

ELECTRONIC RECORDS ARCHIVES

METRICS PLAN (MP v3.0)

(WBS #: 1.1.1.2.1)

for the

**NATIONAL ARCHIVES AND
RECORDS ADMINISTRATION**

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

Final

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ERA METRICS PLAN (MP)

Signature Page

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ERA METRICS PLAN

1.0 Introduction

This section describes the purpose of the Metrics Plan (MP), provides background information on the program, provides the scope including assumptions and limitations, defines terminology used in the plan, and lists documents used as reference materials during plan development.

1.1 Purpose

The *ERA MP* is a program level document and its purpose is to plan metrics activities for the Electronic Records Archives (ERA) Program for use throughout the ERA system lifecycle. It describes the schedules, functions, responsibilities, and procedures for all metrics activities within ERA.

The audience for this document is the ERA Program Management Office (PMO), as well as NARA management responsible for oversight of ERA and the systems integrator(s) hired to develop ERA. The collected metrics provide insight into the achievement of the ERA vision through completion of program activities. Additionally, the metrics provide input to NARA's technical, quality, and product performance goals as described in *The Strategic Plan of the National Archives and Records Administration* and the *Annual Performance Plan*. Performance metrics to be captured and reported on are defined in the *ERA Performance Goal Specifications (PGS)* document.

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 system, when operational, will make it easy for NARA customers to find records they want and easy for NARA to deliver those records in formats suited to customers' needs. The success of the ERA PMO in building and deploying the ERA system will depend on professional program and project management with an emphasis on satisfying NARA requirements for a viable system.

1.3 Scope

Metrics provide visibility to the status and ongoing progress of the ERA program. Metrics to be collected for the Systems Analysis and Design Phase of the ERA system lifecycle as identified in this plan will be used to track the size, effort, budget, and schedule of the ERA program. This plan applies to all ERA metrics that are required to be collected by the ERA PMO and development contractors as documented herein. Note that an Appendix depicting all of the metrics that will be collected and reported for all phases of the ERA system lifecycle will be included in the next major update of the *ERA MP*. The *ERA MP* provides the following:

- Definition and usage of the metrics;
- Identification of the roles and responsibilities for metrics collection, reporting, storage, and tracking processes; and

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- Procedures, tools, and resources required for metrics collection and reporting.

1.3.1 Metrics Characteristics

All metrics must adhere to the following characteristics of software lifecycle data as defined in IEEE/EIA 12207.1-1997, *Standard for Information Technology – Software life cycle processes – Implementation Considerations*.

- Unambiguous: Data is described in terms that only allow a single interpretation.
- Complete: Data includes necessary, relevant requirements with defined units of measure.
- Verifiable: A person or a tool can check the data for accuracy or correctness.
- Consistent: There are no conflicts within the data.
- Traceable: The origin of the data can be determined.
- Presentable: The data can be retrieved and viewed.

1.3.2 Assumptions

The ability to manage metrics assumes that tools used by Development Contractors will be compatible with those used by the ERA PMO.

1.3.3 Limitations

There are no known limitations at this time.

1.4 Acronyms and Definitions

The terms used in this plan are defined in IEEE Std. 610.12-1990, *IEEE Standard Glossary of Software Engineering Terminology*. **Table 1-1, Acronyms List**, contains a list of acronyms used herein.

ACRONYM	DEFINITION
ACWP	Actual Cost Work Performed
AI	Action Item
AS	Acquisition Strategy
BAC	Budget At Completion
BCWP	Budgeted Cost Work Performed
BCWS	Budgeted Cost of Work Scheduled
CCB	Configuration Control Board
CI	Configuration Item
CM	Configuration Management
CMG	Configuration Management Guidance
CMP	Configuration Management Plan
CONOPS	Concept of Operations
COTP	Contractor Oversight and Tracking Plan

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ACRONYM	DEFINITION
COTS	Commercial Off-The-Shelf
CP	Communications Plan
CPI	Cost Performance Index
CPR	Cost Performance Report
CR	Change Request
C/SSR	Cost/Schedule Status Report
CV	Cost Variance
EAC	Estimate At Completion
ELC	ERA Life Cycle
ERA	Electronic Records Archives
ETC	Estimate To Complete
EV	Earned Value
FTE	Full Time Equivalent
GQM	Goal-Question-Metric
IEEE	Institute of Electrical and Electronics Engineers, Inc.
IMS	Integrated Master Schedule
IPT	Integrated Product Team
IT	Information Technology
IV&V	Independent Verification and Validation
LOE	Level Of Effort
MP	Metrics Plan
MR	Metrics Report
MRP	Metrics Report Process
NARA	National Archives and Records Administration
OBS	Organizational Breakdown Structure
PD	Program Director
PF	Performance Factor
PGS	Performance Goal Specifications
PMBOK	Project Management Body of Knowledge
PMD	Program Management Division
PMI	Project Managements Institute
PMO	Program Management Office
PMP	Program Management Plan
PO	Program Office
POST	Program Office Support Team
PRP	Peer Review Process
QM	Quality Management
QMP	Quality Management Plan
RFP	Request For Proposal
RKG	Risk Management Guidance
RKM	Risk Management Plan
RO	Risk Officer
RQM	Requirements Management Plan

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ACRONYM	DEFINITION
SAD	Systems Analysis and Design
SDLC	Systems Development Life Cycle
SED	System Engineering Division
SLIM	Software Lifecycle Management
SLOC	Software Lines of Code
SPI	Schedule Performance Index
STD	Standard
SV	Schedule Variance
TAB	Total Allocated Budget
TCPI	To Complete Performance Index
TRA	Training Needs Assessment
TRP	PMO Training Plan
TSP	Testing Management Plan
VAC	Variance At Completion
VAR	Variance Analysis Report
WBS	Work Breakdown Structure
WR	Work Remaining
XO	Executive Officer

Table 1-1: Acronyms List

1.5 References

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

1.5.1 Standards and Guidelines

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

- American National Standards Institute (ANSI) 748-A.
- IEEE/EIA Guide, Industry Implementation of International Standard ISO/IEC 12207:1995 (ISO/IEC 12207), Standard for Information Technology – Software life cycle processes – Implementation Considerations, April 1998;
- IEEE/EIA Guide, Industry Implementation of International Standard ISO/IEC 12207:1995 (ISO/IEC 12207), Standard for Information Technology – Software life cycle processes – Life cycle data, April 1998;
- IEEE Standard 1061-1998, Software Quality Metrics Methodology; December 8, 1998;
- IEEE Standard for Software Productivity Metrics, Software Engineering Standards Subcommittee of the Technical Committee on Software Engineering of the IEEE Computer Society, March 22, 1993; and

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- Project Management Institutes (PMI) Project Management Body of Knowledge (PMBOK) 2000 Edition
- Government Performance and Results Act of 1993 (GPRA)

1.5.2 NARA and ERA PMO Documentation

The following NARA and ERA PMO documentation was used to support the generation of this document.

- Fiscal Year 2004 Annual Performance Plan, Revised Final
- The Strategic Plan of the National Archives and Records Administration, 1997-2008, Revised 2003
- ERA Configuration Management Plan (CMP) Version 2.3
- ERA Metrics Report (MR)
- ERA Metrics Report Process (MRP) Version 1.0
- ERA Peer Review Process (PRP) Version 1.1
- ERA Performance Goal Specifications (PGS) Version 1.0
- ERA Program Management Plan (PMP) Version 2.3
- ERA Quality Management Plan (QMP) Version 2.4
- ERA Request For Proposal (RFP) for the Electronic Records Archives, December 24, 2003
- ERA Requirements Management Plan (RQM) Version 2.2
- ERA Risk Management Plan (RKM) Version 3.0
- ERA Testing Management Plan (TSP) Version 2.1
- ERA Training Needs Assessment (TRA) Version 2.1
- ERA PMO Training Plan (TRP) Version 2.0

2.0 Organization

The ERA PMO Organization is depicted in the *ERA Program Management Plan (PMP)* which can be accessed using the following link: <S:\ERAPMO\ERA Program Management\Deliverables\Program Management Plan\Current Final\ERA.DC.PMP.2.3.DOC>. Please refer to this document for desired information.

2.1 Roles and Responsibilities

Roles and responsibilities for the ERA PMO are described in the *ERA PMP* which can be accessed using the following link: <S:\ERAPMO\ERA Program Management\Deliverables\Program Management Plan\Current Final\ERA.DC.PMP.2.3.DOC>. Please refer to this document for more specificity.

2.2 Schedule/Incremental Approach

The source selection process has been completed and two (2) development contractors have been selected to compete in a design fly-off that will result in a down-select evaluation to a single Development Contractor. The sole Development Contractor will be awarded an option to

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develop ERA Increment One (1). Options for subsequent increments will be awarded subject to availability of funding and adequate Development Contractor performance on the preceding increment.

2.3 Planned Tasks and Activities

The metric task is identified in the *ERA PMP*. Metrics activities comprising this task, including the collection, storage, and reporting of metrics using the *ERA Metrics Report (MR)*, are identified and scheduled in accordance with the ERA Work Breakdown Structure (WBS) and Schedule, which is controlled as part of the *ERA PMP*.

Metrics are collected from a variety of sources that include the ERA PMO, ERA support contractors, development contractors, and Independent Verification and Validation (IV&V). Earned Value (EV) metrics will be collected on a monthly basis and reported on a biweekly basis from the Deliverable Manager to the Program Analyst, while all other metrics will be collected and reported on a quarterly basis in the *ERA MR* for the system development lifecycle phases as defined in the *IEEE/EIA Guide, Industry Implementation of International Standard ISO/IEC 12207:1995 (ISO/IEC 12207), Standard for Information Technology – Software life cycle processes – Life cycle data* document.

As the reporting period nears completion, the ERA Metrics Task Leader transmits an e-mail to all metrics providers, e.g., Configuration Management (CM), the ERA PMO POST Program Support Division Director, and Risk Officer, requesting that metrics for the reporting period just completed be collected/generated and reported. The e-mail contains a desired due date for the metrics data.

Development contractor metrics are submitted to the ERA PMO Contracting Officer's Representatives (CORs). This metrics data is then provided to the Government's ERA Project Control Specialist who forwards the data to the ERA Metrics Task Leader.

Upon receipt of the metrics data, the ERA Metrics Task Leader saves the data to his/her account on the working drive (i.e., 'H' drive). The ERA Metrics Task Leader obtains a copy of the previous months ERA Metrics Report and the corresponding Microsoft Excel Workbook. The workbook contains the tables and charts that will subsequently be copied to the *ERA Metrics Report* (which is a Microsoft Word document). Using the recently provided metrics data, the task leader culls the data and begins populating the tables that are contained in individual worksheets in the Microsoft Excel Workbook. Once a table is updated with the reporting period's data, the ERA Metrics Task Leader updates the range of the source data to create an updated chart. This process repeats itself for each metric.

Once the Microsoft Excel Workbook has been updated, the ERA Metrics Task Leader makes a copy of the previous reporting period's metrics report. Using the data that has been provided, the ERA Metrics Task Leader begins populating the report with the latest metrics data (from the reporting period just concluded). The front matter in the *ERA Metrics Report* (i.e., the text that precedes the pictorial representations of the data), consists of an encapsulation that describes the actual performance for each metric. For example, Fiscal Year cost numbers are reported, e.g.,

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budget, outlays, and obligations, and the percentage under or over budget. The corresponding Microsoft Excel chart provides a pictorial of the same Fiscal Year cost numbers.

Once this process is complete, the ERA Metrics Task Leader sends the *ERA Metrics Report* (i.e., the Microsoft Word document) and the embedded spreadsheet data in the Microsoft Excel file electronically to the metrics data providers, requesting an informal review for the purpose of ensuring that the information has been accurately portrayed in the charts. When complete and no discrepancies are found, the ERA Metrics Report is submitted to the Government by the ERA PMO POST Program Manager. Once submitted, the *ERA Metrics Report* is subject to the ERA Document Review process.

The method of collection and reporting of each metric contained in the ERA Metrics Report is described in more detail in the *ERA Metrics Report Process (MRP)* document.

2.4 Task Estimation and Cost

The ERA WBS and Schedule, part of the *ERA PMP*, delineates metrics activities/tasks. WBS task estimation and costs will be developed from the lowest level of the WBS elements. Please refer to the *ERA PMP* for more detailed information.

3.0 Metrics Collection and Use

This section provides details regarding metrics definition, collection, and reporting. Application of the measurement approach provides all program stakeholders with a common and quantitative means to monitor risk and program success in a timeframe that avoids or minimizes program impacts and the cost of correction.

Section 3.1 defines the methodology used to determine the metrics to be collected and reported during the ERA system lifecycle. Metrics are subject to periodic review and update as program activities are completed. Descriptions, definitions of data items, computations, additional data, and examples of each metric are provided in **Appendix A, ERA Metrics Descriptions**.

Section 3.2 provides the detailed collection and storage procedures for the metrics as well as the reporting requirements.

3.1 Metrics Definition and Methodology

The *ERA MP* defines a set of metrics that provide insight to system quality and productivity as well as product characteristics and program management. The plan helps the ERA PD monitor the status of the ERA program from a quantitative perspective, and make programmatic decisions based on the metric information presented in the quarterly *ERA MR*.

Note that any metric in isolation is not sufficient to determine program status. A set of metrics and their trends are usually needed to make a good judgment.

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As an example: When a metric such as “Requirements Coverage” indicates unacceptable coverage of requirements for a given reporting period, the responsible ERA PMO Metrics Organization member may evaluate certain other measures in order to isolate the specific cause(s) of the problem and/or use the data to analyze trends. In this way, the corrective action taken addresses the actual problem not just the symptoms. The key to successful use of the metrics defined in this plan is the frequency of reporting and data analysis.

