

ELECTRONIC RECORDS ARCHIVES

REQUIREMENTS MANAGEMENT PLAN (RQM)

(TOMP VERSION 2.0, TASK 4.3.10)

for the

**NATIONAL ARCHIVES AND
RECORDS ADMINISTRATION**

**ELECTRONIC RECORDS ARCHIVES
PROGRAM MANAGEMENT OFFICE
(NARA ERA PMO)**

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ERA REQUIREMENTS MANAGEMENT PLAN (RQM)

Signature Page

Program Director,

I recommend approval of the Requirements Management Plan (RQM).

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Requirements Management Plan (RQM)

1.0 Introduction

This *Requirements Management Plan (RQM)* applies to all requirements for the Electronic Records Archives (ERA). It defines the roles and responsibilities of the Requirements Management process, the process for developing and managing the requirements, the schedules and dependencies, and the tools and resources needed to do the job. The guidelines, rules, and procedures defined in this plan must be adhered to by the people involved with developing and managing the requirements for ERA.

1.1 Purpose

The purpose of this document is to outline all Requirements Management activities for the ERA Program. It describes the functions, responsibilities, and procedures for Requirements Management within the ERA. This plan covers all requirements work within ERA beginning with the development of the ERA Vision, progressing through the development and management of the ERA requirements, and ending with Operations and Support for the system.

1.2 ERA Program Overview

ERA will be a comprehensive, systematic, and dynamic means for preserving virtually any kind of electronic record, free from dependence on any specific hardware or software. The ERA, when operational, will make it easy for the National Archives and Records Administration (NARA) customers to find records they want and easy for NARA to deliver those records in formats suited to customers' needs.

1.3 Acronyms

Table 1-1, Acronym List, contains a list of acronyms used in this document.

ACRONYM	DEFINITION
AS	Acquisition Strategy
CAR	Committee on Archival Requirements
CCB	Configuration Control Board
CM	Configuration Management
CMM	Capability Maturity Model
CMP	Configuration Management Plan
ConOps	Concept of Operations
COR	Contracting Officer Representative
ELC	ERA Life Cycle
ERA	Electronic Records Archives
ERB	Engineering Review Board
IPT	Integrated Product Team
IV&V	Independent Verification and Validation

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ACRONYM	DEFINITION
MNS	Mission Needs Statement
MP	Metrics Plan
NARA	National Archives and Records Administration
PD	Program Director
PMO	Program Management Office
PMP	Program Management Plan
QM	Quality Management
QMP	Quality Management Plan
RD	Requirements Document
RFP	Request for Proposal
RKM	Risk Management Plan
RO	Risk Officer
RQF	Requirements Question Form
RQG	Requirements Management Guidance
RQM	Requirements Management Plan
RR	Requirements Review
SDD	System Design Document
SDR	System Design Review
SME	Subject Matter Expert
SRR	System Requirements Review
SyRS	System Requirements Specification
TEP	Technical Review Plan
TRA	Training Needs Assessment
TRP	PMO Training Plan

Table 1-1: Acronym List

1.4 References

The standards, guidelines, and documentation used to develop the RQM are described in the sections that follow.

1.4.1 Standards and Guidelines

The standards and guidelines used in preparation of this document are listed below.

- IEEE/EIA 12207.0 Standard for Information Technology - Software life cycle processes – Life cycle data
- IEEE Std 1233 - 1998, IEEE Guide for Developing System Requirements Specifications
- SEI Software Acquisition Capability Maturity Model (CMM), Version 1.02, April, 1999

1.4.2 ERA PMO Documentation

The following ERA Program Management Office (PMO) documentation was used to support the generation of this document.

- Project Management Plan (PMP), Version 1.2
- Configuration Management Plan (CMP), Version 1.5
- Requirements Management Guidance (RQG), Version 1.0
- PMO Training Plan (TRP), Version 1.0
- Training Needs Assessment (TRA), Version 2.0
- Technical Review Process (TEP), Version 1.0
- Quality Management Plan (QMP), Version 2.1
- Metrics Plan (MP), Version 2.0
- Risk Management Plan (RKM), Version 1.0
- Acquisition Strategy (AS), Version 2.1
- ERA Life Cycle (ELC), Version 1.0

2.0 Requirements Management Organization and Responsibilities

The ultimate responsibility for Requirements Management within ERA rests with the Program Director (PD). The PD may delegate the day-to-day responsibilities for requirements management to a Requirements Officer. The principal roles in Requirements Management are:

- Requirements Officer,
- Configuration Management (CM) Specialist,
- Development Contractor,
- Engineering Review Board (ERB),
- Configuration Control Board (CCB),
- Users/Subject Matter Experts (SMEs),
- Quality Management (QM) Team,
- Independent Verification and Validation Team, and
- Risk Officer (RO).

