Practical Software and Systems Measurement

Practical Software and Systems Measurement
Objective Information for Decision Makers

PSM Overview

Department of Defense
US Army
Scope and Audience

- Addresses Acquisition, Development, and Maintenance of Software and System Projects
- For Project Managers, Technical Leads, and Measurement Analysts
- Limited to Measurement for Project Management Purposes
References

PSM Book

• “Practical Software Measurement: Objective Information for Decision Makers”
• J. McGarry, D. Card, C. Jones, B. Layman, E. Clark, J. Dean, F. Hall
• Addison-Wesley, Boston, 2002

Guidebook

• “Practical Software and Systems Measurement: A Foundation for Objective Project Management”
• Version 4.0b, October 2000
How Measurement Helps

- Objective Insight into Project Performance
- Objective Information to Identify and Manage Risk
- Early Detection and Resolution of Problems
- Objective Team and Organizational Communications
- Ability to Assess Organizational Performance
- Ability to Defend and Justify Decisions
Overview Outline

- PSM Approach
- Plan Measurement
- Perform Measurement
- Summary and Resources
PSM Key Concepts

- **Measurement Is a Process** - Not a Pre-Defined List of Graphs or Reports
- Both **Data Collection and Analysis** Must Be Planned
- **PSM Is Flexible** - Adapted to Meet Specific Project Information Needs
- **PSM Supports the Integrated Information Needs** of Both Acquirer and Supplier Organizations
- **PSM Addresses the Relationships and Tradeoffs** Between Project Objectives
Measurement Principles

• Use Information Needs and Objectives to Drive the Measurement Requirements

• Define and Collect Measures Based on the Technical and Management Processes

• Collect and Analyze Data at a Level of Detail Sufficient to Identify and Isolate Problems

• Implement an Independent Analysis Capability
Measurement Principles (continued)

• **Use a Systematic Analysis Process** to Trace the Measures to the Decisions
• **Interpret the Measurement Results in the Context** of Other Project Information
• **Integrate** Measurement into the Project Management Process Throughout the Life Cycle
• **Use the Measurement Process as a Basis for Objective Communications**
• **Focus Initially on Project-Level Analysis**
Measurement Activities

Objective and Issues

Evaluate Measurement

Improve Actions

Scope of PSM

Plan Measurement

New Issues

Perform Measurement

Analysis Results and Performance Measures

User Feedback

Analysis Results

Establish & Sustain Commitment

Technical and Management Processes

Objectives and Issues

Core Measurement Process

PSM Overview, 10
PSM Approach Summary

• Measurement Must Address the Specific Information Needs of Each Unique Project
• The PSM Principles Define an Effective Measurement Process
• PSM Can Be Applied to All Projects
• PSM Is Based on Actual Experience from DoD, Government, and Industry Programs
Plan Measurement - Key Concepts

- Each Project Is Described by a Unique Set of Information Needs
- Unique Project Information Needs Usually Can Be Grouped into Seven Common “Information Categories”
- The Project Information Needs Drive the Selection of Measures
- The Measurement Definitions and Methods Are Determined by the Project Processes
Information Needs

- **Objective** - A Project Goal or Requirement
- **Obstacle** - An Area of Concern that Could Impact the Achievement of an Objective
  - **Risk** - concern that *may* occur
  - **Problem** - concern that *has* occurred
  - **Lack of Information** - inadequate data
Plan Measurement

- Identify and Prioritize Information Needs
- Select and Specify Measures
- Integrate Into the Project Processes

Objectives, Issues
Project Environment
Improvement Actions

Risk Management Information
New Information Needs

Proposed Changes
Measurement Plan
Sources for Defining and Prioritizing Project Information Needs

- Risk Analysis Results
- Project Constraints and Objectives
- Leveraged Technologies
- Product Acceptance Criteria
- External Requirements
- Experience
- Planned-Decision Points
PSM Measurement Hierarchy

- Project Information Need
- Information Categories
- Measurable Concepts
- Measurement Constructs (Measures)
Information Categories

• Schedule and Progress
• Resources and Cost
• Product Size and Stability
• Product Quality
• Process Performance
• Technology Effectiveness
• Customer Satisfaction
# PSM Mapping of Information Categories, Concepts, and Measures