In trying to determine what to measure in order to achieve the goals of the ERA program, the Goal-Question-Metric (GQM) paradigm was used. **Figure 3-1, Goal-Question-Metric Paradigm**, illustrates the relationship of the GQM components.

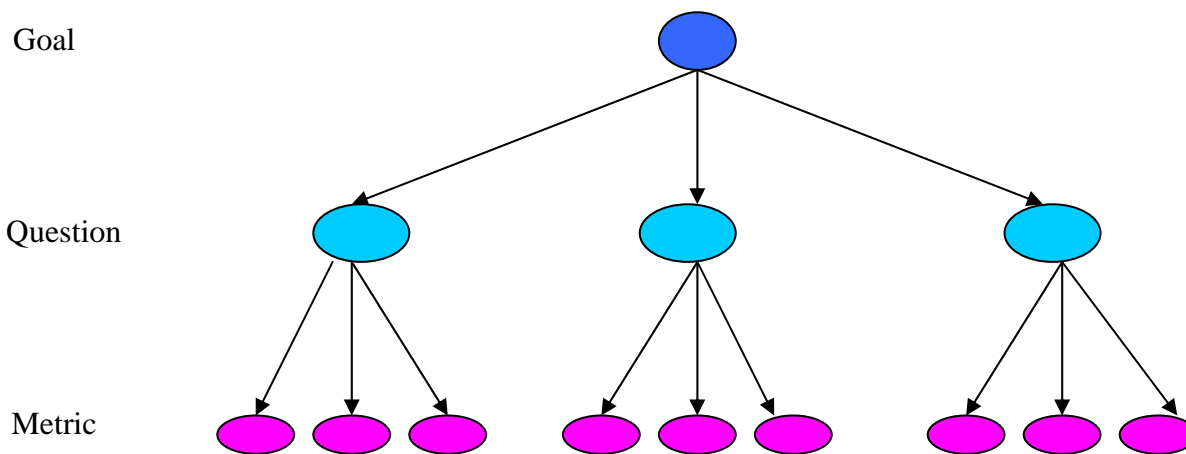


Figure 3-1 Goal-Question-Metric Paradigm

The GQM paradigm is based on the theory that all measurement should be goal-oriented, i.e., there has to be some rationale and need for collecting measurements, rather than collecting metrics just to collect metrics. Each metric collected is stated in terms of the major goals of the ERA development project. Questions are then derived from the goals and help to refine, articulate, and determine if the goals can be achieved. The metrics or measurements that are collected are then used to answer the questions in a quantifiable manner.

Additionally, ERA program metrics provide input to NARA’s technical, quality, and product performance goals as described in *The Strategic Plan of the National Archives and Records Administration* and the *Annual Performance Plan*.

3.1.1 ERA PMO Metrics

Metrics will be collected and reported by both the ERA PMO and the development contractors. Metrics reported by development contractors, e.g., EV, will be reported separately and collectively with ERA PMO metrics. In this scenario, development contractor metrics will be integrated with ERA PMO metrics to determine EV for the entire program. Note that the development contractor metrics data will not be lost or comprised once integrated with ERA

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PMO metrics. The data will still be available as initially reported by the development contractors. Metrics to be collected by the ERA PMO include the following:

- Earned Value:
 - Cost Performance Index (CPI),
 - Cost Performance Variance,
 - Schedule Performance Index (SPI),
 - Schedule Performance Variance,
 - To Complete Performance Index (TCPI),
 - Variance at Completion (VAC),
 - Actual Cost of Work Performed (ACWP),
 - Budget Cost of Work Scheduled (BCWS),
 - Budget Cost of Work Performed (BCWP),
 - Work Remaining,
 - Estimate At Completion (EAC) (based on CPI and SPI)
 - Budget At Completion (BAC),
- Cumulative Cost,
- Configuration Management:
 - Change Request Reporting,
 - CM Rate of Change,
 - Action Item Reporting,
 - Question Reporting,
- Quality Management:
 - Total number of audits and assessments conducted
 - Total number of audits and assessments that are not in compliance
 - Total number of audits and assessments that are in compliance
- Work Product Completion,
- Peer Review Completion,
- Program Staffing Profile, and
- Risk Containment Summary.

3.1.2 Development Contractor Metrics

Development contractor metrics will be submitted to the ERA PMO in accordance with the reporting frequencies stated in the contract. Metrics to be reported by development contractors include but are not limited to the following:

- Continuous process improvement of software engineering processes:
 - Requirements definition and management process,
 - QM activities and processes,
 - CM activities and processes including change, management/control, e.g., change request inventory, action item aging,
 - Test Management activities and processes, e.g., test coverage,
 - Defect management,
 - Operations and support activities and processes,

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- Risk containment and monitoring to include threats and vulnerabilities,
- Earned Value Management to include cost:
 - Cost Performance Index (CPI),
 - Cost Performance Variance,
 - Estimate to Complete (ETC),
 - Level of Effort (LOE),
 - Schedule Performance Index (SPI),
 - Schedule Performance Variance,
 - To Complete Performance Index (TCPI),
 - Cost to Complete, and
 - Schedule to Complete.

Additionally, EV metrics reported by the Development Contractors will comply with *American National Standards Institute (ANSI) 748-A*.

3.1.3 Subcontractor Management Plan and Metrics

The *ERA Request For Proposal (RFP)* specifies that the prime contractor, i.e., development contractor, is responsible for the subcontractor management plan. Development contractor metrics will include appropriate metric data from development contractor subcontractors. The subcontractor management plan, based on the *ERA RFP* include the following metrics related descriptions.

- Its subcontractor management processes, including flow-down of requirements and procedures, and tracking subcontractor performance to ensure program technical and programmatic requirements are met.
- How subcontractors will be integrated into the overall project. The Offeror must specifically describe how development subcontractor staff and activities will be integrated into the Offeror's SW-CMM/CMMI Level 3 (or higher) compliant processes and procedures.

3.1.4 Metrics Reporting

Three (3) tiers or levels of reporting have been identified. They are the ERA Program Manager Level, ERA Division Manager Level, and the ERA Deliverable Manager Level. Metrics to be collected and reported are delineated in **Table 3-1, Metrics Collection and Reporting**, and include the data items that comprise each metric and the metrics thresholds. It is important to note that some metric data that is reported will cross the respective reporting boundaries, i.e., some of the same metrics will be reported to more than one managerial level. Additionally, the dissemination of the metrics r

3.1.4.1 ERA Program Manager Level Metrics

Metrics reported to ERA Program Manager Level will consist of higher level measures that provide a quantitative representation of how the program is progressing. These higher level measures, including cumulative fiscal year cost, cost and schedule performance indices,

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budgetary data, and risk containment provide valuable insight to program management level personnel enabling early detection of cost overages and poor performance. Note also that ERA metrics are available and will be provided to ERA Program Managers as their request. The specific metrics to be reported to the ERA Program Manager Level include the following:

- Earned Value:
 - Schedule Variance (SVcum),
 - Cost Variance (CVcum),
 - Schedule Performance Index (SPI),
 - To Complete Performance Index (TCPI),
 - Cost Performance Index (CPI),
 - Budget at Completion (BAC),
 - Estimate at Completion (EAC),
 - Variance at Completion (VAC),
 - Corrective Action Report,
 - Management Reserve,
- Fiscal Year Budget (FY04/05/06), and
- Risk Containment Summary.

3.1.4.2 ERA Division Manager Level Metrics

Metrics reported to ERA Division Manager Level consist of programmatic measures that provide insight into the implementation of processes contained primarily within CM, but also include earned value measurements as well. These metrics may provide early warnings of trends that are occurring thus triggering risk management and mitigation strategies. Note that while these metrics appear redundant with those metrics for Deliverable Managers, the Division Manager may not require or want for example, metrics on the work product deliverables, as one could deduce from EV data whether or not the schedule was being met. In the event the schedule wasn't being met, the Division Manager could then request metrics on the work product deliverable status. Specific metrics to be reported to the ERA Division Manager Level include the following:

- Action Item Aging,
- Change Request Inventory,
- CM Rate of Change,
- Defect Management,
- Earned Value:
 - Schedule Variance Cumulative (SVcum),
 - Cost Variance Cumulative (CVcum),
 - Schedule Performance Index (SPI),
 - To Complete Performance Index (TCPI),
 - Cost Performance Index (CPI),
 - Budget at Completion (BAC),
 - Variance at Completion (VAC),
 - Estimate at Completion (EAC),

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- Corrective Action Report, and
- Management Reserve.
- Peer Review Completion,
- Program Staffing Profile,
- Question Aging,
- Requirements Rate of Change,
- Risk Containment Summary, and
- Work Product Completion Summary.

3.1.4.3 ERA Deliverable Manager Level Metrics

Metrics reported to ERA Deliverable Managers are identical to those reported to the ERA Division Managers. These metrics provide configuration item status along with some lower level EV measures.

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Table 3-1: ERA Metrics Collecting and Reporting

	Program Manager Level				Division Manager Level												
Reporting Levels																	
Metrics/ thresholds																	
Data Items	FY04 Budget (Cost)	FY05 Budget (Cost)	FY06 Budget (Cost)	EV (SVcum,CVcum,VAC)	Risk Containment Summary	Action Item Aging	Change Request Inventory	CM Rate of Change	Requirement Rate of Change	EV (SV,CV,SPI,CPI,TCPI, VAC)	Question Aging	Peer Reviews Completed	Program Staffing Profile	Risk Containment Summary	Work Products Completion Summary	Defect Management	Future
	5%	5%	5%	±10%, \$125K	Status Improved (Y/N)	< 30days	% Close	> 1.75 % per month	N/A	±10%, \$125K	< 30 days	< 95%	< 90%	Hi/Med/Lo	< 95%	% Closed	TBD
Submittal	X	X	X														
Appropriations	X	X	X														
Obligations	X	X	X														
Expenditures	X	X	X														
Status of Action Items						X											
Total Number of Action Items (Cumulative/Reporting Period)						X											

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Reporting Levels	Program Manager Level				Division Manager Level												
Metrics/ thresholds																	
Data Items	FY04 Budget (Cost)	FY05 Budget (Cost)	FY06 Budget (Cost)	EV (SVcum, CVcum, VAC)	Risk Containment Summary	Action Item Aging	Change Request Inventory	CM Rate of Change	Requirement Rate of Change	EV (SV, CV, SPI, CPI, TCPI, VAC)	Question Aging	Peer Reviews Completed	Program Staffing Profile	Risk Containment Summary	Work Products Completion Summary	Defect Management	Future
Number of Action Items Open (Cumulative/Reporting Period)						X											
Number of Action Items Closed (Cumulative/Reporting Period)						X											
Total Number of Action Items Open per Severity by Time Interval: <ul style="list-style-type: none"> 0 - 30 days, 31 - 60 days, 						X											
	5%	5%	5%	±10%, \$125K	Status Improved (Y/N)	< 30days	% Close	> 1.75 % per month	N/A	±10%, \$125K	< 30 days	< 95%	< 90%	Hi/Med/Lo	< 95%	% Closed	TBD

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	Program Manager Level				Division Manager Level												
Reporting Levels																	
					Deliverable Manager Level												
Metrics/ thresholds	5%	5%	5%	±10%, \$125K	Status Improved (Y/N)	< 30days	% Close	> 1.75 % per month	N/A	±10%, \$125K	< 30 days	< 95%	< 90%	Hi/Med/Lo	< 95%	% Closed	TBD
Data Items	FY04 Budget (Cost)	FY05 Budget (Cost)	FY06 Budget (Cost)	EV (SVcum, CVcum, VAC)	Risk Containment Summary	Action Item Aging	Change Request Inventory	CM Rate of Change	Requirement Rate of Change	EV (SV, CV, SPL, CPI, TCPI, VAC)	Question Aging	Peer Reviews Completed	Program Staffing Profile	Risk Containment Summary	Work Products Completion Summary	Defect Management	Future
Number of Questions Closed (Cumulative/Reporting Period)											X						
Total Number of Questions Open per Severity by Time Interval: <ul style="list-style-type: none"> 0 - 30 days, 31 - 60 days, 61 – 90 days, > 90 days 											X						

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	Program Manager Level				Division Manager Level												
Reporting Levels																	
					Deliverable Manager Level												
Metrics/ thresholds	5%	5%	5%	±10%, \$125K	Status Improved (Y/N)	< 30days	% Close	> 1.75 % per month	N/A	±10%, \$125K	< 30 days	< 95%	< 90%	Hi/Med/Lo	< 95%	% Closed	TBD
Data Items	FY04 Budget (Cost)	FY05 Budget (Cost)	FY06 Budget (Cost)	EV (SV,cum,CV,cum,VAC)	Risk Containment Summary	Action Item Aging	Change Request Inventory	CM Rate of Change	Requirement Rate of Change	EV (SV,CV,SPI,CPI,TCPI,VAC)	Question Aging	Peer Reviews Completed	Program Staffing Profile	Risk Containment Summary	Work Products Completion Summary	Defect Management	Future
Total Number of Change Requests Submitted							X										
Number of Change Requests Submitted (Cumulative/Reporting Period)							X										
Total Number of Change Requests Approved							X										
Number of Change Requests Approved (Cumulative/Reporting Period)							X										

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	Program Manager Level				Division Manager Level												
Reporting Levels																	
					Deliverable Manager Level												
Metrics/ thresholds	5%	5%	5%	±10%, \$125K	Status Improved (Y/N)	< 30days	% Close	> 1.75 % per month	N/A	±10%, \$125K	< 30 days	< 95%	< 90%	Hi/Med/Lo	< 95%	% Closed	TBD
Data Items	FY04 Budget (Cost)	FY05 Budget (Cost)	FY06 Budget (Cost)	EV (SV,cum,CV,cum,VAC)	Risk Containment Summary	Action Item Aging	Change Request Inventory	CM Rate of Change	Requirement Rate of Change	EV (SV,CV,SPI,CPI,TCPI,VAC)	Question Aging	Peer Reviews Completed	Program Staffing Profile	Risk Containment Summary	Work Products Completion Summary	Defect Management	Future
Total Number of Change Requests Submitted by Type of Change:							✘										
<ul style="list-style-type: none"> • Document, • Hardware, • Software: <ul style="list-style-type: none"> - Developed, - COTS • Requirements, • Testing, • Operations 																	

