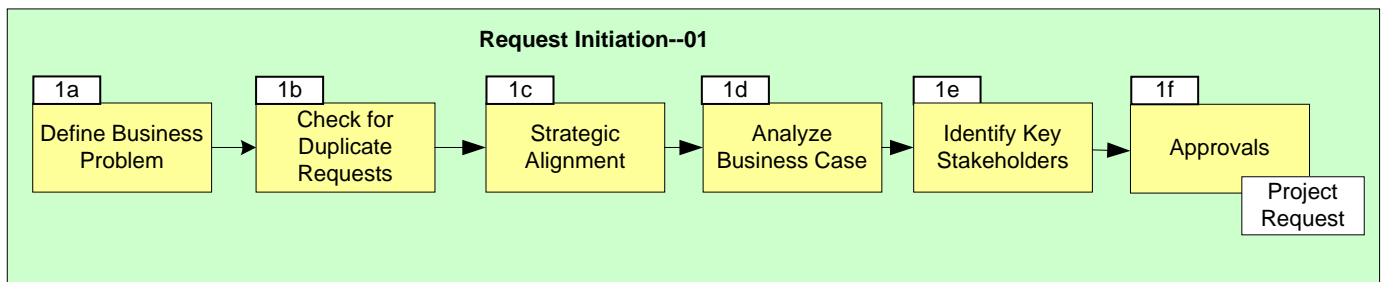- To provide an understanding of the business justification for the work, showing results of a high-level business analysis of the request
- To obtain approval from any existing Agency Change Approval Board/IT Advisory Committee/IT Managers Council/IT Steering Committee to continue with functional and technical specification, analysis, and planning work

At this time ASD has multiple request intake tools as indicated in the Automated Toolset Listing on the following page.

Detailed Process Flows

Business Process documentation and/or work-flow redefining may be considered or initiated by the agency to more fully understand the business needs, and discover possible non-automated or non-technical solutions to address the business problem. If a technical solution is likely, the agency may even initiate business process redefine in preparation for the business change that will occur with the implementation of a new technical solution.

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┌────────────────────────────────────────────────────────────────────────────────────┐
│                           Request Initiation--01                                      │
│  ┌1a──────┐   ┌1b──────┐   ┌1c──────┐   ┌1d──────┐   ┌1e──────┐   ┌1f──────┐          │
│  │ Define  │→ │ Check for│→ │         │→ │ Analyze │→ │Identify │→ │ Approvals│        │
│  │ Business│   │Duplicate │   │Strategic│   │Business │   │  Key    │   │          │      │
│  │ Problem │   │ Requests │   │Alignment│   │  Case   │   │Stakehold│   │          │      │
│  └─────────┘   └─────────┘   └─────────┘   └─────────┘   └─────────┘   └──────────┘      │
│                                                                          ┌─────────┐   │
│                                                                          │ Project │   │
│                                                                          │ Request │   │
│                                                                          └─────────┘   │
└────────────────────────────────────────────────────────────────────────────────────┘
```

Activities

    1a. Define Business Problem/Opportunity
- Document the business problem or opportunity and describe the request in adequate detail to allow analysis from an agency perspective.
- Document the agency justification for initiating this request.
- Describe the agency priority for this request.

    1b. Check for duplication of requests within Agency

    1c. Strategic Alignment
- Verify alignment with agency and strategic information technology plan (SITP).

    1d. Analyze business case
- Impacts to other organizations, departments, agencies, and external entities
- Business justification feasibility
- Preliminary budget analysis
- Required timeframes for application implementation/modifications
- Preliminary technical review as needed

    1e. Identify Key Business Stakeholders
- Customers
- Other partners, such as affected State Agencies and/or political subdivisions (NH Municipal and county governments)

    1f. Obtain Approvals
- Obtain agency approval from the appropriate agency unit sponsor(s) and the change/planning board to begin a more detailed IT evaluation and planning effort for this request.
- If applicable, use existing enterprise change management process to review, validate, prioritize, and coordinate the request at the Agency level.

*Validate these requirements with input from other OIT Divisions and Bureaus.

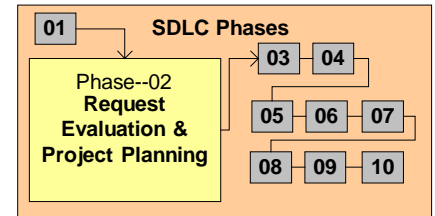**Additional Information**

Automated Toolset Listing	Word Processing Tools Infrastructure Change Request System Track-IT—Request Tracking System (DOS) MS Access—Customized request tracking systems (DOT) CRTS—Lotus Notes Change Request Tracking System (DHHS)
Templates	N/A
Reference Materials	N/A

Request Evaluation and Project Planning--02

Supporting Materials/Artifacts

Request must be officially submitted to ASD. Official request submission may vary by requester, request intake tool and/or most likely impacted OIT resources. The definition of management procedures and processes around request intake are being further defined and will emerge as the ASD matures.

```
01          SDLC Phases
                        03   04
Phase--02
Request              05   06   07
Evaluation &
Project Planning     08   09   10
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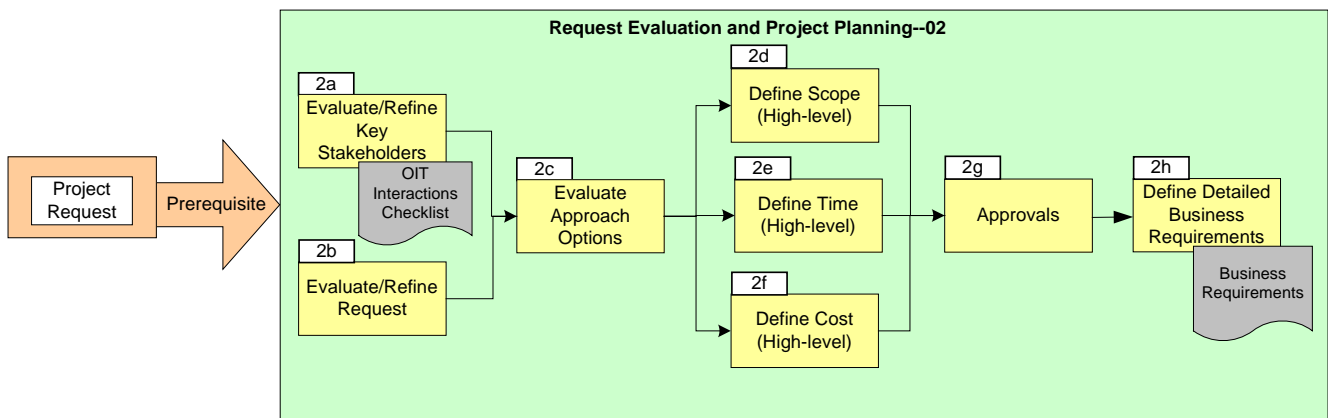
Purpose

