

Commonwealth of Virginia



Information Technology Resource Management Guideline

Model Standard for Small-Scope Projects

Preface

PUBLICATION DESIGNATION

COV ITRM Guideline 91-4.

SUBJECT

Small-scope information systems development projects.

EFFECTIVE DATE

January 1, 1992.

AUTHORITY

Code of Virginia, § 2.1-563.31 (Powers and Duties of the Council on Information Management).

Code of Virginia, § 2.1-563.17 (Powers and Duties of the Department of Information Technology).

SCOPE

This Guideline is applicable to all state agencies and institutions of higher education (hereinafter collectively referred to as "state agencies") that are engaged in such functions as planning, managing, developing, purchasing and using information technology resources in the Commonwealth.

PURPOSE

To provide a model structured approach for defining, developing and implementing small-scope information systems projects in state agencies.

OBJECTIVES

The Commonwealth's Model Standard for Small-Scope Projects Guideline will:

- Define a set of phases, tasks, activities and deliverables that are normally associated with small-scope information systems development projects;
- Identify a minimal set of tasks and activities that can be used to provide required deliverables;
- Provide a flexible set of phases, tasks, activities and deliverables that allow for variations in the size, scope and complexity of projects; and
- Provide a framework that can

accommodate the use of various systems development methodologies, tools and techniques.

DEFINITIONS

Information Systems are the application programs and databases used by state government to carry out its responsibilities.

Systems Development refers to all actions, functions or activities performed by state agencies for the purpose of defining, acquiring, developing, enhancing, modifying, testing, or implementing information systems.

Maintenance refers to the necessary activities needed to maintain the functionality, efficiency and effectiveness of existing information systems without changing existing inputs, outputs or calculations.

Enhancement refers to those activities needed to create new, or change existing inputs, outputs or processing capabilities to enhance or improve an existing information system's usefulness and functionality.

Systems Development Methodology refers to a set of principles, practices and procedures which is used to define, develop, and implement information systems. A systems development methodology guides the sequence of working tasks, defines task prerequisites and results, and establishes key checkpoints. It may also identify the resources, tools and techniques to be used for a task or set of tasks.

Systems Development Tools and Techniques refer to specific strategies or standardized methods or procedures to guide the execution of one or more systems development tasks. Prototyping, joint applications design, structured analysis and design, information engineering, object-oriented design, reverse engineering, and structured programming are examples of systems development methods. Computer-aided software (or systems) engineering (CASE) products, fourth-generation languages, and data dictionaries are examples of automated tools and enabling technologies that are used in conjunction with the methodologies.

GENERAL RESPONSIBILITIES

In accordance with the *Code of Virginia*, the following provisions apply:

The Council on Information Management (CIM)

Responsible for:

Directing the development and promulgation of policies, standards, and guidelines for managing information technology resources in the Commonwealth.

Advisory Committees

Responsible for:

Meeting, conferring with, and advising the Council in the development of the Commonwealth's policies, standards, and guidelines for managing information technology resources.

The Department of Information Technology (DIT)

Responsible for:

Providing administrative support to the Council and performing such other services as the Council may direct in the performance of its powers and duties. Support may include advising the Council in the development, interpretation, and dissemination of its policies, standards, and guidelines, and maintaining records thereon for the Council.

All State Agencies

Responsible for:

Cooperating with the Council in the performance of its powers and duties; and

Complying with the Council's policies, standards, and guidelines for managing information technology resources in the Commonwealth.

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SECTION 1

INTRODUCTION

BACKGROUND

In 1982, the MASD/DIT Standard 82-1 was issued and forwarded to all State agencies and institutions of higher education. This standard provided those persons responsible for evaluating, selecting, and developing Commonwealth data processing systems with specific criteria and a structured approach to assist them in developing and maintaining quality application systems.

When the MASD/DIT Standard 82-1 was issued, both data processing and systems development were oriented towards developing large complex application systems in centralized mainframe computer environments. Since 1982, the proliferation of minicomputers and microcomputers in state government, the type of applications being developed, the methodologies and technologies available to support applications development, and the availability of off-the-shelf software solutions have created the need to revise and update the systems development life cycle concepts presented in MASD/DIT Standard 82-1.

This guideline has been developed as a model standard that can be adopted by state agencies in whole or in part to address systems development for small, relatively simple information systems or enhancements and modifications to such systems.

SMALL-SCOPE PROJECT PHASES

This model standard uses a phased approach to define, develop and implement small-scope projects. This approach consists of four logical phases: Definition and Recommendations; Design; Development and Testing; and Implementation and Evaluation.

SECTION 2

USING THE MODEL STANDARD FOR SMALL-SCOPE PROJECTS

This standard identifies project deliverables and provides a structured approach of phases, tasks and activities that will be used to define, develop and implement or enhance small-scope information systems. This includes the purchase or development of new application information systems or making modifications and enhancements to existing information systems.

The following definitions, symbols and terminology are used throughout this standard:

- **Phase** - means a distinct logical stage in the systems development process.
- **Task** - means a logical group of like work within a given phase.
- **Activity** - means a specified logical unit of work within a task. Activities should be defined in small enough increments of work to estimate the resources required to accomplish the activity, and to allow for the measurement of progress for scheduling and reporting on the project. Mandatory activities within a task are preceded by Activities must include. Optional activities within a task are preceded by Activities could include.
- **Deliverable** - means a resulting product from the activities of one or more tasks that can be stored in electronic or paper form or a combination of the two.
- **Mandatory** - This symbol is used to indicate a task that must be performed or a deliverable that must be developed for all projects.
- **Conditional Mandatory** - This symbol is used to indicate a task or deliverable that is usually considered mandatory for all projects. However, these tasks and deliverables are not applicable to all projects all of the time.