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	Program Manager Level				Division Manager Level												
Reporting Levels																	
					Deliverable Manager Level												
Metrics/ thresholds	5%	5%	5%	±10%, \$125K	Status Improved (Y/N)	< 30days	% Close	> 1.75 % per month	N/A	±10%, \$125K	< 30 days	< 95%	< 90%	Hi/Med/Lo	< 95%	% Closed	TBD
Data Items	FY04 Budget (Cost)	FY05 Budget (Cost)	FY06 Budget (Cost)	EV (SVcum, CVcum, VAC)	Risk Containment Summary	Action Item Aging	Change Request Inventory	CM Rate of Change	Requirement Rate of Change	EV (SV, CV, SPI, CPI, TCPI, VAC)	Question Aging	Peer Reviews Completed	Program Staffing Profile	Risk Containment Summary	Work Products Completion Summary	Defect Management	Future
Number of Change Requests: <ul style="list-style-type: none"> Submitted Approved Disapproved by Type of Change (Cumulative/Reporting Period)							X										

FINAL

	Program Manager Level				Division Manager Level												
Reporting Levels																	
					Deliverable Manager Level												
Metrics/ thresholds	5%	5%	5%	±10%, \$125K	Status Improved (Y/N)	< 30days	% Close	> 1.75 % per month	N/A	±10%, \$125K	< 30 days	< 95%	< 90%	Hi/Med/Lo	< 95%	% Closed	TBD
Data Items	FY04 Budget (Cost)	FY05 Budget (Cost)	FY06 Budget (Cost)	EV (SV,cum, CV,cum, VAC)	Risk Containment Summary	Action Item Aging	Change Request Inventory	CM Rate of Change	Requirement Rate of Change	EV (SV, CV, SPI, CPI, TCPI, VAC)	Question Aging	Peer Reviews Completed	Program Staffing Profile	Risk Containment Summary	Work Products Completion Summary	Defect Management	Future
Total Number of Requirements									X								
Total Number of Changes to Requirements									X								
Budget At Completion (BAC)				X						X							
Actual Cost Work Performed (ACWP)				X						X							
Budgeted Cost of Work Performed (BCWP)- Earned Value				X						X							

FINAL

	Program Manager Level				Division Manager Level													
Reporting Levels																		
					Deliverable Manager Level													
Metrics/ thresholds	5%	5%	5%	±10%, \$125K	Status Improved (Y/N)	< 30days	% Close	> 1.75 % per month	N/A	±10%, \$125K	< 30 days	< 95%	< 90%	Hi/Med/Lo	< 95%	% Closed	TBD	
Data Items	FY04 Budget (Cost)	FY05 Budget (Cost)	FY06 Budget (Cost)	EV (SV,cum,CV,cum,VAC)	Risk Containment Summary	Action Item Aging	Change Request Inventory	CM Rate of Change	Requirement Rate of Change	EV (SV,CV,SPI,CPI,TCPI,VAC)	Question Aging	Peer Reviews Completed	Program Staffing Profile	Risk Containment Summary	Work Products Completion Summary	Defect Management	Future	
Budgeted Cost of Work Scheduled (BCWS)-Planned Work				X						X								
Cost Variance or Cost Variance %				X						X								
Schedule Variance or Schedule Variance %				X						X								
Cost Performance Index (CPI)				X						X								
Schedule Performance Index (SPI)				X						X								

FINAL

	Program Manager Level				Division Manager Level												
Reporting Levels																	
					Deliverable Manager Level												
Metrics/ thresholds	5%	5%	5%	±10%, \$125K	Status Improved (Y/N)	< 30days	% Close	> 1.75 % per month	N/A	±10%, \$125K	< 30 days	< 95%	< 90%	Hi/Med/Lo	< 95%	% Closed	TBD
Data Items	FY04 Budget (Cost)	FY05 Budget (Cost)	FY06 Budget (Cost)	EV (SVcum, CVcum, VAC)	Risk Containment Summary	Action Item Aging	Change Request Inventory	CM Rate of Change	Requirement Rate of Change	EV (SV, CV, SPI, CPI, TCPI, VAC)	Question Aging	Peer Reviews Completed	Program Staffing Profile	Risk Containment Summary	Work Products Completion Summary	Defect Management	Future
To Complete Performance Index (TCPI)				X						X							
Estimate To Complete (ETC)				X						X							
Variance At Completion (VAC)				X						X							
% Level of Effort (LOE)				X						X							
Number of Scheduled/Completed Milestones											X						

FINAL

	Program Manager Level				Division Manager Level												
Reporting Levels																	
					Deliverable Manager Level												
Metrics/ thresholds	5%	5%	5%	±10%, \$125K	Status Improved (Y/N)	< 30days	% Close	> 1.75 % per month	N/A	±10%, \$125K	< 30 days	< 95%	< 90%	Hi/Med/Lo	< 95%	% Closed	TBD
Data Items	FY04 Budget (Cost)	FY05 Budget (Cost)	FY06 Budget (Cost)	EV (SV,cum,CV,cum,VAC)	Risk Containment Summary	Action Item Aging	Change Request Inventory	CM Rate of Change	Requirement Rate of Change	EV (SV,CV,SPI,CPI,TCPI,VAC)	Question Aging	Peer Reviews Completed	Program Staffing Profile	Risk Containment Summary	Work Products Completion Summary	Defect Management	Future
Number of Scheduled/Completed Peer Reviews												X					
Number of ERA Staff (Planned/Actual)													X				
Number of ERA Government Staff (Planned/Actual)													X				
Number of ERA POST Staff (Plan/Actual)													X				
Number of ERA Contractor Staff (Plan/Actual)													X				

FINAL

	Program Manager Level				Division Manager Level												
Reporting Levels																	
					Deliverable Manager Level												
Metrics/ thresholds	5%	5%	5%	±10%, \$125K	Status Improved (Y/N)	< 30days	% Close	> 1.75 % per month	N/A	±10%, \$125K	< 30 days	< 95%	< 90%	Hi/Med/Lo	< 95%	% Closed	TBD
Data Items	FY04 Budget (Cost)	FY05 Budget (Cost)	FY06 Budget (Cost)	EV (SV,cum,CV,cum,VAC)	Risk Containment Summary	Action Item Aging	Change Request Inventory	CM Rate of Change	Requirement Rate of Change	EV (SV,CV,SPI,CPI,TCPI,VAC)	Question Aging	Peer Reviews Completed	Program Staffing Profile	Risk Containment Summary	Work Products Completion Summary	Defect Management	Future
Number of ERA Staff by Division (Plan/Actual):													X				
<ul style="list-style-type: none"> PMO Total, PMO PO, PMO PSD, PMO SED, POST PM, POST PMD, POST SED 																	

FINAL

	Program Manager Level				Division Manager Level												
Reporting Levels																	
					Deliverable Manager Level												
Metrics/ thresholds	5%	5%	5%	±10%, \$125K	Status Improved (Y/N)	< 30days	% Close	> 1.75 % per month	N/A	±10%, \$125K	< 30 days	< 95%	< 90%	Hi/Med/Lo	< 95%	% Closed	TBD
Data Items	FY04 Budget (Cost)	FY05 Budget (Cost)	FY06 Budget (Cost)	EV (SV,cum, CV,cum, VAC)	Risk Containment Summary	Action Item Aging	Change Request Inventory	CM Rate of Change	Requirement Rate of Change	EV (SV, CV, SPI, CPI, TCPI, VAC)	Question Aging	Peer Reviews Completed	Program Staffing Profile	Risk Containment Summary	Work Products Completion Summary	Defect Management	Future
Cumulative Number of Open/Closed Risk Items by Risk Exposure: <ul style="list-style-type: none"> High, Moderate, and Low 					X									X			
Cumulative Number of Work Products (Completed/Scheduled)															X		
Cumulative Number of Defects Found/Closed by Severity																X	

FINAL

	Program Manager Level				Division Manager Level												
Reporting Levels																	
					Deliverable Manager Level												
Metrics/ thresholds	5%	5%	5%	±10%, \$125K	Status Improved (Y/N)	< 30days	% Close	> 1.75 % per month	N/A	±10%, \$125K	< 30 days	< 95%	< 90%	Hi/Med/Lo	< 95%	% Closed	TBD
Data Items	FY04 Budget (Cost)	FY05 Budget (Cost)	FY06 Budget (Cost)	EV (SVcum, CVcum, VAC)	Risk Containment Summary	Action Item Aging	Change Request Inventory	CM Rate of Change	Requirement Rate of Change	EV (SV, CV, SPI, CPI, TCPI, VAC)	Question Aging	Peer Reviews Completed	Program Staffing Profile	Risk Containment Summary	Work Products Completion Summary	Defect Management	Future
Defect Aging by Severity																X	

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3.2 Metrics Environment Infrastructure

The sections below describe the metrics collection, reporting, and storage requirements.

3.2.1 Metrics Collection

Various ERA PMO Organization team members are responsible for ensuring that metrics data is collected and reported in a timely manner. In some cases, this effort may require using tools to extract the metrics data from a database at the appropriate time. Other data, e.g., number of personnel/staff changes, is compiled manually. Tools used for the collection and reporting of ERA metrics are defined in **Section 4.2, Tools for Metrics**. The data source used to collect the data is provided in the metrics tables in **Appendix A**. Where possible, data is extracted automatically from other sources. The collection and reporting for subsequent ERA system lifecycle phases will be defined in future updates to the *ERA MP*.

3.2.2 Metrics Reporting

The metric data that is collected will be used for both monthly and quarterly metrics reporting. The *ERA MR* will be generated on a monthly basis for Program, Divisional, and Deliverable Level Managers. The metric data to be used will be as of the end of the reporting period. The *ERA Metrics Report Process (MRP)* document describes the report generation process which includes how the data is collected and what functional area is responsible for reporting the data.

3.2.3 Metrics Storage

Metrics data can be produced on demand via simple query using the numerous toolsets, e.g., Rational Suite AnalystStudio, PROMT, etc. that will be utilized on the ERA program. The periodic reports that are generated are stored in a program repository resident within Rational ClearCase to include the Microsoft Excel file containing varying metrics data.

The *ERA MR* is submitted using an MS Word format. This document contains charts that have been copied from a corresponding MS Excel file. All data used in the compilation of the metrics report is stored in the MS Excel file. The MS Excel file is collocated with the MS Word file on the 'S' drive. Additionally, both the MS Word document containing the metrics report and the MS Excel file containing the data are submitted to the ERA PMO.

4.0 Resources

This section describes the ERA PMO metric resource requirements that will be required during the course of the ERA system lifecycle.

4.1 Resources for Metrics

The resources needed for metrics are those provided by the ERA PMO to collect, enter, and validate the data and provide the reports. For the Systems Analysis and Design phase, it is

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anticipated that the total level of staffing required for the metrics collection and reporting effort will be two (2) Full Time Equivalent (FTEs).

4.2 Tools for Metrics

Metrics collected, generated, and provided during the Systems Analysis and Design phase of the ERA system development lifecycle will be gathered from various sources including, but not limited to, those listed below:

- ERA Deliverables Tracking Status -Microsoft Word table that tracks documentation that was submitted during the reporting period which is extracted from the WBS;
- ERA Peer Review Action Item Database - Microsoft Access database to be used in conjunction with the WBS to determine the number of peer reviews, e.g., those scheduled for review of documents, conducted versus those scheduled;
- ERA Risk Radar - For a summary of all risks identified and tracked;
- Microsoft Excel - For generation, storage, and reporting of metrics data including EV;
- Microsoft PowerPoint - For the latest ERA Organizational Charts;
- Microsoft Project Scheduler – For WBS, Schedule, and EV data;
- Microsoft Office Project Web Access (PROMT) – Used to record actual hours worked/track personnel charging against WBS elements/tasks;
- Microsoft Word - For actual generation of the Metrics Report to include presentation of the Microsoft Excel spreadsheets including description of the findings as of the end of the reporting period for each metric contained in the report.
- Novell GroupWise – An e-mail application to be used in conjunction with Rational Suite AnalystStudio applications that require automatic notifications to users;
- Polytron Version Control System (PVCS) – Currently used for the management and version control of configuration items to include change history.

Note that in the near future, PVCS will be replaced with Rational ClearCase.

- Project Connect and wInsight (C/S solutions) – Export EV data from MS Project to wInsight Utility applications to comply with ANSI 748-A standards;
- Rational Suite AnalystStudio – Includes the following software applications:
 - Rational ClearQuest – Software application that is used in conjunction with Microsoft Access for the tracking of the following:
 - Action Items;
 - Change Requests; and
 - Questions;

Note that the Microsoft Access database that is currently used with Rational ClearQuest will be migrated to an Oracle database application.

- Rational RequisitePro – Software application that will be used for requirements management;

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- **(FUTURE)** Rational ClearCase – Software application that will replace PVCS in the near future and be used for management and version control of configuration items to include change history;
- **(FUTURE)** Rational TestManager – Software application that will be used to analyze development contractor test cases and provide test status information;
- **(FUTURE)** Rational Rose – Software application that will be used to analyze development contractor design and development efforts, e.g., use cases, domain models;
- **(FUTURE)** Rational ProjectConsole – Software application that will be used to generate charts replete with metric data to be used in the monthly metrics reports

As the volume of metrics increases, other tools may be evaluated for a match with the needs of the program.