To evaluate and transform the Business Requirements into an ASD Development Project. The focus is:

- To ensure that the Key Stakeholders properly understand and consistently agree upon the detailed business requirements
- To analyze the business requirements, the project situation, the constraints, and the conceptual project strategy thereby establishing project feasibility and gaining an initial understanding of the risks
- To assist the Key Stakeholders in deciding whether or not to continue the project.
- To obtain approval from whatever entity is managing the project portfolio and/or the change management system to initiate this project
- To obtain approval from and provide appropriate information to the Office of the CIO and OIT Divisions and Bureaus utilizing Project Integration Bureau processes.
- To ensure that the Key Stakeholders (Sponsor, Director, Commissioner, etc) buy into the project and are committed to its success by obtaining approval from the sponsor. (See Section 5, *Referenced Documents* – specifically, *Project Collaboration Policy)*

Detailed Process Flows

```
                    Request Evaluation and Project Planning--02
                                            2d
        2a                               Define Scope
     Evaluate/Refine                     (High-level)
        Key
     Stakeholders
                  OIT        2c          2e
 Project          Interactions  Evaluate   Define Time
 Request  Prerequisite  Checklist  Approach   (High-level)    2g          2h
                        Options                            Approvals   Define Detailed
        2b                                                              Business
                                         2f                            Requirements
     Evaluate/Refine                  Define Cost                        Business
        Request                       (High-level)                      Requirements
```

<u>Activities</u>
  2a. Evaluate/Refine Key Stakeholders
  - Expanded Stakeholder Identification
  - Specify roles and responsibilities
  - Start to create a resource plan
  - Start to create a communications plan

  👥 Other OIT Divisions are, to varying degrees, stakeholders in any given ASD project. Regardless of the impact the agency believes the project may have on the state's technical infrastructure and/or support services, representatives from these OIT units should be notified at this stage. An early review will determine their necessary involvement—either as suppliers of basic information such as hardware standards, or as consultants who become project stakeholders and are present throughout the project life cycle.

  👥 To determine the appropriate level of involvement, the proper ASD representative can utilize the OIT Interaction Checklist. This questionnaire guides the project leads through a series of communication checkpoints that will identify who to contact within other OIT Divisions and Bureaus. At minimum, email exchange may be sufficient for smaller projects; larger efforts may require that other OIT Divisions and Bureaus be included in any review meetings and project planning efforts.

  2b. Evaluate/Refine Request
  - Gather and analyze business and technical data
  - Check for duplication of Request at the OIT Enterprise level
  - Review business process design and update it if appropriate
  - Anticipated benefits analysis and resulting recommendations
  - Screen and evaluate the request at a project level – to be done by the change control board, the IT leader, the project review board, or the relevant project portfolio management entity.[1]

  👥 Other OIT Divisions and Bureaus may need to review the business requirements, depending on the relative impact on OIT infrastructures, support operations and contracting requirements. The OIT representative, with the Agency Sponsor's input, should complete the *OIT Interactions Checklist* to ascertain who within OIT should be contacted. Relevant documentation may need to be forwarded to these OIT contacts.

  2c. Evaluate Approach Options
  - Complete Request for Information (RFI) documentation if necessary
  - Conceptual cost/benefits and alternative analysis and resulting recommendations
  - Reference existing procurement resources on the OIT Website, http://toolbox.oit.nh.gov/procurement/index.html

  👥 Include other OIT Divisions and Bureaus, as they are valuable resources when determining options. Given their broad understanding of the overall state information technology environment, and purchasing/contracting requirements, they are well suited to make cost-effective recommendations that consider best practices, state standards, resource sharing and economies of scale that may benefit the project. ASD staff should meet with all project Stakeholders from other OIT Divisions and Bureaus to discuss their recommendations.

  2d. Define Scope (High-level)
  - Specification of Business Deliverables
  - Create Project Work Breakdown Structure (WBS) construction. Please note that this is separate from the Solution WBS as the Project WBS includes information on how

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[1] Existing organizational entities can address this project-level screening. This is not a duplicate effort. The intent is simply to screen project requests, from a business perspective, before development work begins.

the team navigates through the design phases. The solution WBS typically is limited to how the team develops the solution
- Set up scope management processes
- Develop quality assurance requirements and plan

One purpose for including other OIT Divisions and Bureaus at *Phase 02* is to ensure that the proposed project is feasible and of reasonable risk in context with OIT standards and resources. Another purpose is to ensure that the post-project scope is well defined from the beginning. All OIT resource utilization after implementation must be factored into the overall scope and understood prior to making "go/no-go" decisions.

Furthermore, when other OIT Divisions and Bureaus are involved in advance planning, they can advise stakeholders that the proposed project:
- Can utilize statewide contracts,
- Requires technical edits for hardware purchases,
- Must employ the Department of Administrative Services vendor bidding process,
- Is within state guidelines for a viable request for proposal (RFP), and Can be leveraged with other agency needs to optimize resources and reduce costs.

2e. Define Time (High-level)
- Develop conceptual schedule constraints/targets

2f. Define Cost (High-level)
- Develop conceptual budget constraints/targets

Other OIT Divisions and Bureaus involvement is most likely minimal during this activity; however, a cost-benefit analysis (completed as part of this activity) should include all OIT costs, including hardware purchases, installation of hardware and software and ongoing support (network/systems operations and help desk).

2g. Approvals
- Business requirements and constraint identification/refinement, review and signoff.

Large projects may identify other OIT Divisions and Bureaus as project stakeholders. Therefore, they must be included in project planning and status reporting activities. Any change in the project plan may impact other OIT Divisions and Bureaus, which may in turn impact other work not related to this specific project.

If identified as a project stakeholder (due to project size and/or impact), other OIT Divisions and Bureaus should review the business requirements and may participate in the sign-off process.

At a minimum, when other OIT Divisions and Bureaus have identifiable deliverables (at any point during the life cycle or in conjunction with post-implementation support), they should be considered stakeholders and be incorporated into project planning.

The Project Integration Bureau (PIB) should be contacted to help determine necessary enterprise project submissions, reviews, and approvals via OIT-wide processes.

2h. Define Detailed Business Requirements
- Identify data requirements (including logical data base design)
- Identify input & output requirements and sources for input data (includes report generation requirements)
- Identify data conversion and migration requirements *
- Define security requirements *
- Define performance requirements *
- Define requirements for acceptance *
- Start defining requirements for testing *
- Start defining requirements for training *
- Perform a detailed Cost/Benefits analysis

If other OIT Divisions and Bureaus are project stakeholders, they will need to review the business requirements and potentially assume a consultative role on best practices, state standards and other technical details that may impact the functional design.