2.1 Requirements Officer

The Requirements Officer is responsible for ensuring that Requirements Management activities are carried out as described in this plan. The Requirements Officer is responsible for the maintenance and implementation of this plan. The Requirements Officer also is responsible for all requirements related issues, recommendations, and the continuing assurance that the requirements are fulfilled. The Requirements Officer is responsible for ensuring that all requirements questions receive a timely response. The Requirements Officer selected for ERA has the experience and expertise necessary to perform the Requirements Management task as described in this plan. The Requirements Officer will interact with the Independent Verification and Validation (IV&V) Team in requirements related activities as directed by the Program Director and as specified in the IV&V Plan (currently under development).

2.2 Configuration Management (CM) Specialist

The CM Specialist is responsible for maintaining all controlled versions of the requirements according to the procedures in the *ERA Configuration Management Plan (CMP)*.

2.3 Development Contractor

The development contractor will be responsible for further derivation and decomposition of requirements after the contract is awarded. Based on the requirements that are delivered to the development contractor by the ERA PMO, the development contractor will further refine the requirements to specify the functional, data, and system requirements. The development contractor will then prepare and deliver the final requirements in the form of a System Requirements Specification (SyRS) for the system, and will lead a System Requirements Review (SRR) for the functional requirements. As part of the SRR, the development contractor will be responsible for ensuring traceability to the higher level requirements, adhering to the standards defined in this plan, and allocating requirements to hardware, software, operations, and other system components.

The development contractor may use the requirements question process (as defined in this document) to submit written questions to the ERA PMO, to gain clarity and understanding of the requirements. The development contractor will use the CM process to request requirements changes that are coordinated with the Engineering Review Board (ERB).

2.4 Engineering Review Board (ERB)

The ERB will perform its role in relation to requirements changes in the manner defined in the *CMP*. The mission of the ERB is to conduct a technical evaluation on all Problem Reports (Action Items), Requirements and Change Proposals, suggesting additions, modifications or revisions to the ERA program baselines and/or supporting products before work is authorized and initiated.

2.5 Configuration Control Board (CCB)

The CCB performs its role in relation to requirements changes in the manner defined in the *CMP*. The ERA CCB is responsible for all changes made to Functional, Allocated, Product, and Production baselines.

2.6 Users/Subject Matter Experts (SMEs)

Users and SMEs provide input to the requirements definition process through participation in Integrated Product Teams (IPTs), user conferences, and other requirements gathering activities. As such, users and SMEs are crucial to the requirements gathering process. Users and SMEs generally define business needs due to their expertise in business processes, whereas the ERA PMO translates and defines the performance and technical requirements. Users and SMEs ultimately validate and verify all requirements for the ERA program. Users and SMEs may also propose changes to the requirements in the manner described in the *CMP*.

2.7 Quality Management (QM) Team

The QM Team audits the requirements in the manner defined in the *ERA Quality Management Plan (QMP)*. QM will assist in determining evaluation criteria for requirements and test specifications, evaluate requirements against evaluation criteria, ensure process improvements are implemented and documented, participate in the CCB, and ensure that personnel participate and agree to the allocation of requirements.

2.8 Independent Verification and Validation (IV&V) Team

The IV&V Team will perform requirements-related verification and validation activities as specified by the Program Director and the IV&V Plan (currently under development).

2.9 Risk Officer (RO)

Throughout the requirements development and management process, risks must be identified and managed as defined in the *ERA Risk Management Plan (RKM)*. Requirements-related risks must be reported to the ERA RO.

2.10 Training

Individuals filling any of the above roles receive training pertinent to that role as specified in the *ERA Training Needs Assessment (TRA)* and the *PMO Training Plan (TRP)*.

3.0 Requirements Documentation

All requirements are documented in the *ERA Requirements Document (RD)*.

4.0 ERA Phased Approach

The ERA system will be developed using a phased approach. Each phase, “Needs Definition,” “Concept Exploration,” “Concept Development and Initial Production,” and “Operations and Maintenance” requires different Requirements Management strategies. Details on the purpose and application of the phases may be found in the *ERA Acquisition Strategy (AS)* document. The *RD* addresses the phases only to the extent that they impact the way requirements are managed during each phase.

For the purposes of this document, the “Concept Development and Initial Production” phase has been separated into a “Concept Development” phase and an “Initial Production” phase, because requirements are managed differently during “Concept Development” than “Initial Production.” The “Needs Definition” phase has been combined into the “Concept Exploration” phase because the requirements activities are the same.

During each phase of ERA, the Development Contractor should consider the ERA PMO its customer. The Development Contractor should address all requirements-related comments, questions, issues, etc. to the ERA PMO. The Development Contractor should not directly contact NARA personnel, ERA users or stakeholders, or others involved with the ERA project without first clearing such contact with the ERA PMO.

5.0 Concept Exploration Phase Requirements Management

Concept Exploration Phase Requirements Management involves the elicitation and development of requirements to a level of detail necessary for use by development contractors as the basis to bid on the RFP.

5.1 Concept Exploration Phase Requirements Development Process

Figure 5-1, Concept Exploration Phase Requirements Development High-Level Steps, shows the high-level steps for the concept exploration phase requirements development.