4.3 Training

Training will be provided on the metrics collection process as specific training needs are identified. Training that will be provided, will be performed in accordance with the *ERA Training Needs Assessment (TRA)* and *PMO Training Plan (TRP)*.

5.0 Risks

According to *the IEEE Std. 1061-1998, Standard for Software Quality Metrics Methodology*, the purpose of measurement is to help management achieve project objectives, identify and track risks, satisfy constraints, and recognize problems early. A system of ERA's magnitude will not be void of risk; however, utilization of a formal risk management plan (e.g., *ERA Risk Management Plan (RKM)*), to include implementation of risk processes, may facilitate mitigation efforts that reduce the severity or eliminate risks when encountered.

6.0 Quality Control Measures

Updates made to the *ERA MP* will be subject to peer review in accordance with the *ERA Peer Review Process (PRP)* document and a quality review by the QM Specialist in accordance with the *ERA Quality Management Plan (QMP)*. Anomalies detected in the quality review and peer review process of products will be fed into the appropriate ERA PMO problem tracking system. Through implementation of this process, QM will track problems until closure.

The ERA PMO QM team will conduct process improvement reviews to review and evaluate metrics from the development effort. Findings provide information that is required to determine if processes need to be modified to prevent or reduce quality related problems. Process improvement recommendations will be an output of these reviews.

The ERA PMO QM team will also provide metric data to the ERA PD in accordance with **Section 8.6, Metrics and Measures**, in the *ERA QMP*.

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The *ERA MR* will be submitted in accordance with the information provided in **Section 3.1.1** and is subject to QM review in accordance with the *ERA QMP*.

7.0 Plan Maintenance

The ERA PD is responsible for this plan. As a part of process improvement (e.g., IV&V assessments, lessons learned, QM assessments), the *ERA MP* and the overall quality management approach will continue to evolve. The plan will be updated as needed to maintain current and sufficient quality management activities. The *ERA MP* was placed under CM control following its initial approval by the ERA PMO and updates will be controlled by the Configuration Control Board (CCB).

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Appendix A: ERA Metrics Descriptions

Table A-1, Metric Set Definition, provides an explanation of the metric items and descriptions to enhance reader comprehension.

Item	Description
Name	Name given to the metric
Program Goals	List of program goals (measurements are goal-oriented)
Questions	Questions derived from goals that must be answered in order to determine if the goals are achieved
Impact	Indication of whether a metric can be used to alter or halt the project.
Target value	Numerical value of the metric that is to be achieved in order to meet planned objective. Include the critical value and the range of the metric.
Benefits	Provides examples of the benefits derived from using the metric.
Tools	Software or hardware tools that are used to gather and store data, compute the metric, and analyze the results.
Application	Description of how the metric is used and what its area of application is.
Data items	Input values that are necessary for computing the metric values.
Computation	Explanation of the steps involved in the metrics computation.
Interpretation	Interpretation of the results of the metrics computation.
Considerations	Provides examples of the considerations as to the appropriateness of the metric (e.g., Can data be collected for this metric? Is the metric appropriate for this application?).
Example	An example of applying the metric.
Data Source	Location of where the data is kept

Table A-1: Metric Set Definition

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Item	Description
Name	Action Item Aging
Program Goals	<ul style="list-style-type: none"> • Monitor action item closure • Monitor cost and schedule impact due to action items
Questions	<ul style="list-style-type: none"> • How many action items have been generated? • What is the status (Open/Closed) of the Action Items? • What is the impact to schedule and cost due to action item implementation?
Impact	This metric has the potential to alter the project if it is determined that the action item will cause a redesign and/or cause schedule delays.
Target Value	< 30 days old
Benefits	This metric shows the age of each open action item by severity. The data provides visibility to all open action items including those that have been outstanding for an extended period of time so that effort may be applied to ensure resolution.
Tools	Rational ClearQuest
Application	This is a program management metric used to measure product quality.
Data Items	<ul style="list-style-type: none"> • Cumulative Number of Action Items – Cumulative number of action items submitted • Cumulative Number of Action Items by Severity Level – Cumulative number of action items submitted based on Severity levels, (i.e., Critical, High, Intermediate, Low) • Total Number of Open Action Items – Total number of open action items as of the end of the reporting period • Total Number of Open Action Items by Severity Level – Total number of open action items by Severity level as of the end of the reporting period. • Cumulative Number of Closed Action Items – Cumulative number of action items that were closed during the reporting period. • Cumulative Number of Closed Action Items by Severity – Cumulative number of closed action items ordered by Severity level as of the end of the reporting period. • Action Item Aging – Used to ensure all Action Items are implemented in a timely manner. It is calculated by dividing the number of open action items by the number of closed action items. • Average Time Taken to Close Action Items – Total time to implement action item divided by the total number of closed action items. • Total Time Taken to Close Action Items – Sum the number of days from the date that the action item was opened until the day the action item was closed. • Cumulative Number of Open Action Items Based on Time Interval – Number of Action Items open 0-30 days, 31 –60 days, 61 –90 days, and > 90 days • Cumulative Number of Action Items Open Per Severity and Time Interval – Number of Action Items open 0-30 days, 31–60 days, 61–90 days, and > 90 days using Critical, High, Intermediate, and Low Severity levels
Computation	See Data Items Section above for computations

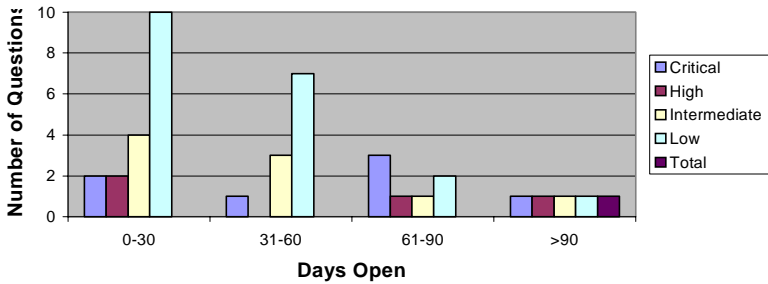
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Item	Description																														
Name	Action Item Aging																														
Interpretation	Action items that have been open for more than 30 days need to be followed up to ensure closure. Action items of greater severity may become potential risks that can affect cost and schedule.																														
Considerations	The higher the severity the more emphasis that should be placed on bringing the action item to closure.																														
Example	<div data-bbox="500 527 1287 951" data-label="Figure"> <p>Action Items Aging Report April 2003</p> <table border="1"> <caption>Data from Action Items Aging Report</caption> <thead> <tr> <th>Days Open</th> <th>Critical</th> <th>High</th> <th>Intermediate</th> <th>Low</th> <th>Total</th> </tr> </thead> <tbody> <tr> <td>0-30</td> <td>2</td> <td>2</td> <td>4</td> <td>10</td> <td>18</td> </tr> <tr> <td>31-60</td> <td>1</td> <td>0</td> <td>3</td> <td>7</td> <td>11</td> </tr> <tr> <td>61-90</td> <td>3</td> <td>1</td> <td>1</td> <td>2</td> <td>7</td> </tr> <tr> <td>>90</td> <td>1</td> <td>1</td> <td>1</td> <td>1</td> <td>4</td> </tr> </tbody> </table> </div> <p data-bbox="748 1010 1114 1041" style="text-align: center;">Action Item Aging Example</p>	Days Open	Critical	High	Intermediate	Low	Total	0-30	2	2	4	10	18	31-60	1	0	3	7	11	61-90	3	1	1	2	7	>90	1	1	1	1	4
Days Open	Critical	High	Intermediate	Low	Total																										
0-30	2	2	4	10	18																										
31-60	1	0	3	7	11																										
61-90	3	1	1	2	7																										
>90	1	1	1	1	4																										
Data Source	Action Item Database																														

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Item	Description
Name	Question Aging
Program Goals	<ul style="list-style-type: none"> • Monitor question closure (with close attention to requirement related questions) • Monitor cost and schedule impact if any due to questions
Questions	<ul style="list-style-type: none"> • How many questions have been generated? • What is the status (Open/Closed) of the questions? • What is the impact to schedule and cost due to question implementation?
Impact	This metric has the potential to alter the project if it is determined that the question will cause a redesign and/or cause schedule delays.
Target Value	< 30 days old
Benefits	This metric shows the age of each open question by severity. The data provides visibility to all open questions including those that have been outstanding for an extended period of time so that effort may be applied to ensure resolution.
Tools	Rational ClearQuest
Application	This metric provides management with visibility to trends in questions regarding the requirements during the systems analysis and design phases, and maintenance phases.
Data Items	<ul style="list-style-type: none"> • Cumulative Number of Questions – Cumulative number of questions submitted • Cumulative Number of Questions by Severity Level – Cumulative number of questions submitted based on Severity levels, (i.e., Critical, High, Intermediate, Low) • Total Number of Open Questions – Total number of open questions as of the end of the reporting period • Total Number of Open Questions by Severity Level – Total number of open questions by Severity level as of the end of the reporting period. • Cumulative Number of Closed Questions – Cumulative number of questions that were closed during the reporting period. • Cumulative Number of Closed Questions by Severity – Cumulative number of closed questions ordered by Severity level as of the end of the reporting period. • Question Aging – Used to ensure all questions are implemented in a timely manner. It is calculated by dividing the number of open questions by the number of closed questions. • Average Time Taken to Close Questions – Total time to implement response to question divided by the total number of closed questions. • Total Time Taken to Close Questions – Sum the number of days from the date that the question was opened until the day the question was closed. • Cumulative Number of Open Questions Based on Time Interval – Number of Questions open 0-30 days, 31 –60 days, 61 –90 days, and > 90 days. • Cumulative Number of Questions Open Per Severity and Time Interval – Number of Questions open 0-30 days, 31–60 days, 61–90 days, and > 90 days using Critical, High, Intermediate, and Low Severity levels.

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Item	Description																														
Name	Question Aging																														
	<ul style="list-style-type: none"> • Requirements Question - An inquiry for clarification of an approved ERA requirement that is submitted. 																														
Computation	See Data Items Section above for computations																														
Interpretation	Questions that have been open for more than 30 days need to be followed up to ensure closure. Questions of greater severity may become potential risks that can affect cost and schedule.																														
Considerations	The higher the severity the more emphasis that should be placed on bringing the question to closure.																														
Example	<div data-bbox="500 638 1284 1041" style="border: 1px solid black; padding: 10px; text-align: center;"> <p>Questions Aging Report April 2003</p>  <table border="1" style="margin: 10px auto; border-collapse: collapse;"> <caption>Data for Questions Aging Report (April 2003)</caption> <thead> <tr> <th>Days Open</th> <th>Critical</th> <th>High</th> <th>Intermediate</th> <th>Low</th> <th>Total</th> </tr> </thead> <tbody> <tr> <td>0-30</td> <td>2</td> <td>2</td> <td>4</td> <td>10</td> <td>8</td> </tr> <tr> <td>31-60</td> <td>1</td> <td>0</td> <td>3</td> <td>7</td> <td>4</td> </tr> <tr> <td>61-90</td> <td>3</td> <td>1</td> <td>1</td> <td>2</td> <td>7</td> </tr> <tr> <td>>90</td> <td>1</td> <td>1</td> <td>1</td> <td>1</td> <td>4</td> </tr> </tbody> </table> </div> <p style="text-align: center;">Question Aging Example</p>	Days Open	Critical	High	Intermediate	Low	Total	0-30	2	2	4	10	8	31-60	1	0	3	7	4	61-90	3	1	1	2	7	>90	1	1	1	1	4
Days Open	Critical	High	Intermediate	Low	Total																										
0-30	2	2	4	10	8																										
31-60	1	0	3	7	4																										
61-90	3	1	1	2	7																										
>90	1	1	1	1	4																										
Data Source	Question Database																														

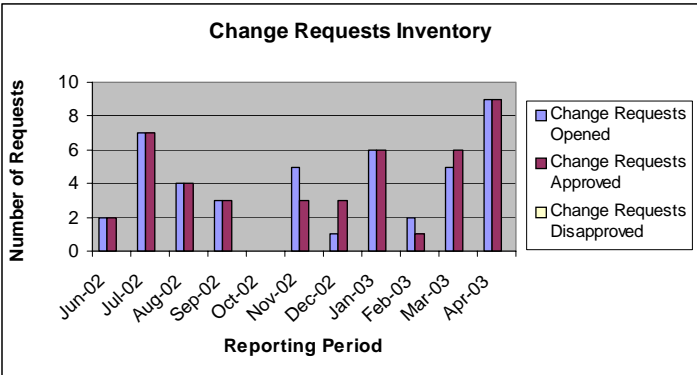
FINAL

Item	Description
Name	Change Request Inventory
Program Goals	<ul style="list-style-type: none"> • Identify trends early in their lifecycle in order to reduce, eliminate, or avoid cost and schedule implications. • Identify relationships between Change Requests (CRs) and prevent perpetual CRs.
Questions	<ul style="list-style-type: none"> • What documents/software/hardware are impacted based on the required change? • What is the impact of the required change in terms of cost and schedule?
Impact	This metric can be used to alter or halt a project.
Target Value	N/A, there is no target value
Benefits	Enables the identification of trends that could have deleterious effects on cost, schedule, or performance.
Tools	Rational ClearQuest
Application	This metric lists the ERA change requests that are open as of the end of the reporting period or have been approved or disapproved during the reporting period. The data provides management with insight to the trend in new change requests and resolution as the program progresses. This is a program management metric used to measure the rate of change in order to determine potential negative trends.
Data Items	<ul style="list-style-type: none"> • Change Request – A request for modification of ERA configuration item (i.e., document, hardware, software, requirement) made prior to the end of the reporting period. Includes Project, Release/Version Number, Date of Request, Type of Change, Priority, Status, and Date as specified in the <i>ERA CMP</i>. • Total Number of Change Requests Submitted – Total number of change requests that were submitted for the reporting period. • Cumulative Number of Change Requests Submitted - Cumulative number of change requests submitted up through and including the reporting period. • Total Number of Change Requests Submitted by Type of Change – Total number of change requests that were submitted for the reporting period broken down by type of change, e.g., document, hardware, software, requirements. • Cumulative Number of Change Requests Submitted by Type of Change – Cumulative number of change requests by type of change that were submitted up through and including the reporting period. • Total Number of Change Requests Approved – Total number of change requests that were approved during the reporting period. • Cumulative Number of Change Requests Approved – Cumulative number of change requests that have been approved up through and including the reporting period.