Additionally, issues such as security, performance and Commercial Off-The-Shelf (COTS) products are directly related to other OIT Division requirements, their input at this phase is essential.

*Validate these requirements with input from other OIT Divisions and Bureaus.

Additional Information

Automated Toolset Listing	MS Project—Project Scheduling, Time Management and Resource Management MS Visio—Flow charting, process flow and business Project Concept Document Tool Configuration Management Tools: - SourceSafe - Harvest - On Delete (Executive Workstation) - Turnover (IBM) - State Network (backed-up drive)
Templates	OIT Interactions Checklist (see Appendix A) Functional Design Phase Business Requirements Document (see Appendix B)
Reference Materials	Procurement Resources on the OIT Website, http://toolbox.oit.nh.gov/procurement/index.html Project Collaboration Policy on OIT Website

Functional Design—03
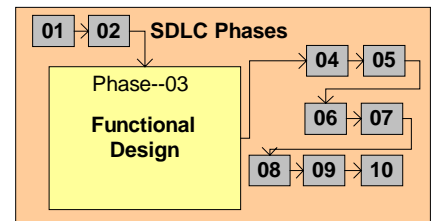
Supporting Materials/Artifacts

Business Requirements and OIT Interactions Checklist have started

Purpose

The Functional Design Phase takes the first step in translating the solution needs from business language into logical and technical system requirements by:

- Translating the business requirements from business language into logical and technical system requirements. Both the technical stakeholders and the project team analysts describe and model the automated behavior and characteristics of the system and verify that the business requirements are met.

- Allowing the stakeholders to validate proposed technical approaches during which process they create a detailed description of the work for the technical implementation team and attempt to discover any technical constraints/risks

- Constructing a detailed statement of development work, thereby providing the stakeholders with sufficient information to determine whether or not to continue the project.

Detailed Process Flows
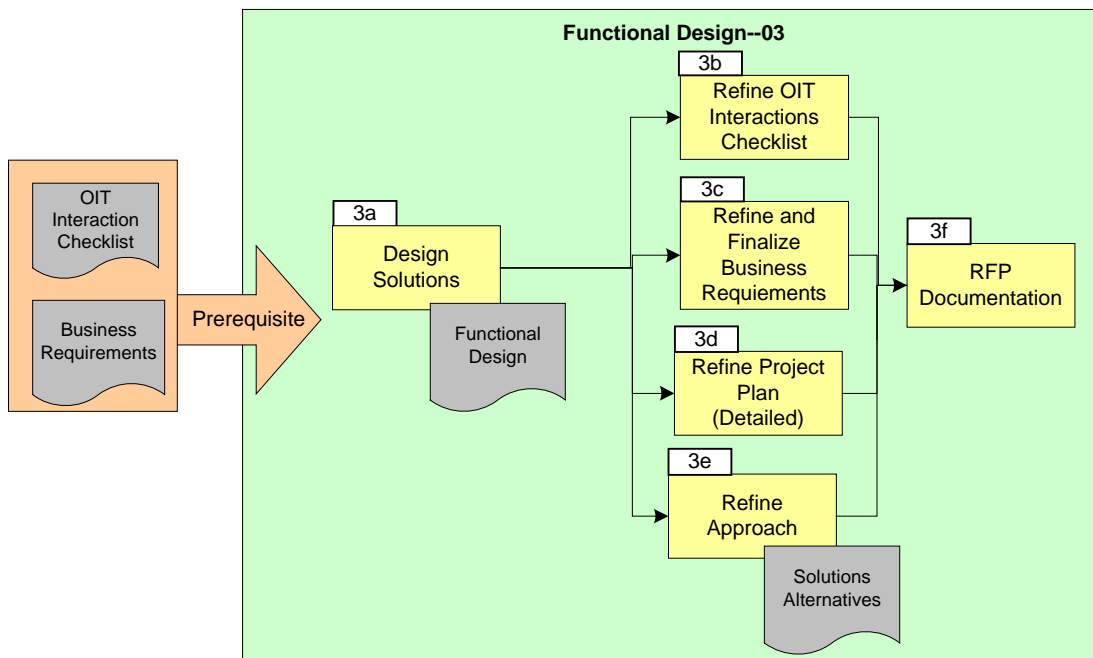
- The Project Team should decide which software development methodology will be used for the project. There are many Software Development Methodology options used within the Industry. The best methodology varies by project according to such things as your customer's level of involvement, the technologies you are working with, time constraints/requirements, existing process and standards, etc…. Often hybrid methodologies are used which combine aspects of the major System Development Methodologies. Some of the more popular System Development Methodologies include:
  - o Waterfall
  - o Joint Application Development (JAD)
  - o Rapid Application Development (RAD)
  - o Spiral Model
  - o Iterative System Development

  Please see Appendix E for descriptions of these methodologies.

Activities

3a. Design Solution (High-Level)
- Input from other OIT Divisions on architecture standards, support services, and contract requirements
- Define detailed functional logic
- Develop high-level automation logic for business workflow
- Identify options and select the Hardware platform(s) *
- Identify options and select the System platform(s) *
- Identify options and select the technical architecture *
- Identify options and select the operational support strategy *

🕮 Perform functional design review/signoff and validate the design against the business requirements If other OIT Divisions and Bureaus are to provide services and support (including post implementation), acceptance criteria for project requirements such as desktops, servers, network performance, database specifications, operational support, and end user support should be included in the functional design document.

🕮 Support solutions require an analysis of all OIT resources and should be determined in conjunction with other OIT Divisions/Bureaus. Refer to the *OIT Interactions Checklist* (Appendix A) for appropriate contact information. Additionally, if the solution utilizes the Help Desk for customer support, Help Desk staff training and/or the creation of test scripts may be required.

3b. Refine OIT Interactions Checklist

🕮 This questionnaire guides the project leads through a series of communication checkpoints that will identify who to contact within other OIT Divisions and Bureaus.

3c. Refine and Finalize Business Requirements

3d. Refine Project Plan (Detailed)
- Start defining requirements for assembly of the technical team *
- Refine timeline
- Refine budget

🕮 Project planning may be impacted by scope, resource availability and other constraints within other OIT Divisions and Bureaus. Scheduling and resource loading should be done with input/approval from managers within these Divisions and Bureaus.

3e. Refine Approach Options
- Analyze and recommend (if applicable) off-the-shelf solutions and options *
- Analyze and recommend (if applicable) contract services and outsourcing options for the project *

👥 Other OIT Divisions and Bureaus must review all options under consideration to ensure they meet state standards for technical specifications and purchasing requirements. If the Operations Division (OPS) is providing post implementation support, their requirements must be determined during this phase as they may have an impact on the functional design. Options involving purchases and contracts from outside vendors must be reviewed by Logistics to ensure these transactions are within state requirements.