FOR EXAMPLE: A purchased software package may not require the development of application program specifications or the corresponding generation of application program code.

The phases and tasks in this standard have been sequentially numbered and the tasks are annotated in bold typeface. The phases within this standard can be logically combined and the tasks can be performed in any logical order that provides the required deliverables and approvals. Descriptive information is provided with each task, including activities and/or examples of potential activities. The project manager has the discretion to include additional tasks and activities not specified in this standard, and to use appropriate systems development methodologies, tools and techniques that will satisfy the intent of a given task. The project manager may substitute tasks and activities within the context of this standard as long as the appropriate mandatory deliverables are developed and approved, and the mandatory approvals to proceed are obtained. The number and level of tasks and activities needed to plan, manage and control a given project will be determined by the project manager and will be commensurate with his/her understanding of the size, scope, and complexity of the project.

In addition to the mandatory tasks and activities for each phase, there are optional tasks and activities which may, at the option of the project manager be included in some projects and

excluded from other projects, depending upon the size, scope and complexity of a given project. Failure to include one or more of the optional tasks or activities for any given phase does not constitute failure to comply with this standard.

The specific means for project management on a given project must be documented by the project manager. As appropriate, these means should address such things as managing a project team, conducting user and project team meetings, and reviewing and as needed revising project plans.

State regulations require additional approvals under certain conditions.

- All Commonwealth accounting and financial control systems, whether automated or manual, must be approved for adequacy of audit trails and financial controls by the Auditor of Public Accounts. Similarly, any system which in any way involves the disbursing of State monies or impacts a second system involving such disbursement must be reviewed by the Auditor of Public Accounts. It is the responsibility of the developing agency to contact the Auditor of Public Accounts.
- The Code of Virginia (Section 2.1-196.1) requires the Comptroller's approval of all accounting and financial systems. No accounting or financial control systems will be developed without prior approval of the Comptroller. An Office of the Comptroller Directive, entitled: "Required Approval of Agency-Based Accounting Systems", addresses agency procedures for complying with Section 2.1-196.1 of the Code. It is the responsibility of the developing agency to contact the Office of the Comptroller.

PHASE 1: DEFINITION AND RECOMMENDATIONS

This phase covers the tasks, activities and deliverables necessary to define a small-scope project, develop the functional and informational requirements, develop viable alternatives, and to recommend a course of action that can meet the defined requirements. The resulting deliverables from this phase provide the information needed to make an informed decision on developing or enhancing a small-scope information system.

A project manager will be appointed for each small-scope project. A formal project team to address the requirements in this phase will be appointed on an as needed basis.

This phase provides for the following:

Mandatory **DELIVERABLES**

- Project Definition
- Project's Systems Development Methodology
- Functional and Informational Requirements
- Analysis Documentation
- Alternatives Documentation
- Recommendations Document
- Written Approval of the Deliverables
- Written Approval to Proceed

Conditional
Mandatory **D ELIVERABLES**

- Implementation Work Plan

Optional **D ELIVERABLES**

- Functional and Informational Constraints
- Functional and Informational Impact Analysis
- Conceptual Systems Model

**Task
Number**

Tasks/Activities

1.10 Mandatory **DEFINE A SMALL-SCOPE PROJECT**

This task will be used to define the small-scope project. The project definition and the other deliverables from this phase must contain sufficient information for management to understand what the project will accomplish, who it will effect, how much will it cost, and how long it will take to complete.

Activities could include, but are not limited to:

- Developing a statement of the project's scope, objectives and goals.
- Developing a statement on constraints, assumptions, and mandates that could affect the project's development. This could include budgetary, time, resource, and legislative factors.

Deliverable: ***PROJECT DEFINITION***

1.20 *Mandatory* **DEFINE/SELECT SYSTEMS DEVELOPMENT METHODOLOGY**

The task will be used to define the systems development methodology that will be used for this project.

Activities could include, but are not limited to:

- Identifying specific systems development tools and techniques that will be used on this project.
- Identifying the specific phases, tasks, activities and deliverables for the specified systems development tools and techniques.
- Documenting the project's systems development methodology.

Deliverable: ***SYSTEMS DEVELOPMENT METHODOLOGY***

1.30 **INITIATE THE DATA DICTIONARY**

If a data dictionary is applicable to this project, this task will be used to initiate the process and be an ongoing task throughout the project.

Activities could include, but are not limited to:

- Finalizing the form(s) that will be used to capture data element information, as applicable.
- Researching and extracting data element information from any existing sources that will be applicable to this project.

1.40 *Mandatory* **DEFINE FUNCTIONAL AND INFORMATIONAL REQUIREMENTS**

Functional and informational requirements should be defined in terms of the project scope, objectives and other criteria developed as part of the project definition. Other considerations in developing requirement definitions could include such things as the agency's overall business objectives, existing systems, and data requirements. Requirements definition should focus on what needs to be accomplished and **not** how it should be accomplished, nor on what information technology resources may be required.

Activities could include, but are not limited to:

- Conducting interviews to determine perceptions of needs and problems and to gather information on possible requirements.
- Collecting and documenting functional and informational requirements including all outputs and timing factors. Timing factors could include such things as updating and reporting cycles, response times, turnaround times, and interface exchange schedules.
- Preparing a list of general financial control, security, backup and audit requirements.

Deliverable: ***FUNCTIONAL & INFORMATIONAL REQUIREMENTS***

1.50 DEFINE FUNCTIONAL AND INFORMATIONAL CONSTRAINTS

This task will be used as needed to document known or anticipated constraints that may impact the functional and informational requirements identified as part of this project.