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Item	Description
Name	Change Request Inventory
	<ul style="list-style-type: none"> • Total Number of Change Requests Open – Total number of change requests that have not been approved or disapproved as of the end of the reporting period. • Total Number of Change Requests Disapproved - Total number of change requests that were disapproved during the reporting period. • Cumulative Number of Change Requests Disapproved – Cumulative number of change requests that have been disapproved up through and including the reporting period. • Total Number of Change Requests Submitted by Priority - Total number of change requests that were submitted for the reporting period broken down by priority, i.e., Critical, High, Intermediate, or Low. • Cumulative Number of Change Requests Submitted by Priority – Cumulative number of change requests by priority that were submitted up through and including the reporting period. • Total Number of Change Requests Open by Type of Change – Total number of change requests open broken down by type of change for the reporting period. • Total Number of Change Requests Open by Priority – Total number of change requests open broken down by priority for the reporting period. • Cumulative Number of Change Requests Open by Priority- Cumulative number of Change Requests open by priority up through and including the reporting period. • Cumulative Number of Change Requests Open by Type of Change - Cumulative number of Change Requests open by type of change up through and including the reporting period. • Total Number of Change Requests Disapproved by Type of Change – Total number of change requests disapproved by type of change for the reporting period. • Cumulative Number of Change Requests Disapproved by Type of Change – Cumulative number of change requests disapproved by type of change up through and including the reporting period. • Cumulative Number of Change Requests Disapproved by Priority – Cumulative number of change requests disapproved by priority up through and including the reporting period. • Total Number of Change Requests Disapproved by Priority – Total number of change requests disapproved by priority for the reporting period. • Total Number of Change Requests Approved by Type of Change – Total number of Change Requests approved broken down by type of change for the reporting period.

FINAL

Item	Description																																																
Name	Change Request Inventory																																																
	<ul style="list-style-type: none"> • Cumulative Number of Change Requests Approved by Type of Change – Cumulative number of change requests approved broken down by type of change up through and including the reporting period. • Total Number of Change Requests Approved by Priority – Total number of Change Requests approved broken down by priority for the reporting period. • Cumulative Number of Change Requests Approved by Priority – Cumulative number of change requests approved broken down by priority up through and including the reporting period. 																																																
Computation	Sum of the number of change requests submitted, approved, or disapproved as of the end of the reporting period and then charted using a standard bar graph.																																																
Interpretation	See Example																																																
Considerations	Reinforces formal configuration control (of configuration items), i.e., no changes can be made and incorporated into the configuration baseline without approval of the Change Request.																																																
Example	<div style="text-align: center;">  <table border="1" style="margin: 10px auto;"> <caption>Change Request Inventory Example Data</caption> <thead> <tr> <th>Reporting Period</th> <th>Change Requests Opened</th> <th>Change Requests Approved</th> <th>Change Requests Disapproved</th> </tr> </thead> <tbody> <tr><td>Jun-02</td><td>2</td><td>2</td><td>0</td></tr> <tr><td>Jul-02</td><td>7</td><td>7</td><td>0</td></tr> <tr><td>Aug-02</td><td>4</td><td>4</td><td>0</td></tr> <tr><td>Sep-02</td><td>3</td><td>3</td><td>0</td></tr> <tr><td>Oct-02</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>Nov-02</td><td>5</td><td>3</td><td>0</td></tr> <tr><td>Dec-02</td><td>1</td><td>3</td><td>0</td></tr> <tr><td>Jan-03</td><td>6</td><td>6</td><td>0</td></tr> <tr><td>Feb-03</td><td>2</td><td>1</td><td>0</td></tr> <tr><td>Mar-03</td><td>5</td><td>6</td><td>0</td></tr> <tr><td>Apr-03</td><td>9</td><td>9</td><td>0</td></tr> </tbody> </table> </div>	Reporting Period	Change Requests Opened	Change Requests Approved	Change Requests Disapproved	Jun-02	2	2	0	Jul-02	7	7	0	Aug-02	4	4	0	Sep-02	3	3	0	Oct-02	0	0	0	Nov-02	5	3	0	Dec-02	1	3	0	Jan-03	6	6	0	Feb-03	2	1	0	Mar-03	5	6	0	Apr-03	9	9	0
Reporting Period	Change Requests Opened	Change Requests Approved	Change Requests Disapproved																																														
Jun-02	2	2	0																																														
Jul-02	7	7	0																																														
Aug-02	4	4	0																																														
Sep-02	3	3	0																																														
Oct-02	0	0	0																																														
Nov-02	5	3	0																																														
Dec-02	1	3	0																																														
Jan-03	6	6	0																																														
Feb-03	2	1	0																																														
Mar-03	5	6	0																																														
Apr-03	9	9	0																																														
Data Source	Change Request Tracking Database																																																

FINAL

Item	Description
Name	Configuration Management (CM) Rate of Change
Program Goals	Monitor the number of configuration items that have been modified during the reporting period
Questions	<ul style="list-style-type: none"> • How many Configuration Items are under CM control? • How many Configuration Items have been modified?
Impact	This metric cannot be used to alter or halt a project.
Target Value	> 1.75% as anything greater than 2% indicates excessive rework is occurring.
Benefits	Lends insight as to whether or not the peer review process is effective in finding discrepancies.
Tools	Rational ClearCase, Rational ClearQuest
Application	The metric indicates how many of the Configurations Items (CIs) were modified during the reporting period.
Data Items	<ul style="list-style-type: none"> • Configuration Item - A physical or functional element controlled for the program. Includes CI Type (Document, Baseline, Hardware, or Software), CI Title, Release, Version, and Date/Time Last Modification. • Total Number of Modified CIs - A count of the CIs that were changed during the reporting period. • Total Number of CIs - The number of CIs in the CM library regardless of status as of the end of the reporting period.
Computation	$\text{CM Rate of Change} = \frac{\text{Total Number of Modified Configuration Items}}{\text{Total Number of Configuration Items}} \times 100$
Interpretation	If the rate of change is greater than 2% it can be inferred that a schedule slip may be imminent or the technical design is not sound. A rate of change greater than 2% is considered high.
Considerations	Target value could be skewed if a number of document updates have been scheduled in the same timeframe.
Example	Three (3) documents in the existing database require updating thus the need to create change requests. The change requests are approved and the documents are checked out to the document owner. The document owner makes the required changes and after submittal the document is checked back using a new version number. The version number change is detected through the running of a customized query that looks for checked out and checked in dates to coincide with the reporting period. The number of changes to the configuration items are summed and then divided by the total number of configuration items with the result being multiplied by one hundred.

FINAL

Item	Description																								
Name	<p>Configuration Management (CM) Rate of Change</p> <div data-bbox="646 478 1360 863" style="text-align: center;"> <table border="1"> <caption>CM Rate of Change Data</caption> <thead> <tr> <th>Reporting Period</th> <th>CM Percentage Rate of Change</th> </tr> </thead> <tbody> <tr><td>Jun-02</td><td>12.90</td></tr> <tr><td>Jul-02</td><td>8.57</td></tr> <tr><td>Aug-02</td><td>26.09</td></tr> <tr><td>Sep-02</td><td>2.33</td></tr> <tr><td>Oct-02</td><td>1.12</td></tr> <tr><td>Nov-02</td><td>1.11</td></tr> <tr><td>Dec-02</td><td>0.52</td></tr> <tr><td>Jan-03</td><td>0.00</td></tr> <tr><td>Feb-03</td><td>1.01</td></tr> <tr><td>Mar-03</td><td>0.50</td></tr> <tr><td>Apr-03</td><td>2.30</td></tr> </tbody> </table> </div> <p style="text-align: center;">CM Rate of Change Example</p>	Reporting Period	CM Percentage Rate of Change	Jun-02	12.90	Jul-02	8.57	Aug-02	26.09	Sep-02	2.33	Oct-02	1.12	Nov-02	1.11	Dec-02	0.52	Jan-03	0.00	Feb-03	1.01	Mar-03	0.50	Apr-03	2.30
Reporting Period	CM Percentage Rate of Change																								
Jun-02	12.90																								
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Jan-03	0.00																								
Feb-03	1.01																								
Mar-03	0.50																								
Apr-03	2.30																								
Data Source	ERA CM Library (Rational ClearCase), Rational ClearQuest Change Request Database																								

FINAL

Item	Description
Name	Requirements Rate of Change
Program Goals	Monitor the number of requirements that have been modified during the reporting period to assess general stability and completeness for the requirements.
Questions	<ul style="list-style-type: none"> • How many requirements exist in the requirements repository? • How many requirements have been modified? • How many new requirements have been added? • How many requirements have been deleted?
Impact	This metric cannot be used to alter or halt a project.
Target Value	N/A, there is no established target threshold
Benefits	<ul style="list-style-type: none"> • The Requirements Rate of Change metric provides a measure of technical flux as it relates to the user requirements. • A key indicator to the status of the requirements is the number of new or changed requirements per month • Lends insight as to how effective the requirements elicitation and generation process was, i.e., is an indicator on how well defined the baselined requirements were.
Tools	Rational ClearCase, Rational RequisitePro
Application	The metric indicates how many of the requirements were modified or added during the reporting period.
Data Items	<ul style="list-style-type: none"> • Total Number of Changes in Requirements - An approved modification to an ERA requirement that has been placed under CM • Total Number of Requirements - The count of approved ERA requirements that have been placed under CM
Computation	$\text{Requirements Rate of Change} = \frac{\text{Total Number of Modified Requirements}}{\text{Total Number of Baselined Requirements}} \times 100$
Interpretation	If the rate of change begins to effect schedule and/or cost performance than it can be inferred that scope creep is occurring and/or the original requirements were poorly defined.
Considerations	N/A
Example	854 requirements are baselined in the program requirements document. During the first month of the Systems Analysis and Design phase, three (3) requirements are modified per the change request process. The change requests are approved and the requirements are modified per the change request. The number of changes to the requirements are summed and then divided by the total number of requirements with the result being multiplied by one hundred.

FINAL

Item	Description
Name	Requirements Rate of Change
	<p style="text-align: center;">Requirements Rate of Change Example</p>
Data Source	Rational Suite ClearQuest Change Request Database, Rational Suite RequisitePro Database

FINAL

Item	Description
Name	FY04/05/06 Budget
Program Goals	<ul style="list-style-type: none"> Track the allocated budget for the reporting period Track the cost outlays for the reporting period Track the number of obligations for the reporting period
Questions	<ul style="list-style-type: none"> What is the total budget allocation for the reporting period? What are the total cost outlays for the reporting period? What are the total obligations for the reporting period? What are the total labor costs for the reporting period?
Impact	This metric can be used to alter or halt a project if it is determined that there are substantial cost overruns.
Target Value	±5% over/under budgeted costs
Benefits	Shows immediately if there is a cost overrun
Tools	MS Excel or other spreadsheet package
Application	This is an MS Excel tool used to track obligations and expenditures
Data Items	<ul style="list-style-type: none"> Original Budget Estimate - The budget allocated to perform work on the program in the contract proposal. Outlays - Total expenditures incurred to perform the work through the end of the reporting period. Obligations - Total monies obligated for the reporting period
Computation	Sum totals for reporting month and then display using bar graph.
Interpretation	<ul style="list-style-type: none"> If cumulative outlays – exceed the cumulative obligations by > 5% per quarter than an overrun is imminent.
Considerations	Reprogramming of the funds may be required
Example	<div style="text-align: center;"> <p>Cumulative Monthly Actual Cost Fiscal Year 2003</p> <p>US Dollars</p> <p>Reporting Period</p> <p>Legend: FY03 Budget (blue), FY03 Obligations (red), FY03 Outlays (yellow)</p> </div> <p style="text-align: center;">Cumulative Monthly Cost Example</p>
Data Source	NARA Budget Office supplies data to ERA Program Budget Analyst

FINAL

Item	Description
Name	Earned Value
Program Goals	<ul style="list-style-type: none"> • Monitor performance, cost, and schedule using a timeline • Monitor the schedule and completion of work products relative to their scheduled and actual completion times • Ensure the project has sufficient resources • Determine how much of the planned work has been done • Forecast the final spending and completion date • Provide an early warning when the project starts to go off-track • Discover which areas/tasks are causing the problems, and where anomalies are occurring • Demonstrate and keep the project/development under control • Track total number of hours per task (cumulative), both budgeted and actual during the reporting period • Track total number of hours spent to complete a task
Questions	<ul style="list-style-type: none"> • How is the project performing with respect to cost? • How is the project performing with respect to schedule? • Is the work force sufficient to complete the work and how well are they performing? • What are the staffing levels: Actual, Planned, Variance? • Is the correct labor mix being utilized? • Is project performance increasing? • How much work/how many tasks has/have been completed as compared to the plan? • Will the project complete on time? • Is scheduled work being completed on time? • Is scheduled work being completed within cost parameters? • Is the total number of hours (actual) spent working on a task more than the budgeted amount? • Is a pattern emerging where it is taking longer than planned to complete particular tasks? • Is the overrun of hours required to complete a task in a particular component area? • Was the prepared budget inadequate for the amount of work to be performed? • Is the component area more technically challenging than originally anticipated?
Impact	These metrics can be used to monitor progress, provide early warnings of problems, trends, enable process improvement, and enable decision making whether to continue work on the project.
Target Value	<ul style="list-style-type: none"> • ±10%, \$125K