3f. RFP Documentation

- Based upon defined approach, complete appropriate RFP documentation and processes.

👥 A well-defined methodology and associated templates are used to create an RFP that is within state standards Documentation for RFP, contracting, and procurement is located at http://toolbox.oit.nh.gov/, but it is recommended to contact Logistics for confirmation of appropriate template/process. It should be reviewed prior to contacting other OIT Divisions. OIT Logistics advises agency representatives on developing RFPs, including the review and sign-off process. Any project requiring an RFP must include Logistics.

*Validate these requirements with input from other OIT Divisions and Bureaus.

Additional Information

Automated Toolset Listing	MS Project—Project Scheduling, Time Management and Resource Management MS Visio—Flow charting, functional flow charting Visio Professional Use Cases (UML) Configuration Management Tools: • SourceSafe • Harvest • On Delete (Executive Workstation) • Turnover (IBM) • State Network (backed-up drive)
Templates	Functional Design Phase Business Requirements Document (see Appendix B) Functional Design Phase Functional Design Document (see Appendix C) Functional Design Phase Solution Alternatives Document (see Appendix D) OIT Interactions Checklist (see Appendix A) RFP (http://toolbox.oit.nh.gov/rfp/index.html)
Reference Materials	Software Development Methodology Reference (see Appendix E) Use Case Reference (see Appendix H)

System Design—04

Supporting Materials/Artifacts

Functional Design Phase Business Requirements
- Stakeholder sign-off/approvals

Functional Design Phase Functional Design
- Stakeholder sign-off/approvals

Functional Design Phase Solution Alternatives
- Stakeholder sign-off/approvals

SDLC Phases

01
02
03

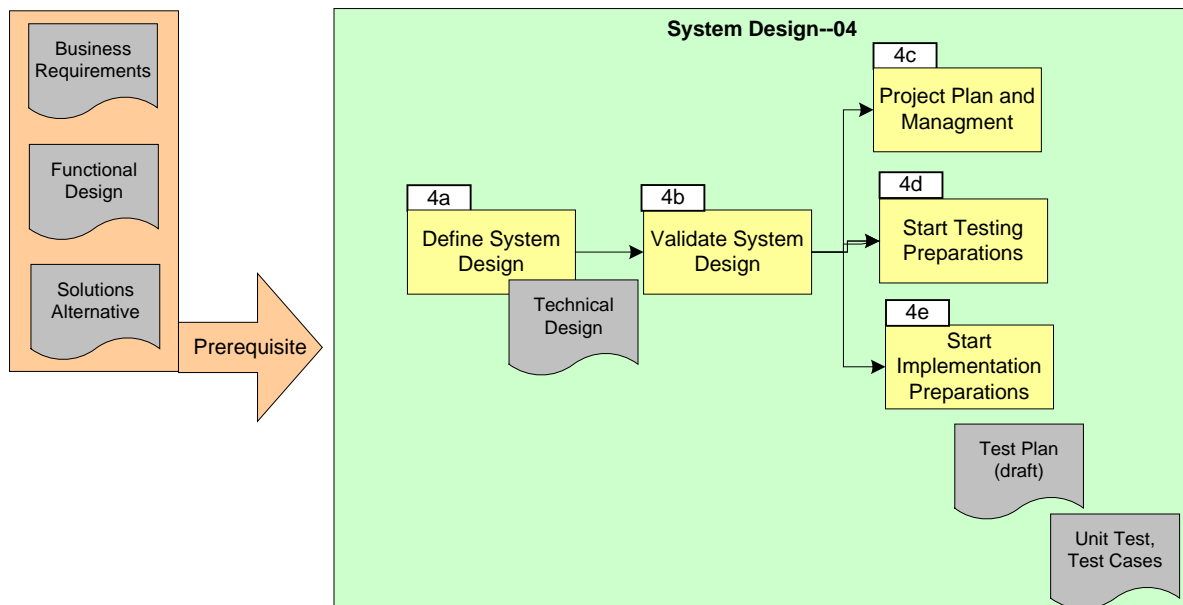Phase--04
System Design

05 → 06
07 → 08
09 → 10
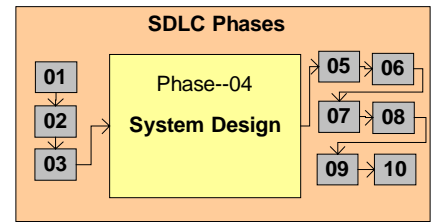
Purpose

Defines the planned work to facilitate efficient and flexible resource assignments by:
- Documenting the system construction (coding) work requirements so that the team can identify and obtain any additional resources necessary
- Ensuring product validation and support later in the project's life cycle

Detailed Process Flows

System Design--04

Business Requirements

Functional Design

Solutions Alternative

Prerequisite

4a
Define System Design

Technical Design

4b
Validate System Design

4c
Project Plan and Managment

4d
Start Testing Preparations

4e
Start Implementation Preparations

Test Plan (draft)

Unit Test, Test Cases

Activities

4a. Define System Design
- Create the physical design of the database
- Finalize technical specifications*
- Finalize system architecture*
- Develop security plan*

To the extent that OIT will be involved in hosting and operational support, other OIT Divisions and Bureaus should provide or review specifications (system architecture and

security plan) to ensure they are compatible with OIT infrastructure, resources and standards.

🕮 Technical design reviews should include project requirements related to all aspects of the project (not just software design). For example, system hosting, maintenance, and support services incorporate requirements that address business concerns for security, availability, and performance. Validate that the proposed solution meets the agency needs.

4b. Validate System Design
- Conduct an in-depth technical design review with validation against the functional design and business requirements.
- Create Prototype

4c. Project Plan and Management
- Assemble the technical team and make task assignments
- Establish a definitive timeline
- Establish a definitive budget

🕮 Any staff from other OIT Divisions and Bureaus responsible for project deliverables should be identified in project documentation, including solution options, functional design, system design, and project plans.

4d. Conduct Testing Preparations
- Refine testing plans
- Refine acceptance plan
- Design and prepare the testing environments*
- Finalize unit test cases
- Design and prepare the code construction and code management environments

🕮 If the project requires a simulated production test environment for realistic testing, other OIT Divisions and Bureaus can provide recommendations for creating such an environment within the OIT infrastructure.