Activities could include, but are not limited to:

- Documenting known constraints for such things as:
 - staff limitations;
 - equipment;
 - support facilities;
 - technical and environmental factors; and
 - budget/funding limitations.
- Documenting anticipated or potential constraints or issues for such things as:
 - pending legislation;
 - emerging technology; and
 - pending standards, guidelines or policies.

Deliverable: *FUNCTIONAL & INFORMATIONAL CONSTRAINTS*

1.60 DESCRIBE THE IMPACT OF THE FUNCTIONAL AND INFORMATIONAL REQUIREMENTS AND CONSTRAINTS ON THE CURRENT ENVIRONMENT

This task will be used as needed to document the likely organizational impacts, costs or savings that will occur as a result of implementing the developed requirements, given the identified constraints.

Activities could include, but are not limited to:

- Preparing a descriptive list of the impacts.
- Identifying potential required changes to the organizational structure.
- Documenting the estimated (direct and indirect overhead) costs to satisfy the requirements, and the estimated savings, given the current environment.

Deliverable: *FUNCTIONAL & INFORMATIONAL IMPACT ANALYSIS*

1.70 *Mandatory* ANALYZE REQUIREMENTS, CONSTRAINTS & IMPACTS

This task is used to analyze all previous deliverables and document the analysis results. The resulting documentation, which may include a conceptual systems model can be used as a basis for developing alternative solutions to meet the defined requirements.

Activities could include, but are not limited to:

- Analyzing which functions should be performed manually, which functions should be automated, and which functions will be a combination of manual and automated operations.
- Analyzing file requirements.
- Analyzing processing requirements.
- Evaluating the potential use of centralized, decentralized, distributed, or shared processing.
- Evaluating who will manage the hardware and associated information technology resources.
- Documenting the results of the analysis and as appropriate, developing a conceptual systems model.

Deliverable: ***ANALYSIS DOCUMENTATION***

Deliverable: ***CONCEPTUAL SYSTEMS MODEL***

1.80 *Mandatory* **DEVELOP THE ALTERNATIVES**

This task is used to develop information on viable alternatives that can be used to meet the defined requirements and objectives. The deliverable for this task is the primary supporting documentation for the project recommendations deliverable.

Activities could include, but are not limited to:

- Preparing a list of potential alternatives. Evaluating development and acquisition options for each viable alternative.
- Defining the information technology resources required to develop, acquire, implement and operate each alternative. Considerations should include, but are not limited to:
 - identifying appropriate existing information technology resources that will be needed to implement the proposed alternative;
 - identifying additional information technology resources that will be required; and
 - as appropriate, developing an information technology resources implementation schedule.
- Developing cost estimates for each alternative. These estimates should include considerations for the cost of development and/or acquisition, and for ongoing operations.
- Defining the advantages and disadvantages of each alternative.

Deliverable: ***ALTERNATIVES DOCUMENTATION***

1.90 *Mandatory* **PREPARE RECOMMENDATIONS**

This task will be used to document the specific recommendations on the best way to meet the defined requirements and objectives, given the constraints.

Activities could include, but are not limited to:

- Documenting the best alternative(s).
- Documenting any additional rationale for the alternative specified.
- Developing and documenting appropriate cost justification information for the recommended alternative.

Deliverable: **RECOMMENDATIONS DOCUMENT**

1.100 *Conditional*
Mandatory

PREPARE AN IMPLEMENTATION WORK PLAN

This task will be used as needed to develop a work plan with the estimated resource requirements needed to implement the recommendations developed in this phase. The work plan should include all appropriate phases, tasks, activities, and deliverables with estimated time, cost, and resource (personnel, software and equipment) requirements needed to implement the recommendations.

Activities could include, but are not limited to:

- Preparing a list of the required project tasks, activities and deliverables, with time and cost estimates.
- Identifying the resources that will be required to accomplish the tasks and activities identified on the list.

Deliverable: **IMPLEMENTATION WORK PLAN**

1.110 *Mandatory*

OBTAIN APPROVALS AND APPROVAL TO PROCEED

Formal approval of this phase's appropriate deliverables is required.

Activities must include, but are not limited to:

- Presenting the project definition for approval.
- Presenting the informational and functional requirements for approval. As appropriate presenting the functional and informational constraints and impacts for approval.
- Presenting the analysis documentation, alternatives and recommendations for approval. As appropriate, presenting the implementation work plan, conceptual model and information technology resources implementation schedule for approval.
- Obtaining appropriate approval(s) to proceed.

Deliverable: **WRITTEN APPROVALS**

PHASE 2: DESIGN

This phase covers the tasks, activities and deliverables required to develop/purchase information systems software and documentation to implement the recommendations to meet the project's functional and informational requirements. This phase should not be initiated prior to obtaining the required approvals in Phase 1.

This phase provides for the following:

Mandatory **DELIVERABLES**

- User Interface Documentation
- Back-up and Recovery Specifications
- Information Security Documentation
- Systems Design Overview Documentation
- Written Approval of the Deliverables
- Written Approval to Proceed

Conditional
Mandatory **DELIVERABLES**

- Logical File Structures/Database Design
- Systems Interface Documentation
- New Organizational Structure, Functions, and Personnel Documentation
- Application Program Specifications
- Conversion Plan
- Conversion Specifications

**Task
Number**

Tasks/Activities

2.10

PERFORM THE APPROPRIATE PROCUREMENT PROCEDURES, IN ACCORDANCE WITH COMMONWEALTH OF VIRGINIA AGENCY PROCUREMENT AND SURPLUS PROPERTY MANUAL

The project may include information technology resource requirements that are subject to the Commonwealth's procurement laws, procedures, policies and regulations. This task will be used to initiate and follow through on all necessary procurement activities. As needed, all appropriate activities and realistic time frames should be identified for this task.