<table>
<thead>
<tr>
<th>Information Categories</th>
<th>Measurable Concepts</th>
<th>Prospective Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Schedule and Progress</strong></td>
<td>Milestone Completion</td>
<td>Milestone Dates</td>
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<tr>
<td></td>
<td>Critical Path Performance</td>
<td>Slack Time</td>
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<td></td>
<td>Work Unit Progress</td>
<td>Requirements Traced</td>
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<tr>
<td><strong>Resources and Cost</strong></td>
<td>Personnel Effort</td>
<td>Staff Level</td>
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<tr>
<td></td>
<td>Development Effort</td>
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<td></td>
<td>Experience Level</td>
<td>Experience Level</td>
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<tr>
<td></td>
<td>Staff Turnover</td>
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<tr>
<td></td>
<td>Financial Performance</td>
<td>BCWS, BCWP, ACWP</td>
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<tr>
<td></td>
<td>Environment and Support Resources</td>
<td>Budget</td>
</tr>
<tr>
<td></td>
<td>Database Size Components</td>
<td>Cost</td>
</tr>
<tr>
<td></td>
<td>Lines of Code</td>
<td>Quantity Needed</td>
</tr>
<tr>
<td></td>
<td>Requirements Function Points</td>
<td>Quantity Available</td>
</tr>
<tr>
<td></td>
<td>Functional Changes</td>
<td>Time Available</td>
</tr>
<tr>
<td></td>
<td>Function Points</td>
<td>Time Used</td>
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This table outlines the mapping of information categories to measurable concepts and prospects measures, providing a structured approach for software and systems measurement. Each category is associated with specific concepts and measures that help in tracking and assessing various aspects of project progress and resource utilization.
## Information - Category - Measure Mapping

<table>
<thead>
<tr>
<th>Information Categories</th>
<th>Measurable Concepts</th>
<th>Prospective Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Product Quality</strong></td>
<td>Functional Correctness</td>
<td>Defects</td>
</tr>
<tr>
<td></td>
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<td>Age of Defects</td>
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<td>Technical Performance</td>
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<td></td>
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<td>Level Time to Restore</td>
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<td></td>
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<td>Cyclomatic Complexity</td>
</tr>
<tr>
<td></td>
<td>Supportability-Maintainability</td>
<td>Utilization</td>
</tr>
<tr>
<td></td>
<td>Efficiency</td>
<td>Throughput</td>
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<tr>
<td></td>
<td></td>
<td>Response Time</td>
</tr>
<tr>
<td></td>
<td>Portability</td>
<td>Standards Compliance</td>
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<tr>
<td></td>
<td>Usability</td>
<td>Operator Errors</td>
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<tr>
<td></td>
<td>Dependability-Reliability</td>
<td>Mean Time to Failure</td>
</tr>
<tr>
<td><strong>Process Performance</strong></td>
<td>Process Compliance</td>
<td>Reference Maturity Rating</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Process Audit Findings</td>
</tr>
<tr>
<td></td>
<td>Process Efficiency</td>
<td>Productivity</td>
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<td></td>
<td></td>
<td>Cycle Time</td>
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<tr>
<td></td>
<td>Process Effectiveness</td>
<td>Defects Contained</td>
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<td></td>
<td></td>
<td>Defects Escaping</td>
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<tr>
<td></td>
<td></td>
<td>Rework Effort</td>
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<td></td>
<td></td>
<td>Rework Components</td>
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<tr>
<td><strong>Technology Effectiveness</strong></td>
<td>Technology Suitability</td>
<td>Requirements Coverage</td>
</tr>
<tr>
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<td>Technology Volatility</td>
<td>Baseline Changes</td>
</tr>
<tr>
<td><strong>Customer Satisfaction</strong></td>
<td>Customer Feedback</td>
<td>Satisfaction Ratings</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Award Fee</td>
</tr>
<tr>
<td></td>
<td>Customer Support</td>
<td>Requests for Support</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Support Time</td>
</tr>
</tbody>
</table>
Example of Mapping Project Information Needs

**Project - Specific Issues**
- Aggressive Schedule
- Concurrent Activities
- Critical Dependencies
- Changing Mission Objectives
- Unstable Requirements
- Questionable Size Estimates
- Reliability Objectives
- Maintainability Requirements
- Fixed Budget
- Staff Experience
- Staff Availability

**Common Issue Areas**
- Schedule and Progress
- Product Size and Stability
- Product Quality
- Resources and Cost
Prioritize Information Needs