FINAL

Item	Description
Name	Earned Value
	<ul style="list-style-type: none"> • Using EV, no credit is given unless milestones/tasks are one hundred percent complete. • Cost Performance Index (CPI) <1.00 indicates potential productivity problem. • Level Of Effort (LOE) > 100% of planned effort required to complete activity - If the cumulative actual labor hours exceed cumulative budgeted hours to complete a task(s), this could be indicative of poor estimation and planning, leading to overruns and shortening of the test cycle to get back on schedule. • This could also indicate wrong level of labor mix.
Benefits	<ul style="list-style-type: none"> • CPI shows how efficiently the team has turned costs into progress to date. • CPI represents how much work was performed for each dollar spent. • Schedule Performance Index (SPI) establishes the performance baseline against which the program can compare actual performance data. SPI is a schedule variance parameter. • Reviewing for potential threats • Timeliness of accurate (real time) data providing ample time to act
Tools	<ul style="list-style-type: none"> • MS Excel • MS Project • Project Connect and wInsight tools from C/S Solutions
Application	<ul style="list-style-type: none"> • This is a program management metric used to monitor cost, performance, and schedule. • The SPI compares performance to the schedule. The indices of CPI and SPI are the standard cost and schedule performance measures for both government and industry. The CPI shows how efficiently the team has turned costs into progress to date CPI represents how much work was performed for each dollar spent. • The primary reports used for analysis of performance in an EV system is the Cost/Schedule Status Report and the Cost Performance Report (CPR). The CPR includes BCWS, ACWP, BCWP, and EAC in addition to calculated cost and schedule variances for each WBS element from the cost account level up to the project level. • VARs provide current period, cumulative, and at-completion data. VAR contains a description of the cause of the variance, its impact on the project including other elements of the project, corrective action to be taken, and follow-up on previous action taken. Variance thresholds may be reported as a percentage, dollar amount, or a combination of the two.
Data Items	<ul style="list-style-type: none"> • Budget At Completion (BAC) - The total value assigned to the program and, if all goes as planned, the total cost. The planned value accounts for all direct and indirect labor (expressed in dollars) that the work is expected to cost.

FINAL

Item	Description
Name	Earned Value
	<ul style="list-style-type: none"> • Budgeted Cost of Work Scheduled (BCWS) – The sum of budgets allocated to time-phased elements of work (Work Packages (WP)) on the program; the planned value. • Budgeted Cost of Work Performed (BCWP) – The budgeted cost of work recorded when the work is actually completed; earned value. • Actual Cost of Work Performed (ACWP) – The actual, not the estimated, cost of the work performed to-date. • Task - The lowest level of effort in the ERA program schedule. • Cumulative Budgeted Labor Hours - Total number of hours to be worked on a task through the end of the reporting period as defined in the contract. Includes Task Name and Task Cumulative Estimated Labor Hours. • Total Budgeted Labor Hours - Total number of hours to be expended to complete a task as defined in the contract. Includes Task Name and Task Total Estimated Labor Hours. • Cumulative Actual Labor Hours - Total number of hours spent working on a task through the end of the reporting period. Includes Task Name, Task Cumulative Estimated Labor Hours, Task Actual Labor Hours, and Task Cumulative Actual Labor Hours.
Computations	<ul style="list-style-type: none"> • Estimate at Completion (EAC) = This formula determines the unfinished or unearned work given by the formula. $\text{Estimate at Completion (EAC)} = \text{ACWP} + \text{WR} / \text{PF}$ <p>Where: Work Remaining (WR) = BAC – BCWP and</p> <p>Performance Factor (PF) depends on the analysis. For example: $\text{PF} = \text{CPI}$ or $\text{PF} = \text{CPI} \times \text{SPI}$</p> <p>A poor performance, or CPI less than 1, results in an EAC that is greater than the BAC</p> • Variance at Completion (VAC) = The difference between the EAC and the BAC given by the following formula: $\text{Variance at Completion (VAC)} = \text{EAC} - \text{BAC}$ <p>When the projected final cost exceeds the budget, the Development Contractor is effectively predicting an overrun, termed an Adverse Variance at Completion.</p> • Cost Variance (CV) = The difference between BCWP and ACWP given by the formula:

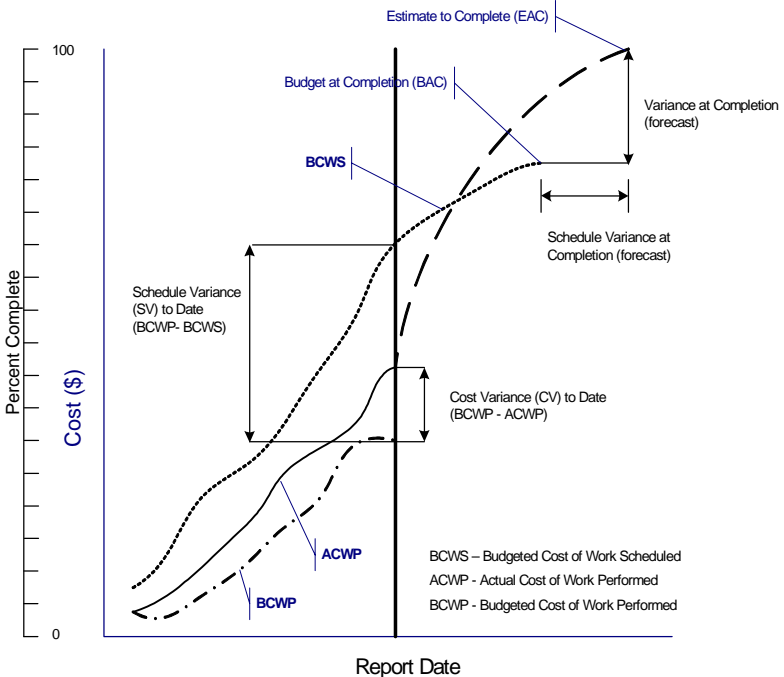
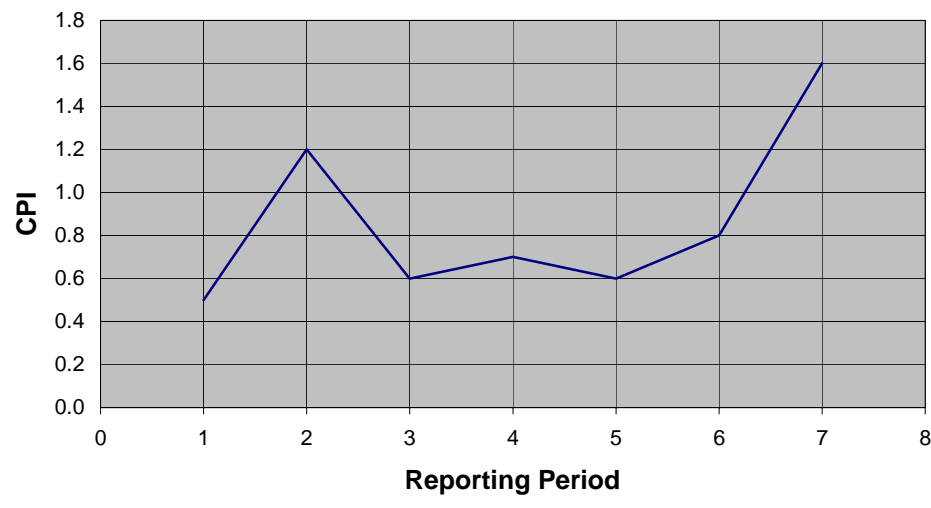
FINAL

Item	Description
Name	<p>Earned Value</p> <p>Cost Variance (CV) = BCWP - ACWP</p> <p>OR</p> <p>Cost Variance Percentage = $\frac{CV}{BCWP} \times 100$</p> <ul style="list-style-type: none"> • Schedule Variance (SV) = The difference between BCWP and BCWS given by the formula: Schedule Variance = BCWP - BCWS Or Schedule Variance Percentage = $\frac{SV}{BCWS} \times 100$ • Schedule Performance Index (SPI) = BCWP divided by BCWS as given by the formula: Schedule Performance Index = $\frac{BCWP}{BCWS}$ • Cost Performance Index (CPI) = BCWP divided by the ACWP given by the formula: Cost Performance Index = $\frac{BCWP}{ACWP}$ <p>A CPI of less than a 1.0 indicates potential productivity problem</p> <ul style="list-style-type: none"> • Variance At Completion (VAC) = Variance at Completion (VAC) = BAC - EAC • To Complete Performance Index (TCPI) shows the future projection of the average productivity needed to complete the program within an estimated budget. It is calculated by the following formula:

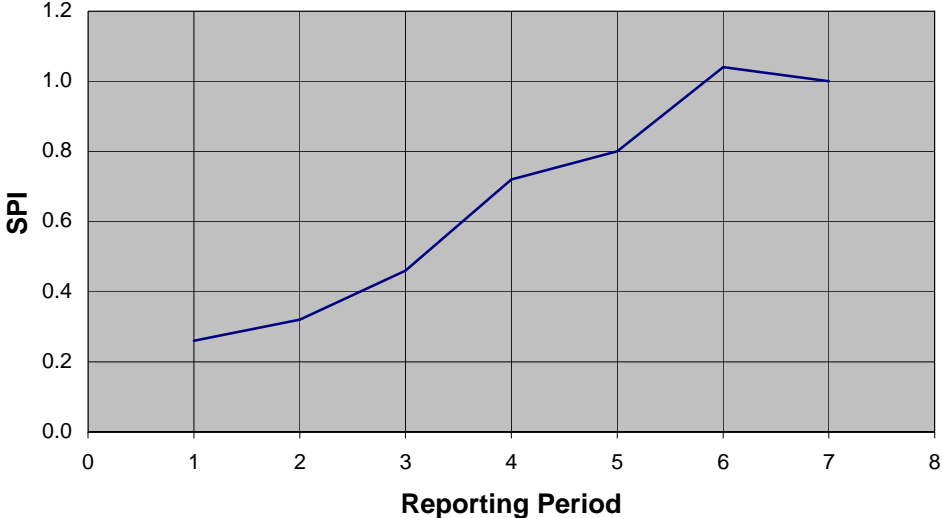
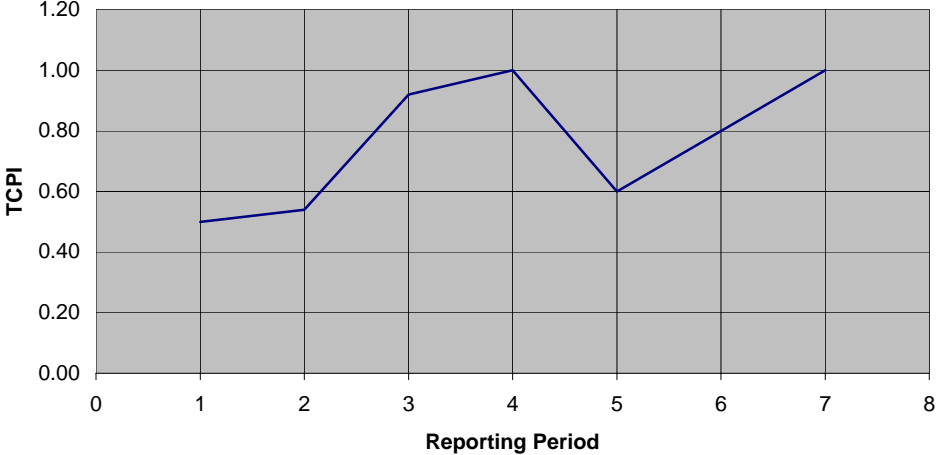
FINAL

Item	Description
Name	Earned Value
	<p style="text-align: right;">Work Remaining BAC – BCWP</p> <p>To Complete Performance Index (BAC) = $\frac{\text{-----}}{\text{Money Remaining}} = \frac{\text{-----}}{\text{BAC – ACWP}}$</p> <p style="text-align: right;">Work Remaining BAC – BCWP</p> <p>To Complete Performance Index (EAC) = $\frac{\text{-----}}{\text{Money Remaining}} = \frac{\text{-----}}{\text{EAC – ACWP}}$</p> <ul style="list-style-type: none"> • Estimate at Completion (EAC) = The difference between the Estimate at Completion and Actual Cost given by the formula: $\text{Estimate at Completion (EAC)} = \frac{\text{BAC}}{\text{CPI}}$
Interpretation	<ul style="list-style-type: none"> • The closer the CPI and SPI are to a value of 1.00, the more successful the program can be considered, at least in terms of cost and schedule. • ERA PD should approve the level of LOE tasks since >5% LOE may present problems when trying to measure project performance • TCPI is compared with CPI to determine how realistic the most recent EAC is for the program. If TCPI is greater than CPI ($CPI/TCPI < 1$), the team is anticipating an efficiency improvement. The estimated total cost of the program (EAC) can therefore be calibrated by comparing TCPI with CPI. If TCPI is 20 percent above the current value of the CPI, both indices require closer examination.
Considerations	<p>In order to use the metrics the program/project must:</p> <ul style="list-style-type: none"> • Have produced a Work Breakdown Structure (WBS), WBS, Organizational Breakdown Structure (OBS) and Integrated Master Schedule (IMS); and • To prepare ETC, the following items should be considered: <ul style="list-style-type: none"> – Cumulative ACWP divided by ordered commitments, – Schedule status, – EV to-date, – Remaining scope of work, – Previous ETC, – Historical data, – Required resources by type, – Projected cost and schedule efficiency improvement, – Future actions, and – Approved contract changes.