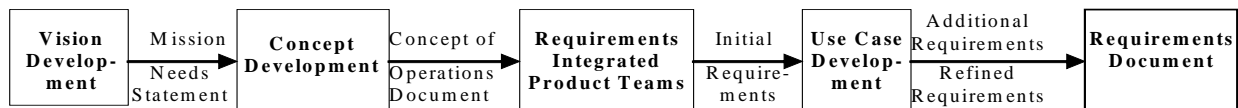


Figure 5-1: Concept Exploration Phase Requirements Development High-Level Steps

5.1.1 Vision Development

Vision development is the process of developing a consensus view of the scope of the ERA program. This vision covers the overall objectives and mission for the system. This is the highest-level requirements-related document, stating the goal and purpose of the system in high-level terms that meet the needs and goals of the agency. This process for ERA concluded with an approved vision statement.

The vision for the ERA was developed using a two-track approach. On the first track, a draft vision statement was developed based on the current understanding of the system by the ERA PMO. This vision statement was used for both the initial concept development and as input to the second track of vision development. In parallel, the second track of vision development was conducted by the senior NARA leadership team, to refine the draft vision and to create “buy-in” for the ERA program. The final vision statement was approved by the Archivist of the United States.

5.1.2 Concept of Operations Development

The *ERA Concept of Operations (ConOps)* document was one of the products of the concept exploration phase. A concept development IPT created the *ConOps* document. The *ConOps* describes the system characteristics from a user’s viewpoint. It communicates the system characteristics to the user(s), buyer(s), and developer(s). It provides the high-level view of what the system will do and how users will interact with it. Inputs to its development were the vision statement, as well as other relevant documents, such as the *ERA Mission Needs Statement (MNS)*, which was prepared as part of the PMO’s acquisition strategy planning process. The *ConOps* document will be updated as necessary.

5.1.3 Concept Exploration Phase Requirements Development Activities

Concept exploration phase requirements development is a repetitive activity. A series of steps is performed to elicit the initial set of requirements. Subsequent cycles through the same set of steps are used to continue to refine the requirements to the point necessary for inclusion with the RFP.

The following steps constitute a complete cycle through the requirements development cycle:

- Prepare for cycle,
- Elicit requirements,
- Analyze requirements,
- Formalize requirements, and
- Validate and Verify requirements.

5.1.3.1 Prepare for Cycle

In preparation for each cycle of requirements evolution, the following steps are taken.

- **Define the goal of the cycle** – The acceptance criteria for each cycle is identified. For example, the criteria for a cycle may be to map each requirement to a specific business need or goal. That is, every requirement should be traceable to a statement in the *MNS* or to an objective from the NARA Strategic Plan.
- **Define the gathering technique for the cycle** – The technique for gathering or refining requirements is defined for each cycle. Techniques included brainstorming using IPTs for Level 0 and Level 1 requirements, creation and decomposition of use cases, Object Oriented Analysis, user conferences, interviews, and questionnaires for the requirements refinement effort.
- **Identify stakeholders/participants** – The key stakeholders are identified for each cycle of requirements gathering. This includes identifying participants in the elicitation activity. Participants are selected based on their knowledge of overall or specific areas of ERA's business, ability to commit the time required to attend the IPT meetings, and ability to contribute towards fulfillment of the goal of the activity. Stakeholders meeting these criteria are selected from the offices within NARA for IPT participation. Selected participants will receive training as explained in the *ERA TRP*.

5.1.3.2 Elicit Requirements

The requirements are gathered or refined using the technique defined during the “prepare” activity (see **Section 5.1.3.1** above). The output of this activity is a set of candidate requirements, or candidate requirements refinements.

5.1.3.3 Analyze Requirements

The candidate requirements are analyzed to form informal requirements. Requirements are made consistent in level and detail. Conflicts (e.g., duplicates, inconsistencies) between requirements are resolved. An initial mapping between levels of requirements is performed. The output of this phase is a new set of requirements, and/or refinements to the existing requirements.

5.1.3.4 Formalize Requirements

Requirements are phrased in “formal” requirements terminology and format (“The system shall...”). Requirements are placed in the RequisitePro Requirements Management tool. Traceability matrices are defined or updated. The *RD* is either created (first cycle) or updated (subsequent cycles).

5.1.3.5 Verify and Validate Requirements

The *RD* is verified and validated by the stakeholders, (the IPT members, or the Committee on Archival Requirements (CAR) plus SMEs) via review or interview, to ensure that it meets the goal that was defined for the cycle. If the *RD* is acceptable to the stakeholders, the document is placed under configuration control.

At the conclusion of verification and validation, either another requirements development process cycle begins to further refine the *RD*, or the document goes into a Requirements Review (RR). The *RD* is ready for RR when the *RD* is determined by NARA and the ERA PMO to be complete and ready for formal review, as discussed in **Section 5.1.3.6**.

5.1.3.6 Concept Exploration Phase Requirements Review

When NARA and the ERA PMO believe the requirements have reached the appropriate level for inclusion with the *ERA Request for Proposal (RFP)*, the following additional activities are performed in preparation for RR.