- **Rank Information Needs Based on Priority at the Current Time**
- **Ranking May Be Set Through a Measurement Planning Workshop With Participant Consensus**
  - Involve acquirer, supplier, PM, test, SW, etc.
- **Priorities May Change in Each Phase as Different Issues Arise**
  - Measurement program needs to be revised when this occurs
Plan Measurement

- Identify and Prioritize Information Needs
- Select and Specify Measures
- Integrate Into the Project Processes
- New Information Needs
- Proposed Changes
- Risk Management Information

Objectives, Issues
Project Environment Improvement Actions

Measurement Plan
Characterize Project Context

• Application Domain
• Life-Cycle Model or Activity Structure
• Product Structure
• Current Measurement Activities
• System and Software Processes and Technology
• Planned Sources of Components (e.g. new, reused, COTS)
• Process Maturity
**Information Categories - Measurable Concepts**

**Schedule and Progress**
- Milestone Completion
- Critical Path Performance
- Work Unit Progress
- Incremental Capability

**Product Size and Stability**
- Physical Size and Stability
- Functional Size and Stability

**Product Quality**
- Functional Correctness
- **Supportability*** - Maintainability
- Efficiency
- Portability
- Usability
- **Dependability*** - Reliability

**Resources and Cost**
- Personnel Effort
- Financial Performance
- Environment and Support Resources

**Process Performance**
- Process Compliance
- Process Efficiency
- Process Effectiveness

**Technology Effectiveness**
- Technology Suitability
- Technology Volatility

**Customer Satisfaction**
- Customer Feedback
- Customer Support

*Systems Engineering
Measurable Concept

- **An Idea About How an Information Need Can Be Satisfied:**
  - Possible entities and attributes to be measured
  - Potential use of results in decision making
- **May Be Implemented in Many Different Ways**
- **Each Measurable Concept Involves a Different Question**
- **PSM-Defined Measurable Concepts Are Widely Used**
Entities and Attributes are the basic elements of a measure.

• An **Entity** is the object that is measured
  – Entities include processes, products, projects, and resources

• A Measurable **Attribute** is a distinguishable property or characteristic of the **Entity**
  – Attributes are either quantitative or qualitative
    - examples include hours, problems, source lines of code, and design units, e.g. classes
# Concepts Relate to Key Questions

<table>
<thead>
<tr>
<th>Information Category</th>
<th>Measurable Concept</th>
<th>Questions Addressed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schedule and Progress</td>
<td>Milestone Completion</td>
<td>Is the project meeting scheduled milestones? Are critical tasks or delivery dates slipping?</td>
</tr>
<tr>
<td></td>
<td>Work Unit Progress</td>
<td>How are specific activities and products progressing?</td>
</tr>
<tr>
<td></td>
<td>Incremental Capability</td>
<td>Is capability being delivered as scheduled in incremental builds and releases?</td>
</tr>
<tr>
<td>Resources and Cost</td>
<td>Personnel Effort</td>
<td>Is effort being expended according to plan? Is there enough staff with the required skills?</td>
</tr>
<tr>
<td></td>
<td>Financial Performance</td>
<td>Is project spending meeting budget and schedule objectives?</td>
</tr>
<tr>
<td></td>
<td>Environment and Support Resources</td>
<td>Are needed facilities, equipment, and materials available?</td>
</tr>
<tr>
<td>Product Size and Stability</td>
<td>Physical Size and Stability</td>
<td>How much are the product’s size, content, physical characteristics, or interfaces changing?</td>
</tr>
<tr>
<td></td>
<td>Functional Size and Stability</td>
<td>How much are the requirements and associated functionality changing?</td>
</tr>
<tr>
<td>Product Quality</td>
<td>Functional Correctness</td>
<td>Is the product good enough for delivery to the user? Are identified problems being resolved?</td>
</tr>
<tr>
<td></td>
<td>Supportability - Maintainability</td>
<td>How much maintenance does the system require? How difficult is it to maintain?</td>
</tr>
<tr>
<td></td>
<td>Efficiency</td>
<td>Does the target system make efficient use of system resources?</td>
</tr>
<tr>
<td></td>
<td>Portability</td>
<td>To what extent can the functionality be re-hosted on different platforms?</td>
</tr>
<tr>
<td></td>
<td>Usability</td>
<td>Is the user interface adequate and appropriate for operations? Are operator errors within acceptable bounds?</td>
</tr>
<tr>
<td></td>
<td>Dependability - Reliability</td>
<td>How often is service to users interrupted? Are failure rates within acceptable bounds?</td>
</tr>
</tbody>
</table>
### Concepts Relate to Key Questions (continued)