FINAL

Item	Description
Name	Earned Value
Example	 <p style="text-align: center;">Earned Value Example</p>  <p style="text-align: center;">Cost Performance Index Example</p>

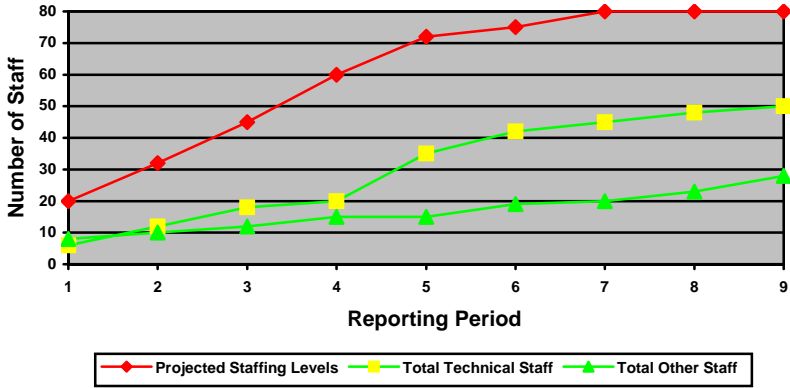
FINAL

Item	Description
Name	Earned Value
	 <p style="text-align: center;">Schedule Performance Index Example</p>  <p style="text-align: center;">To Complete Performance Index Example</p>
Data Source	Export EV data from MS Project to wInsight Utility applications

FINAL

Item	Description
Name	Program Staffing Profile
Program Goals	Monitor the staffing levels required to perform program tasks against projected staffing levels
Questions	<ul style="list-style-type: none"> • What is the projected number of ERA PMO Government Staff required to perform designated tasks? • What is the actual number of ERA PMO Government Staff required to perform designated tasks? • What is the projected number of ERA PMO POST Staff required to perform designated tasks? • What is the actual number of ERA PMO POST Staff required to perform designated tasks?
Impact	Lack of resources could result in schedule slippage due to work overload.
Target Value	< 90% projected staffing level could impact tasks being completed on time which translates into a potential schedule slip.
Benefits	When staffing levels are above the threshold it means that sufficient resources are available to perform required tasks.
Tools	MS Excel, MS PowerPoint
Application	This is a program management metric used to monitor resources and cost
Data Items	<ul style="list-style-type: none"> • Projected Staffing Level - Identification of ERA staffing required completing program activities by reporting period. Includes Staffing Category and for each Staffing Category, the Number of Staff Members, and Staffing Scheduled Finish Date. • Program Staffing Level - Actual ERA staffing by Staffing Category as of the end of the reporting period. Includes Staffing Category and for each Staffing Category, the Number of Staff Members, Staff Member Names, and Reporting Period. • Number of Projected ERA Staff – Total number of staff for the ERA project, includes both Government and POST staff combined cumulative up to and including the reporting period. • Actual Number of ERA Staff – Actual number of staff for the ERA project, includes both Government and POST staff combined cumulative up to and including the reporting period. • Number of Projected Government Staff – Total number of projected Government staff required to complete program activities up to and including the reporting period. • Actual Number of Government Staff – Actual number of Government staff to-date. • Number of Projected POST Staff – Total number of projected POST staff required to complete program activities up to and including the reporting period. • Actual Number of POST Staff – Actual number of POST staff to-date

FINAL

Item	Description																																								
Name	Program Staffing Profile																																								
	<ul style="list-style-type: none"> • Number of Projected Government Staff by Division (i.e., PMO Total, PMO PO, PMO PSD, PMO SED) – Total number of Government projected Government staff by division required to complete program activities up to and including the reporting period. • Actual Number of Projected Government Staff by Division – Actual number of Government staff to-date by division. • Number of Projected POST Staff by Division (i.e., POST Total, POST PO, POST PMD, POST SED) – Total number of projected POST staff by division required to complete program activities up to and including the reporting period. • Actual Number of POST Staff by Division – Actual number of POST staff to-date by division. 																																								
Computation	$\text{Staffing Profile \% Rate} = \frac{\text{Total Number of Actual Staff}}{\text{Total Number of Projected Staff}} \times 100$																																								
Interpretation	If staffing is too low, then there is the potential for schedule slippage as tasks may not be completed as scheduled.																																								
Considerations	Can be used in conjunction with or to help support level of effort																																								
Example	 <p style="text-align: center;">Program Staffing Level Example</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <caption>Data for Program Staffing Level Example</caption> <thead> <tr> <th>Reporting Period</th> <th>Projected Staffing Levels</th> <th>Total Technical Staff</th> <th>Total Other Staff</th> </tr> </thead> <tbody> <tr><td>1</td><td>20</td><td>5</td><td>10</td></tr> <tr><td>2</td><td>32</td><td>10</td><td>12</td></tr> <tr><td>3</td><td>45</td><td>18</td><td>15</td></tr> <tr><td>4</td><td>60</td><td>22</td><td>18</td></tr> <tr><td>5</td><td>72</td><td>35</td><td>20</td></tr> <tr><td>6</td><td>75</td><td>42</td><td>22</td></tr> <tr><td>7</td><td>78</td><td>45</td><td>25</td></tr> <tr><td>8</td><td>80</td><td>48</td><td>28</td></tr> <tr><td>9</td><td>80</td><td>50</td><td>30</td></tr> </tbody> </table>	Reporting Period	Projected Staffing Levels	Total Technical Staff	Total Other Staff	1	20	5	10	2	32	10	12	3	45	18	15	4	60	22	18	5	72	35	20	6	75	42	22	7	78	45	25	8	80	48	28	9	80	50	30
Reporting Period	Projected Staffing Levels	Total Technical Staff	Total Other Staff																																						
1	20	5	10																																						
2	32	10	12																																						
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FINAL

Item	Description																														
Name	Program Staffing Profile																														
	<div data-bbox="630 338 1325 751" style="text-align: center;"> <table border="1" style="margin: auto;"> <caption>Program Staffing Profile Breakdown April 2003</caption> <thead> <tr> <th>Organization</th> <th>Category</th> <th>Total Projected Staff</th> <th>Total Actual Staff to Date</th> </tr> </thead> <tbody> <tr> <td rowspan="4">Government</td> <td>PMO Total</td> <td>25</td> <td>15</td> </tr> <tr> <td>PMO Program Office</td> <td>7</td> <td>5</td> </tr> <tr> <td>PMO PMD</td> <td>8</td> <td>3</td> </tr> <tr> <td>PMO SED</td> <td>10</td> <td>7</td> </tr> <tr> <td rowspan="4">POST</td> <td>POST Total</td> <td>25</td> <td>24</td> </tr> <tr> <td>POST Program Office</td> <td>7</td> <td>7</td> </tr> <tr> <td>POST PMD</td> <td>8</td> <td>7</td> </tr> <tr> <td>POST SED</td> <td>10</td> <td>10</td> </tr> </tbody> </table> </div> <p data-bbox="748 804 1188 840" style="text-align: center;">Program Staffing Profile Example</p>	Organization	Category	Total Projected Staff	Total Actual Staff to Date	Government	PMO Total	25	15	PMO Program Office	7	5	PMO PMD	8	3	PMO SED	10	7	POST	POST Total	25	24	POST Program Office	7	7	POST PMD	8	7	POST SED	10	10
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	POST SED	10	10																												
Data Source	ERA Organization Charts																														

FINAL

Item	Description
Name	Risk Containment Summary
Program Goals	<ul style="list-style-type: none"> • Track risks by risk exposure • Identify trends • Develop risk strategies to mitigate, reduce, or eliminate potential risks
Questions	<ul style="list-style-type: none"> • What is the total number of risks that have been identified? • What is the total number of high exposure risks? • What is the total number of moderate exposure risks? • What is the total number of low exposure risks?
Impact	Can be used to halt or alter the project depending on the severity of the risk.
Target Value	N/A, there is no threshold
Benefits	This measure provides a useful summary for management to identify trends in risk identification in order to be able to monitor them and to also develop strategies to mitigate, reduce, or eliminate them.
Tools	Risk Radar
Application	The metric is a program management metric used to monitor all risk items.
Data Items	<ul style="list-style-type: none"> • Cumulative Number of Open Risk Items – Cumulative number of open risk items up to and including the reporting period. • Cumulative Number of Open Risk Items by Risk Exposure (i.e., High, Moderate, Low) – Total number of open risk items by risk exposure level that are open as of the end of the reporting period. <ul style="list-style-type: none"> – High Exposure: Risks that have a significant impact on cost, schedule, or performance. Significant action required. – Moderate Exposure: Risks that have some impact. Special action may be required. Additional management attention may be required. – Low Exposure: Risks that have minimum impact. Normal oversight needed to ensure risk remains low. • Cumulative Number of Closed Risk Items – Total number of closed risk items by risk exposure level that have been closed for the reporting period. • Cumulative Number of Closed Risk Items by Exposure Level – Total number of closed risk items by risk exposure level that have been closed as of the end of the reporting period.

FINAL

Item	Description																																																												
Name	Risk Containment Summary																																																												
Computation	<p>Risk Exposure is determined using: Impact multiplied by Likelihood/Probability.</p> <p>Risk Impact Level and Likelihood/Probability are determined using the following:</p> <table border="1" data-bbox="553 512 1427 984"> <thead> <tr> <th>Level</th> <th>Technical Performance</th> <th>Schedule</th> <th>Cost</th> <th>Impact on Other Teams</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Minimal or no Impact</td> <td>Minimal or No Impact.</td> <td>Minimal or no Impact</td> <td>None</td> </tr> <tr> <td>2</td> <td>Acceptable with some reduction in margin</td> <td>Additional resources required. Able to meet need dates.</td> <td><5%</td> <td>Some impact</td> </tr> <tr> <td>3</td> <td>Acceptable with significant reduction in margin</td> <td>Minor slip in key milestone. Not able to meet need dates.</td> <td>5 – 7%</td> <td>Moderate impact</td> </tr> <tr> <td>4</td> <td>Acceptable – no remaining margin</td> <td>Major slip in key milestone or critical path impacted.</td> <td>>7<10%</td> <td>Major impact</td> </tr> <tr> <td>5</td> <td>Unacceptable</td> <td>Can't achieve key team or major program milestone.</td> <td>>10%</td> <td>Unacceptable</td> </tr> </tbody> </table> <p style="text-align: center;">Risk Impact Chart Example</p> <table border="1" data-bbox="553 1073 1440 1572"> <thead> <tr> <th>Level</th> <th>Translated Probability</th> <th>Likelihood of Occurrence</th> <th>Potential for Mitigation</th> <th>Approach</th> </tr> </thead> <tbody> <tr> <td>a</td> <td>1 - 20%</td> <td>Remote</td> <td>Mitigation is almost always possible.</td> <td>Is not necessary to develop a contingency plan.</td> </tr> <tr> <td>b</td> <td>21 - 40%</td> <td>Unlikely</td> <td>Mitigation is usually possible.</td> <td>Continue current mitigation plan.</td> </tr> <tr> <td>c</td> <td>41 – 60%</td> <td>Likely</td> <td>Mitigation is possible but difficult.</td> <td>Continue execution of mitigation plan; develop contingency plan.</td> </tr> <tr> <td>d</td> <td>61 – 80%</td> <td>Highly Likely</td> <td>Mitigation is unlikely or difficult.</td> <td>Prepare to enact contingency plan.</td> </tr> <tr> <td>e</td> <td>81 - 99%</td> <td>Near Certainty</td> <td>Mitigation is not possible.</td> <td>Look to minimize impacts; enact contingency plan.</td> </tr> </tbody> </table> <p style="text-align: center;">Risk Probability/Likelihood Chart Example</p> <p>Using the above tables the data is then plotted. See Risk Containment Summary Example below.</p>	Level	Technical Performance	Schedule	Cost	Impact on Other Teams	1	Minimal or no Impact	Minimal or No Impact.	Minimal or no Impact	None	2	Acceptable with some reduction in margin	Additional resources required. Able to meet need dates.	<5%	Some impact	3	Acceptable with significant reduction in margin	Minor slip in key milestone. Not able to meet need dates.	5 – 7%	Moderate impact	4	Acceptable – no remaining margin	Major slip in key milestone or critical path impacted.	>7<10%	Major impact	5	Unacceptable	Can't achieve key team or major program milestone.	>10%	Unacceptable	Level	Translated Probability	Likelihood of Occurrence	Potential for Mitigation	Approach	a	1 - 20%	Remote	Mitigation is almost always possible.	Is not necessary to develop a contingency plan.	b	21 - 40%	Unlikely	Mitigation is usually possible.	Continue current mitigation plan.	c	41 – 60%	Likely	Mitigation is possible but difficult.	Continue execution of mitigation plan; develop contingency plan.	d	61 – 80%	Highly Likely	Mitigation is unlikely or difficult.	Prepare to enact contingency plan.	e	81 - 99%	Near Certainty	Mitigation is not possible.	Look to minimize impacts; enact contingency plan.
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Interpretation	Less than a 95% completion rate could infer a schedule slip is imminent.																																																												