2.20

PREPARE OR MODIFY THE DATA DICTIONARY

This is an ongoing task that allows for the continual definition and refinement of information associated with data elements needed for this project effort.

Activities could include, but are not limited to:

- Identifying new data elements.
- Developing information on a data element concerning its form and content.

- Identifying and defining information for a data element concerning its maintenance responsibilities and any limitations on its accessibility.
- Identifying and defining any relationships between data elements.
- Identifying and defining any security or confidentiality requirements.

2.30 *Conditional*
Mandatory **DEVELOP AND DEFINE LOGICAL FILE STRUCTURES**

This task will be used as needed to design logical file structure(s) to meet the defined requirements. For purchased software packages, this task should also be used to perform necessary validation of the package(s) file structures or databases.

Activities could include, but are not limited to:

- Designing logical databases.
- Developing file layouts for system files and tables.
- Developing file structures, dependencies, and interfaces.
- Documenting needed changes to purchased file structures.

Deliverable: LOGICAL FILE STRUCTURES/DATABASE DESIGN

2.40 *Mandatory* **DEVELOP USER INTERFACES**

This task will be used as needed to define and document all user interfaces (including screens, forms and reports) to meet the defined requirements. This task should focus on the content, placement, order and sequence of information on needed user interfaces. If a software package(s) was purchased, this task should be used to validate the user interfaces and document any enhancements or changes that are necessary to meet the defined requirements.

Activities could include, but are not limited to:

- Identifying, defining and finalizing each input source document and/or form.
- Identifying, defining and finalizing each output document/form that must be generated.
- Identifying, defining and finalizing each input screen that will be needed to add, modify or delete information.
- Identifying, defining and finalizing each output screen that must be generated.
- Identifying, defining and finalizing each output report that must be generated.
- Documenting any needed enhancements or changes to user interfaces on all purchased software systems.
- Identifying, defining and finalizing other types of user interactions such as voice, LCD display, optical character, touch-tone or debit card usage.

Deliverable: USER INTERFACE DOCUMENTATION

2.50 *Conditional*
Mandatory **DEVELOP SYSTEMS INTERFACE DESIGN**

This task will be used as needed to define and document all interfaces with other existing or planned systems.

Activities could include, but are not limited to:

- Identifying, defining and finalizing all messages, flags and communication formats needed for inter-system communication.
- Identifying, defining and finalizing all file interchange formats and interfaces, including timing considerations.
- Identifying, defining and finalizing each input screen that will be needed to add, modify or delete information.
- Identifying, defining and finalizing any protocols needed to interact with other systems.

Deliverable: ***SYSTEMS INTERFACE DOCUMENTATION***

2.60

Conditional
Mandatory

DOCUMENT NEW/MODIFIED ORGANIZATIONAL STRUCTURE

This task will be used as needed to document required additions or changes to the agency's organizational structure to support the end result of this project. The results of this effort may require that the agency establish new positions, reclassify positions, or change existing job descriptions.

Activities could include, but are not limited to:

- Documenting the organizational structure that will be required to support the new or enhanced system including; users, operations, and maintenance staff.
- Identifying new positions and defining the functional responsibilities for each position.
- Identifying new or additional functional responsibilities for existing positions.
- Initiating the process to create new positions, reclassify existing positions, or develop new job descriptions for existing positions.

Deliverable: ***NEW ORGANIZATIONAL STRUCTURE, FUNCTIONS, AND PERSONNEL DOCUMENTATION***

2.70

Conditional
Mandatory

DEVELOP APPLICATION PROGRAM SPECIFICATIONS

This task will be used as needed to develop applications program specifications to support the defined requirements. Conversion and back-up and recovery specifications are not included in this task. At a minimum, program specifications must be developed to support all user and systems interfaces identified in this phase. User interfaces that are part of a purchased software package normally will not require the development of corresponding application program specifications. Program specifications should be developed to provide the necessary detail to accomplish their stated purpose.

Activities could include, but are not limited to:

- Developing specifications to support required on-line transaction processing.
- Developing specifications to support required batch reporting, extracting or updating processes.
- Developing specifications to support required interfaces with other systems.
- Developing specifications to support other types of user interfaces or interactions.
- Developing specifications to support required ad hoc, decision support, and forms generation requirements.

Deliverable: *APPLICATION PROGRAM SPECIFICATIONS*

2.80

Conditional
Mandatory

DEVELOP CONVERSION PLAN AND SPECIFICATIONS

This task will be used as needed to identify data that must be converted and to develop the corresponding specifications to meet these defined needs. As appropriate, a conversion plan should be developed to ensure that the necessary resources are available and that the needed data are converted to the new environment in a timely, scheduled manner.

Activities could include, but are not limited to:

- Preparing a list of the conversion tasks and activities list with time and cost estimates.
- Preparing a conversion schedule that identifies the data sources (documents, files, databases, etc.) that are to be converted and the personnel responsible for the conversion effort.
- Developing conversion program specifications. Specifications may be needed for such things as:
 - converting required data from existing automated files;
 - one-time efforts to convert data from manual reports or source documents;
 - one-time efforts needed to manipulate or correct converted data; and
 - initial loads of new files or databases.