- **Prioritize requirements** – The ERA PMO allocates requirements to ERA increments, and prioritizes requirements within increments following the objectives, guidelines, and program priorities established by the CAR. Prioritization will take the form of assigning requirements to categories such as “Must Have,” “Needed,” and “Desirable.” “Must Have” requirements are defined as requirements that if not met will result in delay of the project. “Needed” requirements are defined as those requirements that require a very strong reason for not being met. “Desirable” requirements are defined as those requirements that if they are not met are open to negotiation.
- **Assess relative risk of the requirements** – Failure to meet certain requirements will have a greater impact on the project than failure to meet other requirements. The relative risk involved with failure to meet each requirement must be ascertained. The process by which these risks are assessed will be defined in a later version of this document.

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When prioritization and risk assessment have been completed, the *RD* undergoes a *RR*, as detailed in the *ERA Technical Review Process (TEP)*. The purpose of the *RR* is to ascertain the adequacy of the requirements in defining the proposed characteristics and functionality of the ERA system for inclusion in the RFP. The requirements will be evaluated according to the criteria described in **Section 10.0, Requirements Acceptance Criteria**.

At the conclusion of the *RR*, the *RD* must be approved by the Milestone Decision Authority (MDA), the Archivist of the United States, as defined in the *Acquisition Strategy (AS)* document.

5.1.3.7 Concept Exploration Phase Requirements Baseline

A baseline describes the functional and performance requirements and design constraints of the ERA as a whole entity. It is comprised of an approved requirements set under configuration control, describing a system specification that defines system functional and performance requirements, high-level system interface requirements, system technical constraints, and the qualification provisions required to verify achievement of each requirement.

The functional baseline resulting from the concept exploration phase is defined as the last iteration of concept exploration requirements definition. This functional baseline will be used for the RFP. Subsequent functional baselines will be established at each production and product release of the system as defined in the *CMP*, and in this plan.

5.2 Concept Exploration Phase Requirements Development Cycles

Milestones for concept exploration requirements activities are provided in the *ERA Program Management Plan (PMP)*. The following sections provide approaches for requirements development used during the execution of this plan. Modifications to these approaches can be made if needed during the “Prepare for Cycle” activity for each development cycle (see **Section 5.1.3** for a discussion of the cyclical approach used in concept exploration).

The Concept Exploration Requirements Development process consists of three iterations of requirements development, defined as follows:

- Level 0 Requirements Development Iteration,
- Level 1 Requirements Development Iteration, and
- Requirements Refinement Iteration.

5.2.1 Level 0 Requirements Development Iteration

The Level 0 (first iteration) requirements elicitation was based on the input of the members of the requirements IPT, as well as review of available documents and interviews with senior NARA staff. This initial set of business level requirements was used as a basis for additional brainstorming sessions to create the candidate requirements. The Requirements Officer (and staff) performed the analysis and formalization steps, and verification and validation was done by the requirements IPT. The result was the first iteration of the *RD*.

5.2.2 Level 1 Requirements Development Iteration

The Level 1 (second iteration) requirements elicitation was accomplished by a combination of brainstorming and review of materials from the Level 0 phase. It was performed by a requirements IPT, and involved users of the system and SMEs. The Requirements Officer (and staff), working in concert with the IPT, completed the analysis and formalization steps, and the verification and validation were done by the requirements IPT. The result was the second iteration of the *RD*.

5.2.3 Requirements Refinement Iteration

Requirements refinement (final iteration) was done by refining the Level 1 Requirements based on the creation of use cases to further explore the existing requirements and derive new requirements. The ERA PMO staff created the use cases, which were presented to a group composed of members of the CAR plus additional SMEs, for analysis, comment, and validation. The CAR plus SMEs' comments on the use cases were then used to refine the requirements, or create new requirements. Comments from industry vendors elicited from a Request for Comment release of the *RD* were also reviewed and considered. The Requirements Officer (and staff) will complete the analysis and formalization steps, and the verification and validation will be done by the CAR plus SMEs. The result will be the final iteration of the *RD*.

5.3 Concept Exploration Phase Requirements Traceability and Allocation

Prior to formal baselining of requirements and issue of the RFP, requirements traceability consists of:

- Traceability between the NARA Strategic Goals and the high level requirements,
- Traceability between use cases and the high level requirements, and
- Traceability between high level "parent" requirements and their lower level "children" requirements.

The requirements activities during the Concept Exploration phase consist of requirements elicitation, and therefore the requirements are expected to be fluid and changeable. Since IPTs and use cases are the sources for the vast majority of Concept Exploration phase requirements, there is not a single identifiable source to which requirements can be traced, making requirements traceability-to-source (the ability to trace a requirement from its inception, through all subsequent changes and iterations, to its current form) impractical. Traceability of high-level requirements to the NARA Strategic Goals is maintained. Requirements are subject to documented CM procedures throughout Concept Exploration.

6.0 Concept Development Phase Requirements Management

NARA will award contracts to two Development Contractors, which will independently analyze and decompose the requirements presented to them by the ERA PMO. Each Development Contractor will produce a system design, containing their decomposed requirements. NARA will review the contractors' designs, and select one contractor to develop the ERA system. For information on the selection process, see the *AS*.