FINAL

Item	Description																																														
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Considerations	Additional risk management data including strategies can be found in the <i>ERA Risk Management Plan (RKM)</i> . The metric data presented here is a subset of that data. Lastly, risk management reports containing additional metric data is reported on at various times providing more detail than what is being reported here.																																														
Example	<div style="text-align: center;"> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td></td> <td style="background-color: cyan;">5</td> <td style="background-color: yellow;"></td> <td style="background-color: yellow;"></td> <td style="background-color: red;"></td> <td style="background-color: red;"></td> <td style="background-color: red;">1</td> </tr> <tr> <td rowspan="5" style="vertical-align: middle;">Impact</td> <td style="background-color: cyan;">4</td> <td style="background-color: green;"></td> <td style="background-color: yellow;"></td> <td style="background-color: yellow;"></td> <td style="background-color: red;">3</td> <td style="background-color: red;"></td> </tr> <tr> <td style="background-color: cyan;">3</td> <td style="background-color: green;"></td> <td style="background-color: yellow;">2</td> <td style="background-color: yellow;">4</td> <td style="background-color: red;"></td> <td style="background-color: red;"></td> </tr> <tr> <td style="background-color: cyan;">2</td> <td style="background-color: green;">3</td> <td style="background-color: green;">1</td> <td style="background-color: yellow;"></td> <td style="background-color: yellow;"></td> <td style="background-color: yellow;"></td> </tr> <tr> <td style="background-color: cyan;">1</td> <td style="background-color: green;">2</td> <td style="background-color: green;">4</td> <td style="background-color: green;"></td> <td style="background-color: green;"></td> <td style="background-color: green;"></td> </tr> <tr> <td></td> <td style="background-color: cyan;">1 - 20</td> <td style="background-color: cyan;">21 - 40</td> <td style="background-color: cyan;">41 - 60</td> <td style="background-color: cyan;">61 - 80</td> <td style="background-color: cyan;">81 - 99</td> </tr> </table> <p>Likelihood /Probability (%)</p> </div> <p>Legend:</p> <table style="margin-left: 20px;"> <tr> <td style="width: 20px; height: 10px; background-color: red; border: 1px solid black;"></td> <td>High Exposure</td> </tr> <tr> <td style="width: 20px; height: 10px; background-color: yellow; border: 1px solid black;"></td> <td>Moderate Exposure</td> </tr> <tr> <td style="width: 20px; height: 10px; background-color: green; border: 1px solid black;"></td> <td>Low Exposure</td> </tr> <tr> <td style="width: 20px; height: 10px; background-color: white; border: 1px solid black; text-align: center;">#</td> <td># = number of risks in that impact/probability bin</td> </tr> </table> <p style="text-align: center;">Risk Containment Summary Example</p>		5					1	Impact	4				3		3		2	4			2	3	1				1	2	4					1 - 20	21 - 40	41 - 60	61 - 80	81 - 99		High Exposure		Moderate Exposure		Low Exposure	#	# = number of risks in that impact/probability bin
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Data Source	Risk Radar																																														

FINAL

Item	Description
Name	Work Product Completion Summary
Program Goals	Track the number of work products that are scheduled for delivery and those that are actually delivered on a cumulative basis.
Questions	<ul style="list-style-type: none"> • What is the number of work products, e.g., documents, scheduled for submission during the reporting period? • What is the number of actual work products submitted during the reporting period?
Impact	<ul style="list-style-type: none"> • Can be used to alter or halt a project if it is determined that the schedule is not being met. • Can be used to alter or halt a project if the deliverable work product(s) is of significance and tied to completion of a program milestone.
Target Value	< 95% completed on time since strategic goal is < 10% schedule slippage
Benefits	Can determine if a program is on schedule or if milestones tied to the deliverable are going to be met.
Tools	<ul style="list-style-type: none"> • MS Word table for deliverables list for the reporting period to be used in conjunction with the ERA WBS and Schedule (MS Project Scheduler) • MS Excel to chart metric data
Application	The metric presents the Cumulative Number of Work Products Completed and the Cumulative Number of Work Products Scheduled for completion.
Data Items	<ul style="list-style-type: none"> • Cumulative Number of Work Products Scheduled - Cumulative number of ERA deliverables that are scheduled for completion by the end of the reporting period in the program schedule. Includes Work Product Name, Work Product Type, Work Product Scheduled Finish Date, and Actual # of deliverables submitted. • Cumulative Number Work Products Completed - Cumulative number of ERA deliverables that were completed as of the end of the reporting period. Includes Work Product Name, Work Product Type, Work Product Scheduled Finish Date, and Work Product Actual Finish Date.
Computation	$\text{Work Product Completion Rate} = \frac{\text{Cumulative Number of Work Products Completed}}{\text{Cumulative Number of Work Products Scheduled}} \times 100$
Interpretation	Less than a 95% completion rate could infer a schedule slip is imminent
Considerations	None

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Item	Description																																				
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Example	<div data-bbox="591 436 1341 840" style="text-align: center;"> <table border="1" style="margin: 10px auto;"> <caption>Work Product Completion Summary Example</caption> <thead> <tr> <th>Reporting Period</th> <th>Cumulative Scheduled</th> <th>Cumulative Completed</th> </tr> </thead> <tbody> <tr><td>Jun-02</td><td>4</td><td>4</td></tr> <tr><td>Jul-02</td><td>12</td><td>11</td></tr> <tr><td>Aug-02</td><td>17</td><td>18</td></tr> <tr><td>Sep-02</td><td>27</td><td>27</td></tr> <tr><td>Oct-02</td><td>33</td><td>33</td></tr> <tr><td>Nov-02</td><td>35</td><td>34</td></tr> <tr><td>Dec-02</td><td>42</td><td>39</td></tr> <tr><td>Jan-03</td><td>47</td><td>43</td></tr> <tr><td>Feb-03</td><td>51</td><td>46</td></tr> <tr><td>Mar-03</td><td>57</td><td>50</td></tr> <tr><td>Apr-03</td><td>67</td><td>56</td></tr> </tbody> </table> </div>	Reporting Period	Cumulative Scheduled	Cumulative Completed	Jun-02	4	4	Jul-02	12	11	Aug-02	17	18	Sep-02	27	27	Oct-02	33	33	Nov-02	35	34	Dec-02	42	39	Jan-03	47	43	Feb-03	51	46	Mar-03	57	50	Apr-03	67	56
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Data Source	Work Breakdown Structure (WBS)																																				

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Item	Description
Name	Defect Management
Program Goals	<ul style="list-style-type: none"> • Monitor defects during development in order to avoid re-design that translates into performance, cost, and schedule impacts. • Monitor defects during test in order to determine the technical competency of the system. • Monitor defects in deliverables and/or deliverables presented during program technical reviews in order to demonstrate competency of design.
Questions	<ul style="list-style-type: none"> • What is the total number of defects? • What is the total number of defects per Severity level? • Are the defects found concentrated in any one area? • What is the defect closure rate? • What is the impact to cost and schedule?
Impact	This metric can be used to alter or halt a project.
Target Value	N/A, there is no target value
Benefits	Enables the identification of trends that could have deleterious effects on cost, schedule, or performance.
Tools	Rational ClearQuest and Rational TestManager or other Rational-compatible tools
Application	Tracks the persistence of software defects through the ERA lifecycle to measure the effectiveness of development and verification activities. This is a program management metric used to identify and categorize defects that are found during development that may impact schedule, cost, and performance.
Data Items	<ul style="list-style-type: none"> • Defect - Any flaw in the specification, design, or in the coding, implementation, or testing of a work product which if not removed, would cause a program or system to fail or to produce incorrect results. Any occurrence in a work product that is determined to be incomplete or incorrect relative to the standards applicable for that work product. An instance where the product does not meet a specified characteristic recorded as of the end of the reporting period. • Total Number of Defects Found – Total number of all defects found during the reporting period. • Cumulative Number of Defects Found – Cumulative number of defects found during all reporting periods combined. • Total Number of Defects Found Per Defect Severity Level – Total number of defects found per severity level (i.e., Critical, High, Intermediate, or Low). • Percentage of Defects Found Per Severity Level – Calculated. Percentage of defects by severity level = number of defects for a severity level divided by total number of defects. X-axis = severity level, Y-axis = number or percentage of defects.

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Item	Description
Name	Defect Management
	<ul style="list-style-type: none"> • Total Number of Defects Found Per Origin (i.e., documentation, requirements, design, code, test, other (mistake in build/configuration process, development/integration tools, test environment)) - To see where most of the defects are coming from so that corrective action can be taken in those areas to reduce the number of defects. X-axis = defect origin or phase, Y-axis = number or percent of defects. • Total Number of Defects Found Per Type (e.g., computation, configuration files, data (incorrect record format, or missing records), database SQA script, functionality (not meeting a requirement), other (test tool problem, test set up is incorrect), hardware interface, logic, software interface) – Showing the number or percent of defects by defect type in order to see what kinds of defects most commonly occur so that corrective action can be taken in those areas to reduce the number of defects. Can depict either the number or percent of defects by origin. X-axis = defect type, Y-axis = number or percent of defects. • Total Number of Defects Closed – Total number of defects closed as of the end of the reporting period. • Cumulative Number of Defects Closed – Cumulative number of defects closed during all reporting periods combined. • Total Number of Defects Closed Per Severity Level – Total number of defects closed based on severity level. • Total Number of Defects Closed Per Origin– Total number of defects closed based on origin. • Total Number of Defects Closed Per Type – Total number of defects closed based on type. • Average Time to Fix Defect – Calculated. Used to forecast the time it will take to fix “x” number of defects which will be put in a certain release. Average time to fix a defect = Total time to fix each defect divided by the total number of defects for which time to fix was entered. • Defect Aging (by Severity) – Number or percentage of defects opened/closed. X-axis = time elapsed in months of age, Y-axis = number or percent of defects. Stacked bar chart on the X-axis to represent the number or percent of defects still open for each defect severity level. The purpose is to determine if there is a problem with critical and high severity defects taking a long time to fix. • Defect Detection/Removal Efficiency- This metric tracks the history of defect removal. Each defect should be corrected effectively, requiring only one re-inspection or regression test to verify removal. The data includes: <ul style="list-style-type: none"> – Total inspections to be conducted or tests to be run, – Inspections or test completed, and – Cumulative inspections or tests failed.

FINAL

Item	Description																																																										
Name	Defect Management																																																										
Computation	See Data Items Section																																																										
Interpretation	During the Development, and Operations and Support phases, the actual number of defects detected is tracked as well as the phase in which the defect was created. Examples include Requirements, Architecture, Design, Code, and Test Levels. These can be further sub-divided, e.g., defects found in an integration test could be broken down to the number of defects that are found per Configuration Item, etc.																																																										
Considerations	When analyzing defects, cost, schedule, and performance impacts will be provided.																																																										
Example	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="2" data-bbox="678 716 773 743" rowspan="2">Defects</th> <th colspan="6" data-bbox="846 747 964 774">Found In:</th> </tr> <tr> <th data-bbox="915 835 948 989" style="writing-mode: vertical-rl; transform: rotate(180deg);">Requirements</th> <th data-bbox="1013 848 1045 976" style="writing-mode: vertical-rl; transform: rotate(180deg);">Architecture</th> <th data-bbox="1094 877 1127 947" style="writing-mode: vertical-rl; transform: rotate(180deg);">Design</th> <th data-bbox="1175 890 1208 934" style="writing-mode: vertical-rl; transform: rotate(180deg);">Code</th> <th data-bbox="1256 890 1289 934" style="writing-mode: vertical-rl; transform: rotate(180deg);">Test</th> <th data-bbox="1321 884 1354 940" style="writing-mode: vertical-rl; transform: rotate(180deg);">Total</th> </tr> </thead> <tbody> <tr> <th colspan="2" data-bbox="630 1024 789 1052">Originated in:</th> <td data-bbox="662 1066 813 1094">Requirements</td> <td data-bbox="862 1066 971 1094" style="background-color: yellow;">22</td> <td data-bbox="997 1066 1029 1094">4</td> <td data-bbox="1094 1066 1127 1094">8</td> <td data-bbox="1175 1066 1208 1094">2</td> <td data-bbox="1256 1066 1289 1094">12</td> <td data-bbox="1321 1066 1354 1094">48</td> </tr> <tr> <td data-bbox="672 1129 802 1157">Architecture</td> <td data-bbox="899 1129 976 1157" style="background-color: yellow;">0</td> <td data-bbox="997 1129 1073 1157" style="background-color: yellow;">17</td> <td data-bbox="1094 1129 1127 1157">9</td> <td data-bbox="1175 1129 1208 1157">2</td> <td data-bbox="1256 1129 1289 1157">7</td> <td data-bbox="1321 1129 1354 1157">35</td> </tr> <tr> <td data-bbox="688 1192 786 1220">Design</td> <td data-bbox="899 1192 932 1220">0</td> <td data-bbox="997 1192 1029 1220">0</td> <td data-bbox="1094 1192 1170 1220" style="background-color: yellow;">12</td> <td data-bbox="1175 1192 1208 1220">9</td> <td data-bbox="1256 1192 1289 1220">5</td> <td data-bbox="1321 1192 1354 1220">26</td> </tr> <tr> <td data-bbox="704 1255 769 1283">Code</td> <td data-bbox="899 1255 932 1283">0</td> <td data-bbox="997 1255 1029 1283">0</td> <td data-bbox="1094 1255 1127 1283">0</td> <td data-bbox="1175 1255 1252 1283" style="background-color: yellow;">7</td> <td data-bbox="1256 1255 1289 1283">16</td> <td data-bbox="1321 1255 1354 1283">23</td> </tr> <tr> <td data-bbox="704 1318 769 1346">Test</td> <td data-bbox="899 1318 932 1346">0</td> <td data-bbox="997 1318 1029 1346">0</td> <td data-bbox="1094 1318 1127 1346">0</td> <td data-bbox="1175 1318 1208 1346">0</td> <td data-bbox="1256 1318 1333 1346" style="background-color: yellow;">28</td> <td data-bbox="1321 1318 1354 1346">28</td> </tr> <tr> <td data-bbox="704 1388 769 1415">Total</td> <td data-bbox="899 1388 932 1415">22</td> <td data-bbox="997 1388 1029 1415">21</td> <td data-bbox="1094 1388 1127 1415">29</td> <td data-bbox="1175 1388 1208 1415">20</td> <td data-bbox="1256 1388 1289 1415">85</td> <td></td> </tr> </tbody> </table> <p style="text-align: center; margin-top: 10px;">Defect Management Example</p>	Defects		Found In:						Requirements	Architecture	Design	Code	Test	Total	Originated in:		Requirements	22	4	8	2	12	48	Architecture	0	17	9	2	7	35	Design	0	0	12	9	5	26	Code	0	0	0	7	16	23	Test	0	0	0	0	28	28	Total	22	21	29	20	85	
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