Deliverable: *CONVERSION SPECIFICATIONS*

Deliverable: *CONVERSION PLAN*

2.90

Conditional
Mandatory

PREPARE BACK-UP AND RECOVERY SPECIFICATIONS

This task will be used as needed to develop back-up and recovery specifications to support the defined requirements. At a minimum these specifications must address data backup, frequency of backups, retention requirements and appropriate data recovery procedures.

Activities could include, but are not limited to:

- Developing specifications for automated data backup that include the frequency and retention requirements. This should include backups for such things as:

-
-
- databases;
 - each data file, including interface files;
 - on-line or batch transaction files; and
 - temporary files.
- Documenting retention requirements for such things as:
 - system generated output reports or forms; and
 - source documents used as system inputs.
 - Documenting information system recovery requirements and developing specifications and procedures to restore all or part of the information system using the automated data backups. Procedures may be required to use input source documents for recovery purposes.
 - Defining and documenting backup and recovery duties and responsibilities.

Deliverable: ***BACK-UP & RECOVERY SPECIFICATIONS***

2.100 *Conditional*
Mandatory

PREPARE INFORMATION SECURITY DOCUMENTATION

This task will be used as needed to identify and develop security requirements, specifications and procedures that are required to meet the Commonwealth's ITRM Information Security Policy, Standards and Guidelines and the agency's corresponding ITRM Security Program.

Activities could include, but are not limited to:

- Defining known and anticipated security and confidentiality requirements.
- Developing information security specifications to meet the defined security requirements.
- Documenting the proposed procedures for meeting the security requirements of the system.

Deliverable: ***INFORMATION SECURITY DOCUMENTATION***

2.110 *Mandatory* **DEVELOP SYSTEMS DESIGN OVERVIEW DOCUMENTATION**

This task will be used to develop comprehensive overview documentation for the entire information systems design.

Activities could include, but are not limited to:

- Developing systems flowcharts that show how the applications programs work together.
- Developing narratives and/or graphics that explain the major functions and processes of the designed system.
- Developing a comprehensive list of application programs, conversion programs, etc.
- Developing other documentation deemed necessary to explain what the system does and how it works.

Deliverable: *SYSTEMS DESIGN OVERVIEW DOCUMENTATION*

2.120 **VERIFY DESIGN DOCUMENTATION**

This task can be used to conduct an internal review of the design documentation and deliverables.

Activities could include, but are not limited to:

- Verifying that the design documentation is sound, logical, and complete. The design documentation includes such things as; purchased software packages, logical file structures, databases, user interfaces, systems interfaces, application program specifications, conversion specifications and backup/recovery specifications.
- Verifying that the requirements in the agency's information security procedures and plans have been adequately addressed.

2.130 *Mandatory* **OBTAIN APPROVALS AND APPROVAL TO PROCEED**

Written approval of all appropriate deliverables of this phase and the written approval to proceed with the project are mandatory deliverables. These approvals can be deferred to the end of the Development and Testing Phase with management's written authorization. This task can be used to obtain the formal approval of this phase's deliverables and the authorization to proceed with the project.

Activities could include, but are not limited to:

- Presenting the appropriate deliverables for approval.
- Obtaining appropriate approval(s) to proceed.

Deliverable: *WRITTEN APPROVALS*

PHASE 3: DEVELOPMENT AND TESTING

The physical development and testing of a system requires a known hardware and software environment (database, operating systems, minicomputer, LAN, etc.). The tasks and activities in this phase are used to create or modify application or conversion programs, files or databases, and to make necessary modifications to purchased software packages. Documentation is generated or prepared for the new/modified programs as they are developed. As needed, data conversion programs are developed, tested, and validated for subsequent use during implementation. Testing is performed as the information system is developed to ensure that it will perform as specified.

This phase provides for the following:

Mandatory **DELIVERABLES**

- Physical Files and/or Databases
- User Instructions Documentation
- Operations Instructions Documentation
- Unit, System & Integrated Systems Test Plan
- Tested Application Programs Executable Code with Documented Test Results
- Tested Information System with Documented Test Results and Approvals
- User Acceptance Test Documentation and Approvals
- Written Approval of the Deliverables
- Written Approval to Proceed

Conditional
Mandatory **DELIVERABLES**

- Tested Source and Executable Conversion Programs
- Conversion Data
- Application Programs Source Code
- Final Organizational Structure, Functions, and Personnel Documentation
- Tested Integrated Information System with Documented Test Results and Approvals

Optional **DELIVERABLES**

- Training Plan

**Task
Number**

Tasks/Activities

3.10

MODIFY INFORMATION TECHNOLOGY ENVIRONMENT

This task is used as needed to modify the operating environment (e.g.: hardware, operating systems, database management systems, etc.). Changes to the environment must be subjected to acceptance testing.

Activities could include, but are not limited to:

- Coordinating the installation of new information technology resources.
- Designing acceptance testing criteria.

3.20 TEST INFORMATION TECHNOLOGY ENVIRONMENT

This task is used as needed to subject the agency's revised operating environment to acceptance testing.

Activities could include, but are not limited to:

- Generating the test data and performing the acceptance testing.
- Verifying the suitability, completeness and accuracy of the information technology environment.

3.30 *Mandatory* **GENERATE PHYSICAL FILE STRUCTURES**

This task will be used as needed to design and create new physical file structure(s) or to modify existing/purchased file structures for the selected hardware and software environment.

Activities could include, but are not limited to:

- Designing and generating new test/production physical databases.
- Modifying and generating revised test/production physical databases.
- Creating or modifying test/production physical system files and tables.