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Figure 6-1, Concept Development Requirements Management Process, illustrates the steps in the Concept Development phase Requirements Management process. See the *TEP* for additional information on the System Requirements Review (SRR) and System Design Review (SDR).

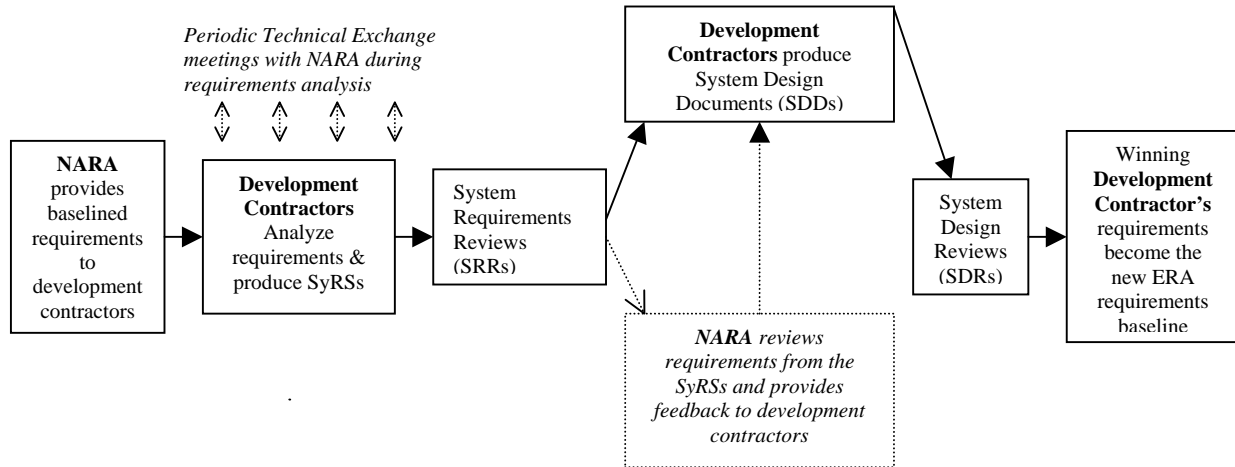


Figure 6-1: Concept Development Requirements Management Process

6.1 Provide Baselined Requirements to Development Contractors

ERA PMO provides baselined requirements to the Development Contractors for use as a basis for the contractors' requirements decomposition and design efforts.

6.2 Contractor Requirement Analysis

The requirements provided to the Development Contractors by ERA PMO are further decomposed and refined by the contractors to the level needed for ERA system design and implementation. The Development Contractors each determine the methodology they use to perform this decomposition. Each Development Contractors is responsible for delivering the results of their system requirements analysis in the form of a System Requirements Specification (SyRS) in a format that follows the traceability and other criteria defined in this document. The Development Contractors are responsible for allocating requirements to hardware, software, operations, or some combination thereof in their SyRSs. Requirements will be allocated to development increments in the SyRSs based on guidance provided in the *RD*. Development Contractors will utilize their own CM processes to control their requirements sets during requirements analysis.

6.2.1 Requirements Questions

Throughout the concept development phase of the ERA project, a requirements question process will be in place to enable the ERA PMO to adjudicate requirements clarifications and questions. Anyone needing clarification of requirements may submit questions on the Requirements Question Form (RQF) shown in **Appendix A, Requirements Question Form (RQF)**.

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The RQF forms are submitted to the Requirements Officer, who maintains a database of questions and a schedule for the needed answers. If the answers are simple clarifications, they are given directly back to the submitter. The Requirements Questions Database includes the data on the RQF, status and resolution of each question, and the rationale for the responses. The clarifications provided from the answers may be added as annotations to the affected requirements. Requirements questions may cause requirements changes, in which case, the standard ERA PMO CM procedures are followed. When the questions generate requirements changes, the questions and answers are also added as annotations to the affected requirements. The Requirements Officer will develop an internal process for handling the questions and data within the requirements team. This process will be detailed in a future iteration of this document.

6.2.2 Technical Exchange Meetings

Independent technical exchange meetings are held periodically between each Development Contractor and the ERA PMO. The purpose of these meetings is to provide the Development Contractors a forum for asking questions, and gathering information and ideas from the ERA PMO in a less formal and more immediate fashion than provided by the requirements question process. Any changes to the ERA baselined requirements set resulting from these meetings will be handled through the ERA PMO CM process. In the event of changes to the ERA baselined requirements set, the rebaselined requirements set will be provided to both contractors.

6.3 System Requirements Review (SRR)

The Development Contractors present the results of their requirements analysis efforts in the form of SyRSs to the ERA PMO at SRRs.

The purpose of the SRRs is to ascertain the adequacy of the Development Contractors' efforts in focusing on the completeness of system requirements in terms of the identification, definition, and determination of the initial direction and progress of the Development Contractors' system engineering management efforts.