4e. Start Implementation Preparations
- Refine training plan
- Begin construction of implementation plan
- If applicable, begin disaster recovery and data recovery planning*
- Refine Service Level Agreements (SLA's) and any other agreements or Memorandums of Understanding (MOU's) including warranty, staffing, and support agreements. *
- Create procedures and design specifications for operational requirements*
- Create procedures and design specifications for support requirements∗

🕮 When Agency businesses have disaster and data recovery plans, ASD project managers should give consideration to adding and/or updating plans as necessary based on the impact of the project. The Technical Support Services Division (TSS) and OPS should be contacted and considered as major stakeholders and possible resources.

🕮 Systems managed by OIT require TSS/OPS to provide operational and user support. Requirements for these post implementation functions must be collaboratively developed to ensure both business and technical requirements can be satisfied.

*Validate these requirements with input from other OIT Divisions and Bureaus.

Additional Information

| Automated Toolset Listing	Database Tools:

	Oracle Designer, Erwin, System Architect, SQL. Visio Professional: UML Visual Studio Mapping Tools PDF: Web page screen flow/mock-up Configuration Management Tools: - SourceSafe - Harvest - On Delete (Executive Workstation) - Turnover (IBM) - State Network (backed-up drive)
Templates	System Design Phase Technical Design (see Appendix G) Test Plan and Test Cases (see Appendix F)
Reference Materials	N/A

Construction and Unit Testing--05

Supporting Materials/Artifacts

System Design Phase Technical Design
Unit Test Planning
Unit Testing Test Cases

SDLC Phases

01	
02	Phase--05
03	**Construction &**
04	**Unit Testing**

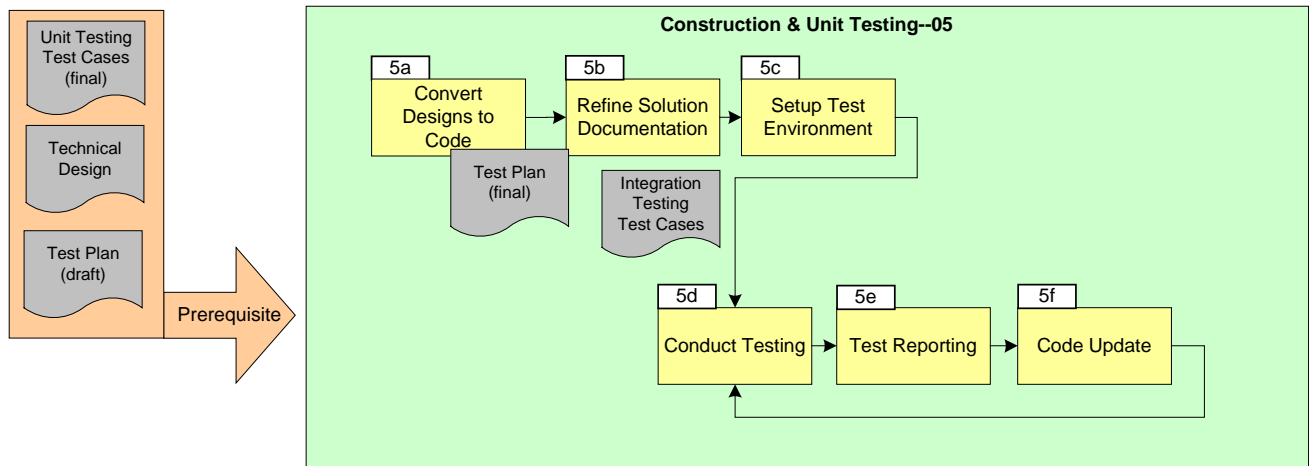|	
06	
07	08
09	10
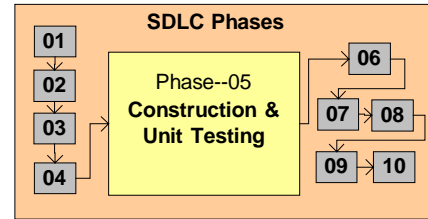
Purpose

The focus of the Construction and Unit Testing Phase completes the criteria specifications, product coding, construction, and a review the Code for conformance to standards, and design requirements, by concentrating on:

- Developing and documenting the Code to maximize knowledge transfer while meeting product requirements
- Verifying the functionality to maximize the potential success of subsequent testing efforts with other application or system components
- Conducting Unit testing and code reviews to find construction defects that may be missed or difficult to find in functional system testing later on

Detailed Process Flows

Construction & Unit Testing--05

Unit Testing Test Cases (final)

Technical Design

Test Plan (draft)

Prerequisite

5a	5b	5c
Convert Designs to Code	Refine Solution Documentation	Setup Test Environment

Test Plan (final)

Integration Testing Test Cases

5d	5e	5f
Conduct Testing	Test Reporting	Code Update

Activities

5a. Convert Designs to Code
- Translate detailed designs into program code.
- To the extent that OIT will be involved in hosting and operational support, other OIT Divisions should provide or review specifications (system architecture and security plan) to ensure they are compatible with OIT infrastructure, resources and standards.

5b. Refine Solution Documentation
- Update design documents, data dictionary and test plans.

5c. Setup Test Environment
- Create a testing environment for unit testing of code modules and specific functional components of the system.

⚉ If the project requires operational support for the development and testing environments (such as DBA, server, or network support), other OIT Divisions and Bureaus'' services should be identified in earlier phases and their activities included in the project plan

5d. Conduct Testing
- Review the code and unit testing results as needed for compliance with the project's quality assurance strategy.
- Finalize Test Plan
- Finalize Integration Testing Test Cases

5e. Review and log Test Results
- Upon successful completion, inspection, and testing of the individual components of the developed (or purchased) system, integration testing may begin.

5f. Code Update
- Make changes to the software to fix bugs and satisfy the requirements within the project documentation.

*Validate these requirements with input from other OIT Divisions and Bureaus.

### Additional Information

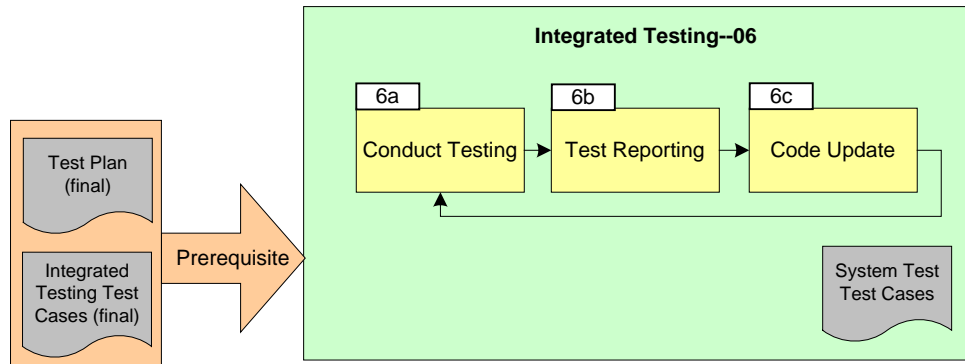| Automated Toolset Listing	N/A Configuration Management Tools: • SourceSafe • Harvest • On Delete (Executive Workstation) • Turnover (IBM) • State Network (backed-up drive)
Templates	Test Plan and Test Cases (see Appendix F)
Reference Materials	N/A