Deliverable: *PHYSICAL FILE STRUCTURES*

3.40 *Conditional*
Mandatory **PERFORM DATA-CONVERSION**

This task will be used as needed to complete all items on the Conversion Plan developed in the Design Phase. Records and files are converted to the format and structure required by the new, modified or purchased application programs. Once converted, the completeness, accuracy and consistency of the new files and data are verified.

Activities could include, but are not limited to:

- Installing and testing the data conversion equipment.
- Developing, testing and documenting any data conversion programs.
- Developing, testing and documenting any data entry conversion programs.
- As appropriate, training users on the use of the data entry programs.
- Converting existing records and files as required by the conversion schedule.
- Developing procedures which will ensure that the data conversion is orderly and timely and that the converted data are complete and accurate.

Deliverable: *DATA FOR TEST AND/OR PRODUCTION FILES/DATABASES*

Deliverable: *TESTED CONVERSION PROGRAMS*

3.50 *Conditional*
Mandatory **GENERATE APPLICATION PROGRAMS**

This task will be used to create all the needed new application programs, modify existing programs as documented, or to customize/modify purchased software as documented and generate the corresponding executable code. The amount of effort required to generate application programs is dependent on the number and complexity of the application programs to be created or modified and the availability, selection and use of systems development methodologies, tools and techniques. The use of automated tools in this task could be a continuation of the use of such tools from previous phases. Alternatively, such tools can be introduced to expedite the generation of application programs. Depending on the systems development methodologies, tools and techniques used, application program source code may also be an appropriate deliverable for this task.

Activities could include, but are not limited to:

- Completing the detailed design documentation of the application program specifications.
- Developing new or modified application programs code.
- Generating machine executable code.

Deliverable: ***APPLICATION PROGRAMS SOURCE CODE***

Deliverable: ***APPLICATION PROGRAMS EXECUTABLE CODE***

3.60 Mandatory **DEVELOP/FINALIZE USER DOCUMENTATION**

This task will be used to develop, update and/or finalize the content and format of user documentation required to support the new, modified or purchased application programs.

Activities could include, but are not limited to:

- Developing, updating and/or finalizing the content and format of user instructions. User instructions should address such things as:
 - how to sign on or off the system;
 - how to invoke a transaction or program;
 - sample documents, forms, reports and screens;
 - data input edit criteria;
 - requesting information via inquiries or ad hoc reporting capabilities;
 - how to exit application programs; and
 - how to handle error or failure conditions.

Deliverable: ***USER INSTRUCTIONS DOCUMENTATION***

3.70 Mandatory **DEVELOP/FINALIZE OPERATIONS DOCUMENTATION**

This task will be used to develop, update and/or finalize the content and format of operations documentation required to support the new, modified or purchased application programs.

Activities could include, but are not limited to:

- Developing, updating and/or finalizing the content and format of the operations instructions. Operations instructions should address such things as:
 - run instructions;
 - error codes and correction procedures;
 - work flows, including sample output reports and distribution lists; and
 - back-up and recovery instructions.

Deliverable: *OPERATIONS INSTRUCTIONS DOCUMENTATION*

3.80

Mandatory

DEVELOP UNIT, SYSTEM AND INTEGRATED SYSTEMS TEST PLAN

This task will be used to develop a test plan for unit application program testing, systems testing and as needed, integrated systems testing. This test plan must address all the testing requirements needed by the developer to ensure that the system will perform as specified. This test plan must also address all the user requirements for systems acceptance testing.

Activities could include, but are not limited to:

- Developing a unit test plan for each application program including:
 - defining the levels of testing to be performed and the sources and types of test data required;
 - preparing a unit testing schedule which identifies needed equipment and the personnel responsible for the testing; and
 - preparing documentation that defines the anticipated and critical test results.
- Developing a systems test plan including:
 - defining the levels of testing to be performed and the sources and types of test data required;
 - preparing the testing schedule which identifies the application programs to be tested, the needed equipment and the personnel responsible for the testing; and
 - preparing documentation that defines the anticipated and critical test results.
- Developing an integrated systems test plan as needed, including:
 - defining the levels of testing to be performed and the sources and types of test data required;
 - preparing the testing schedule which identifies the application programs to be tested, other information systems applications programs to be tested, the needed equipment and the personnel responsible for the testing; and
 - preparing documentation that defines the anticipated and critical test results.

Deliverable: ***UNIT, SYSTEM & INTEGRATED SYSTEMS TEST PLAN***

3.90 *Mandatory* **PERFORM UNIT APPLICATION PROGRAM TESTING**

This task will be used to test each application program (developed, modified or purchased) for accuracy, completeness and reasonableness to ensure that it performs in accordance with the specifications and requirements. There are four steps to this task: preparing for the test; conducting the test; measuring the results of the test; and, as required, modifying the program and performing another test iteration. User acceptance testing must be accomplished as a test iteration of this task or as part of the separate task provided for in this phase.

Activities could include, but are not limited to:

- Preparing for the test as indicated and scheduled on the Unit, System and Integrated Systems Test Plan including:
 - verifying the availability of interfacing files, programs, and support software; and
 - preparing test data which checks normal conditions, error conditions, recovery capabilities, security factors, and timing requirements.
- Conducting the test by executing each program according to its unit test plan.
- Measuring and evaluating the test results including:
 - verifying that each application program performs as specified; and
 - obtaining appropriate approvals for task completion.
- Modifying the program and corresponding user/operations documentation and performing the necessary retests to verify that all identified problems or errors have been resolved.

Deliverable: ***TESTED APPLICATION PROGRAMS EXECUTABLE CODE WITH DOCUMENTED TEST RESULTS AND APPROPRIATE USER APPROVALS***

3.100 DEVELOP TRAINING PLAN

This task will be used as needed to develop a training plan that identifies who must be trained, when they must be trained, and the required content of the training materials.