Some of the criteria which may be used for requirements evaluation include:

- Traceability to acquisition needs,
- Consistency with acquisition needs,
- Testability,
- Feasibility of system architectural design, and
- Feasibility of operation and maintenance.

The PD approves the Development Contractors' SyRSs after completion of the SRRs.

SyRSs are expected to include full requirements traceability-to-source. The source will be the baselined requirements provided to the contractors by the ERA PMO, as well as any subsequent requirement changes made through the requirements change process. The SyRSs must also

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include allocation of requirements to hardware, software, operations, and/or other system components. See the *TEP* document for additional information on these reviews.

6.4 ERA PMO Reviews Requirements and Provides Feedback

After the SRRs, while the Development Contractors continue to work towards their designs, the ERA PMO simultaneously reviews and analyzes the requirements presented at the SRRs. The ERA PMO then provides feedback to the Development Contractors prior to completion of the Development Contractors' design efforts. It is not anticipated that major requirements changes will result from ERA PMO's analysis of the Development Contractors' SyRSs, since the requirements presented in the Development Contractors' SyRSs should primarily be further decompositions of the baselined requirements provided to them by the ERA PMO, rather than a discovery of additional high-level requirements. If changes to the requirements result from ERA PMO's analysis of the Development Contractors' SyRSs, the requirements are re-baselined per the CM change process.

6.5 Development Contractors Produce System Design Documents

The Development Contractors create system designs from the baselined requirements provided by the ERA PMO, their own requirements analysis, and the feedback provided by the ERA PMO from the Development Contractors' SRRs. The results of this effort are System Design Documents (SDDs).

6.6 System Design Reviews (SDRs)

The Development Contractors will present their SDDs to the ERA PMO at System Design Reviews (SDRs). The purpose of the SDRs is to ensure that the ERA PMO and the Development Contractors concur that the proposed system design meets baseline functionality and performance requirements. The ERA PMO will determine whether the SDDs are acceptable, and if so, will approve them. If an SDD is not acceptable, the Development Contractor will revise it as necessary to correct deficiencies.

6.7 Development Contractor Selected

Based on review and analysis of the SDDs submitted by the Development Contractors, in addition to other factors, NARA will select one of the Development Contractors to develop the ERA system. For information on the selection process, see the *AS*.

6.8 New Requirements Baseline

The requirements set developed by the winning Development Contractor in their SDD becomes the baseline requirements for the remainder of the project, after going through the ERA PMO CM process, and approval by the PD. The new baselined requirements set is placed under CM as described in the *CMP*.

7.0 Initial Production Phase Requirements Management

After approval of the SDD by the ERA PMO, the Development Contractor develops the system in five (5) increments. Each increment is composed of iterative releases.

Figure 7-1, Development Methodology, illustrates the increment/release approach used for ERA development

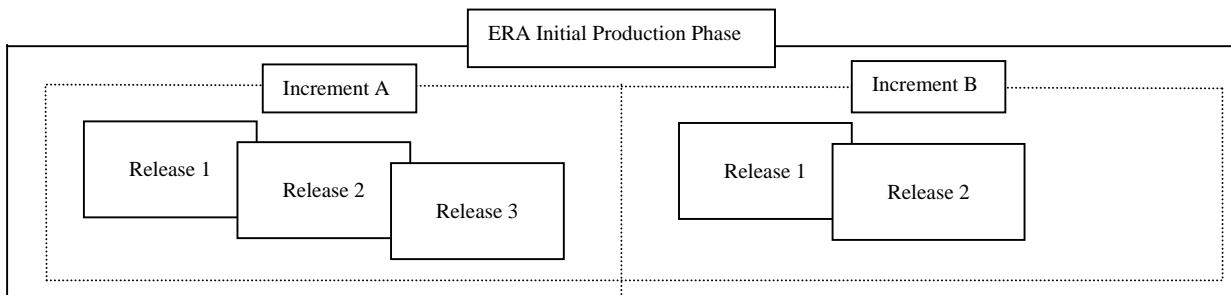


Figure 7-1: Incremental Development Methodology

Prior to the start of the Initial Development Phase, in the Development Contractors SDD, requirements will have been tentatively allocated to each increment, and the scope of each increment will have been defined. Shortly prior to each Increment SRR (described below), this allocation will be reviewed and updated by the contractor if necessary.

7.1 Increment Requirements Management

The Increment SRR is held near the beginning of each increment. The Increment SRR is conducted when the system functional requirements have been allocated to that increment. The Development Contractor is responsible for conducting the increment SRR.

The purpose of the Increment SRR is to ascertain the adequacy of the Development Contractor's efforts in focusing on the completeness of system requirements in terms of their identification, definition, and determination of the initial direction and progress of the Development Contractor's system engineering management effort for the defined increment. The Increment SRR will confirm the Development Contractor's allocation of requirements to the increment.

See the *TEP* for details on Increment SRRs.

7.2 Release Requirements Management

For each release, the following requirements-related activities occur:

- Allocate baselined requirements to the release,
- Analysis of release requirements,
- Decomposition/development of release requirements (if necessary),
- Produce SyRS for the release,

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- Perform the SRR, and
- Release Change Control.