<table>
<thead>
<tr>
<th>Information Category</th>
<th>Measurable Concept</th>
<th>Questions Addressed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process Performance</td>
<td>Process Compliance</td>
<td>How consistently does the project implement the defined processes?</td>
</tr>
<tr>
<td></td>
<td>Process Efficiency</td>
<td>Are the processes efficient enough to meet current commitments and planned objectives?</td>
</tr>
<tr>
<td></td>
<td>Process Effectiveness</td>
<td>How much additional effort is being expended due to rework?</td>
</tr>
<tr>
<td>Technology Effectiveness</td>
<td>Technology Suitability</td>
<td>Can technology meet all allocated requirements, or will additional technology be needed?</td>
</tr>
<tr>
<td></td>
<td>Technology Volatility</td>
<td>Does new technology pose a risk due to too many changes?</td>
</tr>
<tr>
<td>Customer Satisfaction</td>
<td>Customer Feedback</td>
<td>How do our customers perceive the performance on this project? Is the project meeting user expectations?</td>
</tr>
<tr>
<td></td>
<td>Customer Support</td>
<td>How quickly are customer support requests being addressed?</td>
</tr>
</tbody>
</table>
Criteria for Selecting Prospective Measures

- Match with Information Need
- Measurement Effectiveness
- Nature of the Entities (i.e., processes and products) to Be Measured
- Cost and Availability of Data
- Life-Cycle Coverage
- External Data Requirements
Selecting Measures

Schedule and Progress
- Milestone completion
- Critical path performance
- Work unit progress
- Incremental Capability

Prospective Measures
- Requirements traced
- Requirements tested
- Requirements status
- Problem reports opened
- Problem reports closed
- Reviews completed
- Change requests opened
- Change requests resolved
- Units designed
- Units coded
- Units integrated
- Test cases attempted
- Test cases passed
- Action item opened
- Action item completed
Measurement Construct

- A Specification of a Prospective Measure
- A Specific Method for Implementing a Measurable Concept:
  - Specific entities and attributes
  - Pre-planned analyses
- Consists of Base Measures, Derived Measures, and Indicators
- The Information Product Is Comprised of a Collection of Measurement Constructs with Interpretations
- Multiple Constructs May Be Specified for a Single Concept and Information Need
Specify Measurement Constructs

- **Information Need**
- **Information Category**
- **Indicator**
  - Analysis Model
  - Decision Criteria
  - Base/Derived Measures
- **Derived Measure(s)**

**For Each Derived Measure:**
- Measurement Function
- Base Measure(s)

**For Each Base Measure:**
- Measurement Method
- Type of Method
- Scale
- Type of Scale
- Unit of Measurement
- Relevant Entity
- Attribute

**NOTE:** details will be defined in the next section, Measurement Information Model.
Measurement Construct Examples

- **Four Major Components:**
  - Description
  - Specification table
  - Additional analysis guidance
  - Implementation considerations

- **Last Two Components Used in Developing Measurement Procedures**

- **See Appendix A of the PSM Book**

- **Similar Information Is Contained in the PSM Guidebook, Version 4.0b, Parts 3 and 5**
Plan Measurement

- Identify and Prioritize Information Needs
- Select and Specify Measures
- Integrate Into the Project Processes
- Measurement Plan

- Risk Management Information
- Objectives, Issues
- Project Environment Improvement Actions
- New Information Needs
- Proposed Changes
- Proposed Changes
Identify Measurement Opportunities

• Take Advantage of Existing Tools and Measurement Activities:
  - Problem report databases
  - Configuration management systems
  - Project cost and schedule control systems
  - Design tools

• Consider Three Types of Data:
  - Historical results (previous projects)
  - Planning information
  - Actual performance
Develop Measurement Procedures

• Define the Specific Operations, Tools, and Responsibilities for Measurement Activities

• Address Both:
  - Data collection and storage
  - Data analysis and reporting

• Further Considerations Are Discussed in the Perform Measurement Section
**Document Measurement Plan**

- **Purposes of Plan Include:**
  - Integrate analysis and reporting into decision-making processes
  - Integrate data collection into data-generating processes
  - Provide a central source for definitions of measures and analyses