Activities could include, but are not limited to:

- Determining training requirements including:
 - who must be trained (management, users, operations and maintenance staff);
 - what type of training is needed for each group;
 - the contents of the training for each group;
 - where the training will take place;
 - what equipment and facilities will be required; and
 - who will conduct the training.
- Preparing a user training plan that includes tasks, schedules, controls, responsible personnel and personnel to be trained.

Deliverable: *TRAINING PLAN*

3.110 Mandatory PERFORM SYSTEM LEVEL TESTING

This task will be used to test all new, modified or purchased application programs as a group for accuracy, completeness and reasonableness to ensure that they perform in accordance with the specifications and requirements. There are four steps to this task: preparing for the test; conducting the test; measuring the results of the test; and, as required, modifying the programs and performing another test iteration. User acceptance testing must be accomplished as a test iteration of this task or as part of the separate task provided for in this phase.

Activities could include, but are not limited to:

- Preparing for the test as indicated and scheduled on the Unit, System and Integrated Systems Test Plan including:
 - verifying the availability of interfacing files, programs and support software; and
 - preparing test data which checks such things as;
 - normal conditions,
 - error conditions,
 - recovery capabilities,
 - security factors,
 - timing requirements, and
 - user and operations instructions documentation.

- Conducting the test by executing all application programs according to the test plan.
- Measuring and evaluating the test results including:
 - verifying that each application program performs as specified; and
 - obtaining appropriate approvals for task completion.
- Modifying each program and the corresponding user/operations documentation as needed and performing the necessary retests to verify that all identified problems or errors have been resolved.

Deliverable: ***TESTED INFORMATION SYSTEM WITH DOCUMENTED TEST RESULTS AND APPROPRIATE USER APPROVALS***

3.120 *Conditional*
Mandatory

FINALIZE ORGANIZATIONAL STRUCTURE AND PROCEDURES

This task will be used as needed to finalize the organizational structure required to support the new, modified or purchased applications programs.

Activities could include, but are not limited to:

- Finalizing and documenting the organizational structure needed to support the new or enhanced system.
- Completing the documentation for new positions including defining each position's functional responsibilities.
- Completing the documentation for new or additional functional responsibilities for existing positions.
- Preparing new and/or modified organizational charts and related descriptions.
- Documenting new and revised operating procedures for the organization.

Deliverable: ***FINAL ORGANIZATIONAL STRUCTURE, FUNCTIONS, AND PERSONNEL DOCUMENTATION***

3.130 *Conditional*
Mandatory

PERFORM SYSTEM INTEGRATED TESTING

This task is used as needed to verify the new, modified or purchased application programs perform as specified with other information systems. There are four steps to this task: preparing for the test; conducting the test; measuring the results of the test; and, as required, modifying the programs and performing another test iteration. Appropriate user acceptance testing must be accomplished as a test iteration of this task or as part of the separate task provided for in this phase.

Activities could include, but are not limited to:

- Preparing for the test as indicated and scheduled on the Unit, System and Integrated Systems Test Plan including:
 - verifying the availability of interfacing files, programs and support software; and
 - preparing test data which checks such things as;

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- normal conditions,
 - error conditions,
 - recovery capabilities,
 - security factors,
 - timing requirements,
 - user and operations instructions documentation,
 - input data from other information systems is accurate and can be processed correctly,
 - output data from the new, modified or purchased application programs can be created and accepted and processed correctly by other information systems, and
 - procedures and timing considerations effecting interfaces with other information systems are complete and correct.
- Conducting the test by executing all application programs according to the test plan.
 - Measuring and evaluating the test results including:
 - verifying that all programs perform as specified; and
 - obtaining appropriate approvals for task completion.
 - Modifying each program and the corresponding user/operations documentation as needed and performing the necessary retests to verify that all identified problems or errors have been resolved.

Deliverable: **TESTED INTEGRATED INFORMATION SYSTEM WITH DOCUMENTED TEST RESULTS AND APPROPRIATE USER APPROVALS**

3.140 *Conditional*
Mandatory

CONDUCT USER ACCEPTANCE TESTING

This task can be used as needed to conduct user acceptance testing as specified in the Unit, System and Integrated Systems Test Plan. User acceptance testing must be accomplished using this task or as test iterations of the unit, system and/or integrated systems testing tasks.

Activities could include, but are not limited to:

- Preparing for the test as indicated and scheduled on the Unit, System and Integrated Systems Test Plan including:
 - preparing test data which checks such things as;
 - normal conditions,
 - error conditions,
 - recovery capabilities,
 - security factors,
 - timing requirements,

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- user and operations instructions documentation,
 - input data from other information systems is accurate and can be processed correctly,
 - output data from the new, modified or purchased application programs can be created and accepted and processed correctly by other information systems, and
 - procedures and timing considerations effecting interfaces with other information systems are complete and correct.
- Conducting the test by executing all application programs according to the test plan.
 - Measuring and evaluating the test results including:
 - verifying that all programs perform as specified; and
 - documenting all variances from expectations in programs or user instructions documentation.

Deliverable: *USER ACCEPTANCE TEST DOCUMENTATION AND APPROVALS*

3.150 *Mandatory*

OBTAIN APPROPRIATE APPROVALS TO ESTABLISH A PRODUCTION SYSTEM

This task will be used to obtain the required agency approvals of any deferred deliverables, the design and development deliverables, and the approval to proceed with this project.

Activities must include, but are not limited to:

- Presenting all appropriate deliverables and plans for approval.
- Obtaining approval to proceed. This is the agency's formal approval to allocate funds and resources to implement the user accepted application programs as a production system.