Figure 7-2, Release Requirement Management Process, illustrates the major steps in release Requirements Management.

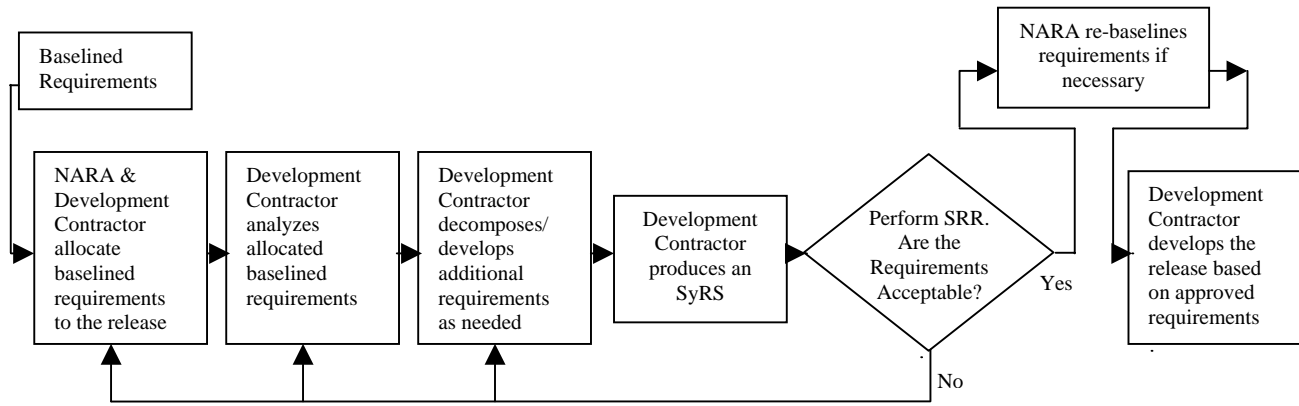


Figure 7-2: Release Requirements Management Process

7.2.1 Allocate Baselined Requirements to Release

At the beginning of work on a release, ERA PMO and the Development Contractor work together to determine which requirements to allocate to the release based on the functionality to be implemented in the release.

7.2.2 Analysis of Release Requirements

Once baselined requirements are allocated to the increment/release, the Development Contractor analyzes the requirements, looking for requirements that need to be decomposed, missing requirements, or other inadequacies.

7.2.3 Decomposition/Development of Release Requirements

Based on the Development Contractor's requirements analysis, the contractor will perform the needed requirements decomposition if it is found to be necessary. In the case of missing requirements, the Development Contractor develops the needed requirements.

7.2.4 Produce System Requirements Specification (SyRS) for the Release

The Development Contractor produces a release SyRS based on the requirements analysis, decomposition, and development. The Development Contractor is responsible for allocating the set of requirements covered by the release SyRS to hardware, software, operations, and/or other system components as part of their release SyRS. Traceability-to-source must be maintained in the release SyRS.

7.2.5 System Requirements Review (SRR) for Release

The Development Contractor presents a release SyRS to the ERA PMO for approval at a release SRR. The release SRR resolves, finalizes, and formalizes the requirements of systems and subsystems for the defined release. The *TEP* provides details on the release SRR.

ERA PMO evaluates the Development Contractor's release SyRS and determines its acceptability. Based on the acceptability of the SyRS, the following occurs.

- If the release SyRS is acceptable, the ERA PMO approves the SyRS, and the requirements are re-baselined if necessary.
- If the release SyRS is not acceptable, the ERA PMO denies permission to begin development of the increment/release. The Development Contractor must correct the deficiencies identified by the ERA PMO, and produce a revised SyRS. ERA PMO may, at its discretion, require the Development Contractor to present another SRR for the revised Release SyRS.

This process continues until the Release SyRS is accepted by the ERA PMO.

7.2.6 Release Change Control

The requirements Change Management process for each requirements change identified during a release will depend on whether a proposed requirements change will impact the schedule or cost of the release. The Development Contractor will be responsible for implementing a CM process. Part of the Development Contractor's CM process must include a Development Contractor CCB. The ERA PMO Contracting Officer Representative (COR) will have a seat on the Development Contractor CCB. All requirements changes must be reviewed and approved by the Development Contractor CCB. Part of this review will include determining whether the change is likely to impact project schedule or cost. Changes that are not expected to impact scope, schedule, or cost can be approved by the Development Contractor's CCB. Changes that are expected to impact scope, schedule, or cost must be referred to the ERA PMO CCB for review and approval as described in the *CMP*. NARA will inform the Development Contractor of the ERA CCB's decision, and the Development Contractor will update their requirements set to reflect the ERA CCB's decisions.

On a monthly basis, NARA and the Development Contractor will synchronize their requirements sets. The Development Contractor will provide their current requirements set to the ERA PMO in a format compatible with the Requirements Management tool in use by NARA (Rational RequisitePro). ERA PMO will update RequisitePro with the Development Contractor's requirement set.