Integrated Testing--06

Supporting Materials/Artifacts

Test Plan
Unit Tested Program Code
Test Environment
Build of new application, or new functionality integrated into
existing application
Integration Testing Test Cases

SDLC Phases

01 → 02

03 → 04

05 →

Phase--06
**Integrated
Testing**

07

08

09

10
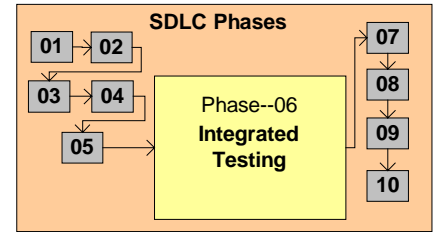
Purpose

This phase verifies the intended interaction of the technical system components. Integration testing attempts to uncover technical deficiencies that are visible only when the individual components integrate into a working system. Typically, end-users are not involved.

Detailed Process Flows

Integrated Testing--06

| Test Plan (final) | | Integrated Testing Test Cases (final) |

Prerequisite →

6a	Conduct Testing
6b	Test Reporting
6c	Code Update

System Test
Test Cases

Activities

6a. Conduct Testing
- Conduct testing with the entire unit tested system to validate that they interact as designed and in a manner that complies with the system and functional design specifications.
- Finalize System Testing Test Cases

By definition, this phase focuses on testing the interaction of all system components. As in Phase 05—Construction and Unit Testing, other OIT Divisions and Bureaus may be needed to assist in testing the entire system environment. ASD project managers should work with other OIT Divisions, and other departments/agencies if applicable, during project planning to understand the support needs during integrated testing.6b. Test Reporting
- Review and Log Test Results
- Triage any found issues, discrepancies, and/or bugs utilizing bug tracking procedures.

6c. Code Update
- Make changes to the software to fix bugs and satisfy the requirements within the project documentation.

*Validate these requirements with input from other OIT Divisions and Bureaus.

Additional Information

|	
Automated Toolset Listing	MS Access—Customized problem tracking system (DHHS) DB2 – Customized problem tracking system (DRA) Bugzilla—Bug Tracking (DOT) Various Tools (DOT)
Templates	Test Plan and Test Cases (see Appendix F)
Reference Materials	N/A

System Testing--07

Supporting Materials/Artifacts

Test Plan
Integration Testing completed
Test Environment
System Testing Test Cases
Vulnerability Scanning Policy
Application Security Procedure

SDLC Phases

Phase--07 **System Testing**
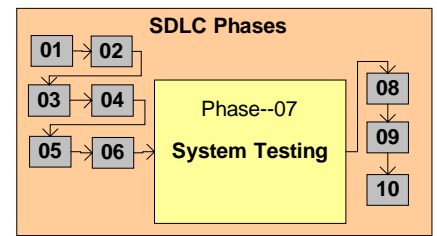
Purpose

The System Testing Phase evaluates the system with actual workloads using agreed upon and realistic utilization characteristics, and system vulnerabilities, which include hardware and software. The testers will evaluate the system for its ability to satisfy the conceptual design, the business requirements of the project, and identify vulnerabilities from a security perspective.

Detailed Process Flows
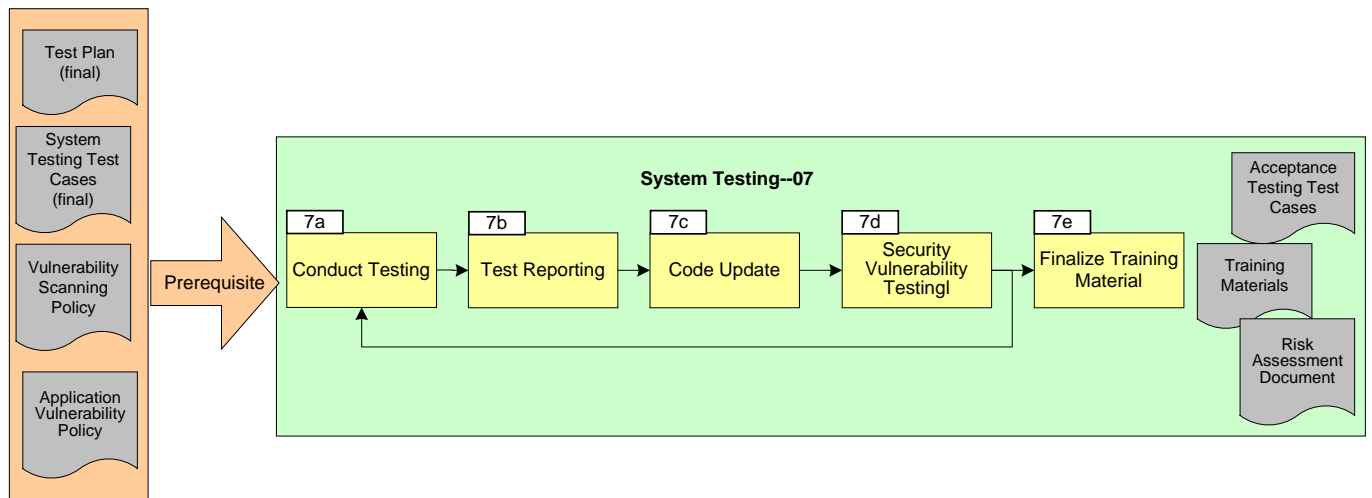
Activities

7a. Conduct Testing
- After successful completion of Integration Testing, conduct System Testing with realistic partial or agreed upon and realistic user loads to ensure that the system performs as designed and that it satisfies the business requirements for the project from the users' perspective.
- Test data migration, conversion, and deployment procedures ensure a smooth transition to production operations.
- Test deployment procedures
- Test system components that were not modified/enhanced to ensure that they function as required.
- Finalize Acceptance Testing Test Cases with Agency participation.
- Obtain sign-off if Agency Partner participates in System Integration Testing.

⚙ Other OIT Divisions and Bureaus may be needed during System Testing to monitor system performance under simulated user loads, assist with data migration, server configuration hardening and plan the transition into the production environment. As in all other phases, it is a best practice to contact other necessary OIT Divisions early (Phase 02) to plan this work in advance.

7b. Test Reporting
- Review and Log Test Results
- Triage any found issues, discrepancies, and/or bugs utilizing bug tracking procedures.