Deliverable: *WRITTEN APPROVALS*

PHASE 4: IMPLEMENTATION AND EVALUATION

The tasks and activities in this phase will be used to implement the accepted deliverables from previous phases into the agency's production environment. In addition, this phase provides tasks, activities and deliverables that can be used to evaluate the effectiveness of an implemented information system. Results of this evaluation may include recommendations that could be used to enhance the usefulness or increase the effectiveness of information system for the organization. This phase should not be initiated prior to obtaining the required approvals from Phase 3.

This phase provides for the following:

Mandatory **DELIVERABLES**

- Pre-Production Verification Criteria and Plan
- Pre-Production Verification Data
- Documented Pre-Production Verifications Results
- Production Information System
- Implementation Complete Approvals

Optional **DELIVERABLES**

- Evaluation Plan
- Evaluation Report

**Task
Number**

Tasks/Activities

4.10 Mandatory **PREPARE FOR PRODUCTION.**

This task will be used to make the final preparations for releasing the accepted information system for production use.

Activities could include, but are not limited to:

- Developing the criteria and a pre-production verification plan that will be used to ensure that all programs, files and databases have been properly established in the production environment. This could include such things as:
 - identifying and documenting on-line transactions codes that must be properly registered and executable, and documenting add, retrieve, modify and delete actions that should be verified for all record types in the system's file structures;
 - identifying the sources and types of data that are needed to verify the specific functions; and
 - defining and developing the verification data.
- Installing and testing any necessary equipment including:
 - coordinating the installation of all required equipment; and
 - coordinating and/or conducting tests of the equipment to verify fault-free operation.

- Implementing any new user organization changes and procedures.
- Training users and operations staff.
- Establishing a production implementation date.
- Establishing a backout strategy.
- Loading the new, modified or purchased programs and files and/or databases into the production environment in preparation for conducting the pre-production verifications.

Deliverable: ***PRE-PRODUCTION VERIFICATION CRITERIA & PLAN***

Deliverable: ***PRE-PRODUCTION VERIFICATION DATA***

4.20 *Mandatory* **PERFORM PRE-PRODUCTION VERIFICATIONS**

This task will be used to perform all necessary verifications as specified in the pre-production verification plan.

Activities could include, but are not limited to:

- Executing the pre-production verification plan.
- Verifying systems operations and outputs are as specified and anticipated.
- Reviewing and verifying all results to ensure that the final supporting documentation is complete and that the accepted information system is ready to be released for production use. Documentation reviewed during this activity should include such things as:
 - the pre-production check-list;
 - user guides;
 - operations documentation; and
 - information systems documentation.

Deliverable: ***DOCUMENTED PRE-PRODUCTION VERIFICATION RESULTS***

4.30 *Mandatory* **RELEASE SYSTEM FOR PRODUCTION USE**

This task will be used to implement the final procedures and the accepted information system into the agency's production environment.

Activities could include, but are not limited to:

- Implementing any needed security procedures.
- Establishing a production schedule.
- Establishing a reports distribution schedule.
- Implementing needed back-up and recovery procedures.
- Establishing point-of-contact for problem determination and resolution.

Deliverable: ***PRODUCTION INFORMATION SYSTEM***

4.40 **PERFORM PHASED IMPLEMENTATION, AS APPROPRIATE**

This task will be used to schedule any activities required for the phased implementation of the accepted information system.

Activities could include, but are not limited to:

- Installing and testing any necessary equipment including:
 - coordinating the installation of all required equipment; and
 - coordinating and/or conducting tests of the equipment to verify fault-free operation.
- Implementing new user organization changes and procedures.
- Training users and operations staff.

4.50 *Mandatory* **OBTAIN APPROPRIATE APPROVAL AND SIGN-OFF.**

This task is used to obtain agency concurrence and approval that the implementation is complete.

Activities must include, but are not limited to:

- Presenting all appropriate deliverables.
- Obtaining final approvals on successful implementation.

Deliverable: *IMPLEMENTATION COMPLETE APPROVALS*

4.60 **PREPARE EVALUATION PLAN**

This task can be used as needed to define a plan to evaluate and/or measure the benefits of the implemented new, modified or purchased application programs. The plan should define what is to be evaluated, how it will be evaluated, when it will be evaluated, and who will perform the evaluation.

Activities could include, but are not limited to:

- Preparing the evaluation task list and schedule.
- Preparing the time and cost estimates needed to conduct the evaluation.
- Preparing a list of special considerations, schedule changes or unique measurement tools and/or criteria that are applicable to the evaluation.

Deliverable: *EVALUATION PLAN*

4.70 **EVALUATE EFFECTIVENESS**

This task can be used to evaluate the overall efficiency and effectiveness of the information systems as specified in the evaluation plan. This evaluation should include an overall assessment of the information systems capabilities to meet the users requirements and expectations.

Activities could include, but are not limited to:

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- Executing the evaluation plan.
 - Identifying major strong points.
 - Identifying major and minor deficiencies.
 - Identifying potential enhancements or recommendations that could correct identified deficiencies.

4.80 PREPARE AND SUBMIT EVALUATION REPORT

This task can be used to prepare the evaluation report for agency management.

Activities could include, but are not limited to:

- Preparing the evaluation report that documents such things as:
 - recommendations for improving performance and effectiveness;
 - major and minor deficiencies; and
 - cost/benefits analysis comparisons.
- Submitting the report to agency management and participating in the report review process.
- Obtaining approval(s) and taking appropriate action to implement accepted recommendations.

Deliverable: *EVALUATION REPORT*

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