The Development Contractor will be responsible for maintaining complete requirements traceability during the release process. The Development Contractor will be required to maintain traceability-to-source; in this case, "source" is the baselined requirements provided to the Development Contractor by the ERA PMO, or subsequent baselined requirements sets.

7.3 Initial Production Phase Status Reporting

The Requirements Officer will provide requirements-related data necessary for the generation of the following reports (as described in the *ERA Metrics Plan (MP)*):

- Requirements coverage,
- Requirements questions,
- Requirements rate of change,
- Requirements Reviews completed late,
- Requirements Reviews completed on time,
- Requirements Reviews overdue,
- Incomplete requirements,
- System Coverage, and
- Software Design Coverage.

The Requirements Officer will use the Requirements Question Database to generate the number of requirements questions. The listings of new and changed requirements will be generated via the data available from approved change requests (see the *CMP*). Detailed reports on the nature of each individual change or question will be available upon request.

8.0 Change Control

Changes to baselined requirements are handled by the change control policies and procedures documented in the *CMP*, and as described in **Section 7.2.6** of this document. In addition, the changes in program risks must be evaluated with each requirements change, as defined in the *RKM*. Changes to requirements may affect other plans, work products, activities, etc., requiring these to be changed as well. See the *CMP* document for details on how requirement-driven changes are identified, evaluated, documented, communicated, tracked, etc.

9.0 Requirements Management Process Reviews

The Requirements Management Process Review includes the following reviews:

- Management Review,
- Requirements Management QM Review, and
- IV&V Review.

9.1 Management Review

Requirements Management activities will be regularly review. The schedule and events that drive these reviews are contained in the *PMP*.

9.2 Requirements Management QM Review

The *QPP* describes the auditing of the requirements and the Requirements Management activities.

9.3 IV&V Team

The IV&V Team will review requirements activities as specified by the Program Director and the IV&V Plan (currently under development).

10.0 Requirements Acceptance Criteria

Every requirement for ERA is checked to verify that it meets the following criteria, as appropriate to the requirement's level.

- Is it valid? Does the requirement represent a distinct and identifiable need?
- Is it verifiable/testable? Every requirement should be able to be verified by testing or via analysis.
- Is it traceable? Every requirement (except the Level 0 requirements) should be traceable to another requirement.
- Is it clear? The requirement should be understandable without further explanation or knowledge.
- Is it independent? Requirements should not "overlap," they should be atomic.
- Is it feasible? Is it possible to implement?

11.0 Resources for Requirements Management

Resources are allocated to the requirement management effort as stated in the *PMP*. Resources include:

- IPTs, which were used to develop and validate the requirements;
- The ERA PMO, which provided support for the preparation or collection of documents presented to the IPTs, and created use cases; and
- Rational RequisitePro, the Requirements Management tool used by the Requirements Officer. The Requirements Officer may designate other staff for the day-to-day operation of the tool.

12.0 Tools for Requirements Management

Effective Requirements Management should be supported by a good tool set. NARA Systems Development Guidelines describe a process for evaluating products.

The requirements management tool must:

- Utilize a database,
- Provide a numbering capability,
- Provide a distinct naming capability,
- Provide for both natural and formal language representations,
- Provide for multiple views of requirements (i.e., multiple diagramming capabilities),
- Provide a prioritization scheme,
- Provide traceability matrices,

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- Provide for the recording of rationale and other notes about the requirements, and
- Provide traceability of changes.

Based on these criteria, Rational RequisitePro has been selected as the ERA requirements management tool. Contractors will be required to either use this tool for their requirements management, or they must exchange requirements data with NARA in such a way as to be fully compatible with RequisitePro.

13.0 Plan Maintenance

The ERA Requirements Officer is responsible for this plan. As a part of process improvement (e.g., IV&V assessments, lessons learned, QM assessments), the RQM and the overall requirements management approach will continue to evolve. The plan will be updated as needed to maintain current and sufficient requirements activities. The plan will be placed under CM control following its initial approval by the ERA PMO. Updates to the RQM will be controlled by the CCB.

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Instructions for the RQF

The fields of the RQF are filled in as follows:

1. Number – The form number is filled in by the Requirements Officer when the form is received. The Requirements Officer maintains the form numbering within the Requirements Question Database.
2. Date Submitted – Filled in by the form submitter.
3. Submitted By – The name of the form submitter.
4. Date Answer Needed – Filled in by the form writer to give the Requirements Officer a deadline for response. The form writer should take into consideration the time needed to answer the question and whether the answer is absolutely needed for the continuation of their activity.
5. Requirements Number(s) – Filled in by the form submitter to reference the relevant requirement(s).
6. Date Answered – Filled in by the Requirements Officer (or analyst who answered the question) on the date the form is returned to the submitter.
7. Answered By – The name of the requirements analyst who answered the question.
8. Change Request Needed – Yes if an actual change to the requirements is needed, no otherwise.
9. Approved by – Signed by the Requirements Officer when the answer is approved.
10. Question/Comment/Recommendation – Filled in by the submitter and provides the details of the question.
11. Response – Filled in by the analyst answering the question.