7c. Code Update
- Make changes to the software to fix bugs and satisfy the requirements within the project documentation.

7d. Security Vulnerability Testing
- Review Application Security Procedure and follow the Vulnerability Scanning Policy.
- Fix unacceptable vulnerabilities.

7e. Finalize Implementation Planning
- Complete the development of training materials to allow for progression into acceptance testing.
- Discuss feasible long-term training alternative(s), decide upon the desired training approach(s), and initiate training planning activities.

*Validate these requirements with input from other OIT Divisions and Bureaus.

### Additional Information

Automated Toolset Listing	MS Access—Customized problem tracking system (DHHS) DB2 – Customized problem tracking system (DRA) Bugzilla—Bug Tracking (DOT) Various Tools (DOT)
Templates	Test Plan and Test Cases (see Appendix F)
Reference Materials	Vulnerability Scanning Policy Application Security Procedure See OIT Standards Website

Acceptance Testing--08

Supporting Materials/Artifacts

Integration and System Testing completed
Appropriate Test Environment(s) built
Acceptance Testing Test Cases
Training Materials
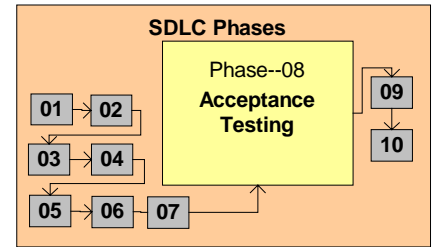
Purpose

The Acceptance Testing Phase focuses on testing the system in a simulated production environment. Initial work cases are planned test cases to demonstrate conformance with the previously defined acceptance testing criteria (See Functional Design Phase 03).

Detailed Process Flows
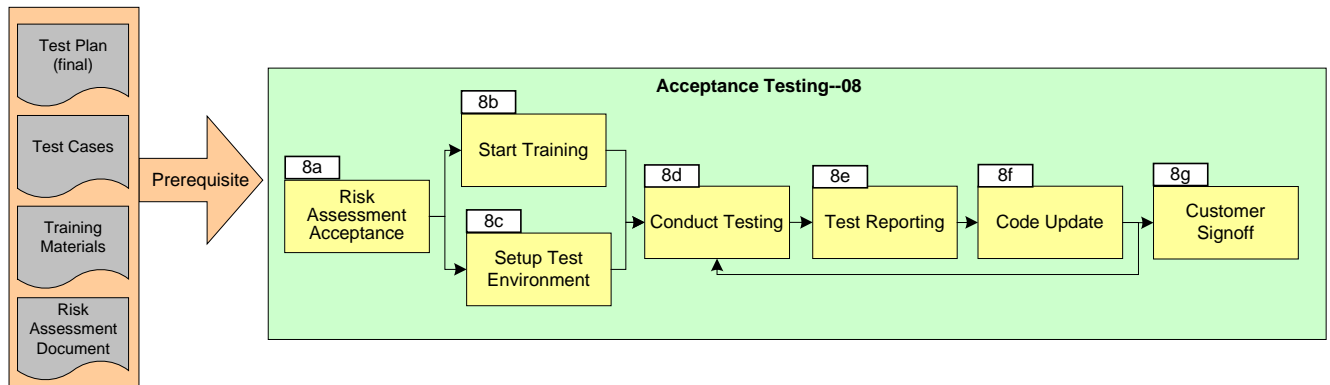
Activities

  8a Start Training
   • Familiarize End Users with the new System/Functionality to help ensure effective testing.
  8b. Setup Test Environment
   • Migrate a copy of real data, system (where applicable), and any supporting components (networks, PCs, etc.) into the simulated production test environment for realistic testing.
  8c. Conduct Testing
   • Demonstrate system by executing the acceptance test plan for the stakeholders and obtain acceptance signoff to deploy the system.
   • Retest system components that were not modified/enhanced to ensure that they function as required.

- Deliver Training materials and support procedures required for acceptance testing and system deployment.

E   If OIT is to support the system, other OIT Divisions and Bureaus may need training materials (for Help Desk Support) and documented support procedures based on user requirements.

E   Other OIT Divisions and Bureaus may be involved in porting the test environment to the production environment. Activities may include network support, PC deployment, and database conversion.

8d. Test Reporting
- Review and Log Test Results
- Triage any found issues, discrepancies, and/or bugs utilizing bug tracking procedures.

8e. Code Update
- Make changes to the software to fix bugs and satisfy the requirements within the project documentation.

8f. Customer Signoff

*Validate these requirements with input from other OIT Divisions and Bureaus.

Additional Information

Automated Toolset Listing	MS Access—Customized problem tracking system (DHHS) DB2 – Customized problem tracking system (DRA) Bugzilla—Bug Tracking (DOT) Various Tools (DOT) Various Tools (WSD)
Templates	Test Plan and Test Cases (see Appendix F)
Reference Materials	N/A

FINAL

Supporting Materials/Artifacts

Acceptance Testing by Customer
- Stakeholder sign-off/approvals

SDLC Phases

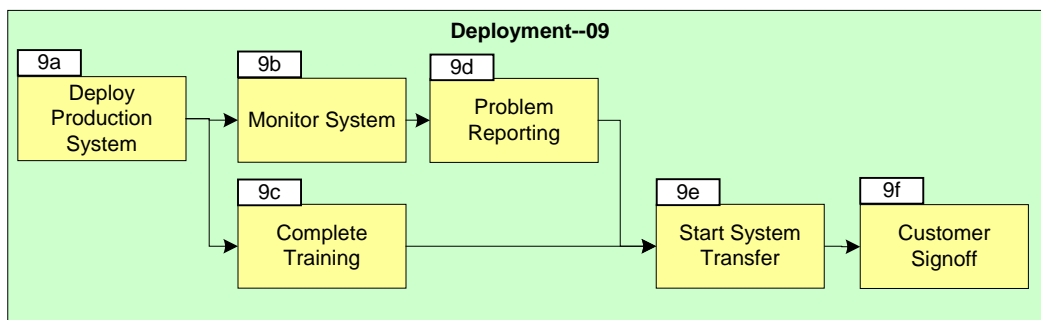|		
01 → 02 → 03		Phase--09
04 → 05 → 06		**Deployment**
07 → 08		
		10

Purpose

This phase separates the deployment activities from the installation and training activities to ensure that:
- A coordinated introduction of the system to the general user community proceeds in an orderly manner

Product introduction to the general user community occurs only if the system meets the business requirements for the project

Detailed Process Flows

Deployment--09

9a — Deploy Production System → 9b — Monitor System → 9d — Problem Reporting

9c — Complete Training → 9e — Start System Transfer → 9f — Customer Signoff
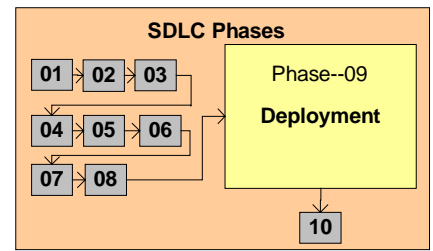
Activities

9a. Deploy Production System
- Make the new production system available to end-users in an organized fashion with coordinated training, documentation, and support/warranty procedures as needed.