- **Establish a Concise Working Document Subject to Change**
Measurement Plan Content

- Introduction
- Project Description
- Measurement Roles, Responsibilities, and Communications
- Description of Project Information Needs
- Definition of Measurement Constructs
- Project Aggregation (Roll-Up) Structures
- Data Collection and Analysis Procedures
- Measurement Evaluation Criteria
Plan Measurement Summary

- The Planning Activity Is Dynamic - Project Information Needs and Processes Are Always Changing
- Success Depends on the Integration of the Measurement Process into the Project Processes
- An Effective Measurement Process Is Designed to Meet the Information Needs of Both Supplier and Acquirer Organizations
- PSM Provides a Systematic Approach for Planning a Measurement Process
Perform Measurement
Measurement Activities

- Establish & Sustain Commitment
- Plan Measurement
- Evaluate Measurement
- Perform Measurement
- Core Measurement Process
- Technical and Management Processes
- User Feedback

Scope of PSM

Objectives and Issues

Analysis Results

Improvement Actions

New Issues

Measurement Plan

Analysis Results and Performance Measures
Perform Measurement - Key Concepts

• This Activity Provides a Systematic Method for Converting Data into Usable Information

• Like Planning, Performing Must Be Flexible to Adapt to Changing Information Needs

• Analysis Is the Primary Task of This Activity - It Includes Estimating, Assessing Feasibility of Plans, and Tracking Performance Against Plans
Perform Measurement

1. Measurement Plan
2. Collect and Process Data
3. Analyze Data
4. Make Recommendations
5. Measurement Performance Measures

- Data
- Information
- Questions
- New Information Needs
- Project Context
- Analysis Results
Analyze Data

- **Indicators Are Systematically Generated, Analyzed, Interpreted, and Reported to:**
  - *Produce an assessment relative to known Information Needs*
  - *Identify new Information Needs (problems, risks, lack of information)*
Generate Indicators

- "Standard" Indicators:
  - Pre-defined in measurement plan
  - Produced regularly
  - May be organized into "sets"

- "Special" Indicators:
  - Usually created as needed
  - May be decompositions of indicators to localize problems
  - May be new indicators that respond to new questions
Generating Useful Indicators

- Use **Consistent** Conventions
- Keep It **Simple;** Keep the Message **Clear**
- Unique **Titles** Should Reflect Scope
- Include an **As Of** Line or Date
- Label Each **Axis** and Provide **Scale Markers**
- **Annotate** With Milestones and Significant Events
- Use **Same Axes and Scales** If Indicators Will Be Compared
Measurement Analysis

Data
- Project Data
- Historical Data

Estimation
- Estimates
- Lack of Information

Feasibility Analysis
- Risks
- Alternatives

Performance Analysis
- Plans
- Actuals

Information
- Plans
- Actuals
- Status
- Problems
Estimation Analysis

• Conducted to **Establish Target Values** or Numerical Expectations for Subsequent Activities and Parameters, Based on Currently Available Data

• **Employs Special Types of Indicators** (estimators), Adjusted by Performance Factors

• **Predicts Values Such as:**
  - Product size
  - Effort
  - Schedule
  - Quality
Feasibility Analysis

• Conducted to Determine Whether Plans and Targets Are **Realistic and Achievable**
• Conducted During the Initial Planning Activity and at All Subsequent Replans
• Looks at:
  - Basis for estimate
  - Realism of adjustments
  - Confidence in process
  - Changes in assumptions or environment
  - Comparisons of project parameters
Performance Analysis

- Conducted to Determine Whether Development is Meeting the Plans, Assumptions, and Targets
- Conducted Periodically Once a Project has Committed to a Plan
- Looks at:
  - Leading indicators
  - Critical path items
  - Inconsistent trends
PSM Analysis Model

- Technology Effectiveness
- Process Performance
- Product Size and Stability
- Resources and Cost
- Schedule and Progress
- Customer Satisfaction
- Product Quality
Details of the PSM Analysis Model
Using the PSM Analysis Model for Performance Analysis

• Relates Information Categories in Terms of Cause and Effect

• Helps Address the Difficult Management Questions:
  - Is there really a problem?
  - What is causing the risk?
  - What are the related Information Needs?
  - What corrective action should be taken?