OIT hosted projects will require coordination of all deployment activities among other OIT Division stakeholders and others on the project team, including the project manager, development and test teams, and the Agency. Initial and ongoing project planning will ensure a smooth transition from development into production. System monitoring, rapid response to any technical issues that arise should, and final system transfer to those who will maintain the system are all activities in this phase that could impact a broad range of OIT resources. ASD project leads must account for this in their planning, and they must include other OIT Division representatives in developing requirements and acceptance criteria for any system that will be hosted and/or maintained by OIT.

9b. Monitor System
- Monitor system carefully and position development resources to respond rapidly to problems and technical support issues.

9c. Complete Training
- Conduct any agreed upon training, such as train the trainer.

9d. Problem Reporting
- Respond to problems and technical support issues.

9e. Start System Transfer
- Prepare for transfer of responsibility for the ongoing maintenance and support of the system to the appropriate maintenance group or team after the warranty period.

9f. Customer Signoff

NOTES:
The warranty and support agreements developed prior to deployment will guide the execution of warranty work. Developing warranty, support, and other agreements are activities that are part of the project.

Execution of these agreements may continue well beyond the end of the development project but those activities are outside of the development project. Once acceptance testing and project wrap-up are complete the project is closed and it will not address new requirements, new features, or functionality or the removal of a subsequently identified defect. If appropriate and if approved by the change management / request review process, a new project may be started to address such work or the work may be performed as an external activity (outside the project) under the terms of the warranty or support agreement.

*Validate these requirements with input from other OIT Divisions and Bureaus.

Additional Information

Automated Toolset Listing	MS SMS IBM Tivoli ICR
Templates	N/A
Reference Materials	N/A

Project Wrap-up--10

SDLC Phases

01 → 02 → 03

04 → 05 → 06

07 → 08 → 09
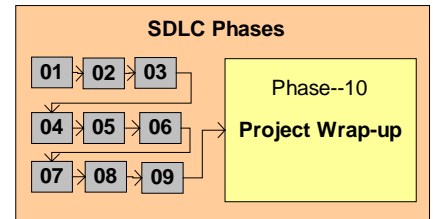
Phase--10
Project Wrap-up

Supporting Materials/Artifacts

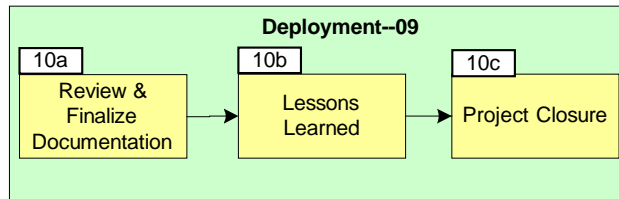Application deployed/new application released

Purpose

This phase is on ending the project in an orderly manner. The tasks are:

- To maximize the capture and reuse of knowledge gained from the work performed on this project
- To maximize the motivation and potential growth of the project team members to improve performance in the organization for the next project
- To avoid repeating mistakes made during this project

Detailed Process Flows

Deployment--09

| 10a | 10b | 10c |
| Review & Finalize Documentation | Lessons Learned | Project Closure |

Activities

9a. Review and Finalize Project Documentation
- Review documentation, procedures, and project tracking reports to ensure that they are complete and accurate so they can be used to jumpstart the next project effort.

9b. Lessons Learned
- Capture lessons learned by debriefing all participants including developers, stakeholders, sponsor, and support staff.
- Provide feedback and guidance to participants to enable future performance growth.

  When other OIT Divisions and Bureaus are stakeholders in any project, include their feedback, capture their lessons learned, and update applicable project documentation. All stakeholders learn from project successes and shortfalls; as one OIT organization, all stakeholders benefit by participating in project wrap-up activities.

9c. Project Closure
- Formally, release or return any remaining project resources to the OIT organization for redeployment on other projects or activities.

*Validate these requirements with input from other OIT Divisions and Bureaus.

Additional Information

Automated Toolset Listing	N/A
Templates	N/A
Reference Materials	N/A

4. ACCOUNTABILITY

The ASD Director is responsible for ensuring that systems development efforts abide by the standard. Exceptions are to be requested and granted through the assigned Agency IT Leader.

5. REFERENCE LIST

Document Name	Appendix Letter	Description	Location
OIT Interactions Checklist	A	A high-level checklist that serves several purposes. 1) A "Yes" answer to any question will trigger involvement of support, operations or logistics. 2) Effort in answering questions will save time of support, operations & logistics when they are contacted.	Appendix A attached
Functional Design Phase Business Requirements Document	B	The purpose of this document is to serve as a basis for defining the Business Requirements from the Users perspective. The requirements contained within this document should stipulate what is needed, rather than how these needs will be met.	Appendix B attached
Functional Design Phase Functional Design Document	C	This document describes in non-technical terms the system's functions and features that are needed to satisfy the business requirements. The Functional Design will provide further explanation of how all of the Business Requirements will be met. When completed, Customers/Users will understand how the system will operate so that it supports the agency business needs.	Appendix C attached
Functional Design Phase Solution Alternatives	D	This template defines potential solutions that meet the agency business needs and functional design of this project. Potential solutions will be explored and defined within this document. The solution alternative that best meets the needs of the Customer/User will be identified and indicated as the preferred solution. Any gaps between the business requirements and the selected solutions' features will be highlighted.	Appendix D attached
Software Development Methodology Reference	E	Contains descriptions of some software development methodologies, and the pros./cons. of each approach.	Appendix E attached
Test Plan	F	The purpose of this document is to serve as a basis for describing the overall approach to testing the new application/software.	Appendix F attached
System Design Phase Technical Design	G	This document serves as a basis for defining the details of the Technical Design of the solution alternative selected by the Customer during the Functional Design Phase.	Appendix G attached
Use Case Reference	H	Provide Use Case format and definitions/descriptions of Use Case content.	Appendix H attached

Procurement Resources on the OIT Website	N/A		http://toolbox.oit.nh.gov/procurement/index.html
RFP Toolkit	N/A		OIT Web Site
Project Collaboration Policy	N/A		OIT Standards – Web Site
Vulnerability Scanning Policy	N/A		OIT Standards – Web Site
Application Security Procedure	N/A		OIT Standards – Web Site