• Requires Multiple Measures - Indicators
Performance Analysis Example

- **Real-Time System**
- **2M + Source Lines of Code**
- **Multiple Suppliers**
- **Average Software Process Maturity**
- **New and Non-Developed Code (COTS/Reuse)**
- **Incremental Development Approach**
- **Key Issues and Objectives:**
  - Meet platform deployment schedule
  - High product quality (reliability)
  - Successfully implement new technology
Software Productivity

SLOC per Staff Month

Proposal

Actuals to Date

30 Aug 98

Build 1

Build 2

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PSM Overview, 57
Software Productivity

- Proposal
- Actuals to Date
- Replan Option 1 (2 Builds)
- Replan Option 2 (Add Build 3)

30 Aug 98

SLOC per Staff Month

- Build 1
- Build 2
- Build 3
Requirements Stability

Build 1

Start of Build 1
S/W Design

Start of
Build 1 I&T

Number of Requirements

Jul 96 Jan 97 Jul 97 Jan 98 Jul 98 Jan 99

30 Aug 98
Software Origin

Developed Versus Non-Developed Code

Source Lines of Code (in Thousands)

Estimate 1  Estimate 2  Estimate 3  Estimate 4

Non-Developed (COTS, Reuse)
Developed (New, Modified)

31 Aug 98
Effort Allocation

Staff Months

Jul 96  | Jan 97  | Jul 97  | Jan 98  | Jul 98  | Jan 99  | Jul 99  | Jan 00  | Jul 00  | Jan 01  | Jul 01  

30 Aug 98

Plan
Actual

Start of Build 1 I&T

Effort Allocation

Practical Software and Systems Measurement
Earned Value
Build 1 Product Development

<table>
<thead>
<tr>
<th>Date</th>
<th>Variance (In Thousands of Dollars)</th>
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<tbody>
<tr>
<td>Aug 98</td>
<td>-500</td>
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<tr>
<td>Sep 97</td>
<td>0</td>
</tr>
<tr>
<td>Oct 97</td>
<td>100</td>
</tr>
<tr>
<td>Nov 97</td>
<td>200</td>
</tr>
<tr>
<td>Dec 97</td>
<td>300</td>
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<td>Jan 98</td>
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<td>Feb 98</td>
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<td>Jul 98</td>
<td>1000</td>
</tr>
<tr>
<td>Aug 98</td>
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</tr>
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</table>

Start of Build 1 I&T: 30 Aug 98
Design Progress

Build 1

Number of Units Completing Design

Mar 97 | May 97 | Jul 97 | Sep 97 | Nov 97 | Jan 98 | Mar 98 | May 98

Plan 1 | Plan 2 | Actual

Start of Build 1 I&T

31 May 98
Problem Report Status
Priority 1, 2, and 3 Problem Reports

Start of Build 1 I&T

Number of Problem Reports

- Discovered
- Closed

Oct 97 Jan 98 Apr 98 Jul 98 Oct 98 Jan 99 Apr 99

30 Aug 98
Software Productivity

- SLOC per Staff Month

- Proposal
- Actuals to Date
- Replan Option 1 (2 Builds)
- Replan Option 2 (Add Build 3)

30 Aug 98

Build 1
Build 2
Build 3

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Performance Analysis Summary

- Problems Detected Using Measurement (low productivity)
- Underlying Causes Localized (requirements growth, low staffing, and code source)
- Alternative Replan Strategies Evaluated
- Measurement Supported an Informed Decision
Perform Measurement Summary

• **Analysis Is Dynamic - Analysis Must Respond to New and Changing Questions**
• **The PSM Analysis Model Links Information Needs and Measurement Results**
• **Both Quantitative and Qualitative Data Should Be Used**
• **Measurement Results Are the Basis for Risk Resolution, Financial Performance Analysis, and Performance Assessment**
Summary and Resources
Summary

• **PSM Is an Effective Measurement Approach that Includes:**
  - Measurement based on project Information Needs
  - A systematic method of defining measures through the information model
  - A defined process for planning, performing, evaluating, and establishing a measurement program
Practical Software and Systems Measurement

PSM Project Strategy

- Government - Industry – Academia Team
- Technical Consensus of Best Practices
- Incremental Product Development and Improvement
- Integrated With Other Initiatives

Proven Measurement
Technical Guidance and Tools

Software and Systems Projects

Comprehensive Transition Support
For More Information

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