Practical Software Measurement
A guide to objective program insight

PSM Project Update
July 21, 1997

Joint Logistics Commanders
Joint Group on Systems Engineering

Office of the Under Secretary of Defense
Acquisition and Technology
Presentation Overview

- **PSM Project Overview**
  Project participants, objectives, and strategy

- **PSM Technical Concepts and Approach**
  Software measurement best practices

- **PSM User Support**
  Transitioning measurement into practice
PSM Project Overview
Project participants, objectives, and strategy
PSM Project Overview

- **PSM Has Two Primary DoD Sponsors**
  - Joint Logistics Commanders Joint Group on Systems Engineering
  - Office of the Under Secretary of Defense for Acquisition and Technology

- **PSM Guidance is Developed by Measurement Professionals from Many Organizations**

- **PSM Supports DoD, Government, and Industry Software Acquisition and Measurement Initiatives**
PSM Project Team

- US Air Force AFMC
- US Air Force STSC
- US Air Force ESIP
- US Air Force STRATCOM
- US Army AMC
- US Army ARDEC
- US Army CECOM
- US Army OPTEC
- US Army PEO STAMIS
- US Army ISSC
- US Navy NAVAIR
- US Navy NAWC
- US Navy NSWC
- US Navy NUWC
- US Navy NCC
- US Navy OPTEVFOR
- US Navy PEO(CU)
- US Navy SPAWAR
- USMC MCTSSA
- DON NISM
- DLA
- DISA
- DSMC
- NDU IRM College
- OUSD - A&T
- FAA
- NASA SATC - GSFC
- National Park Service
- BDM
- BOEING
- GTE
- Hughes Aircraft Co.
- IDA
- INCOSE
- Independent Engineering
- Logicon
- Lockheed Martin
- MITRE
- Tecolote Research
- SEI
- SPC
- SPS
- TRW
- VPI - State University
- West Virginia University
Practical Software Measurement
Project Objectives

• Help Program and Technical Managers Meet Software Cost, Schedule, and Technical Objectives

• Provide a Basis for Objective Communication and Informed Decision Making

• Establish a Foundation for Executive Level Software Performance Measurement
PSM Project Strategy

Proven Software Measurement Technical Guidance and Tools

Comprehensive Transition Support

DoD - Government - Industry Team
Technical Consensus of Best Practices
Continuous Product Improvement
Qualified Transition Organizations
Integrated With User Policy and Initiatives
PRACTICAL SOFTWARE MEASUREMENT

System Engineering

Software Process Improvement

PSM SOFTWARE MEASUREMENT PROCESS

Measurement Practices
Measurement Tools

Software Program Management and Engineering
PSM Technical Concepts and Approach
Software measurement best practices
# Software Development Schedule

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Are We Managing or Reacting?

- Add More People
- Build Software Components In Parallel
- Ignore Development Dependencies
- Reschedule “Backwards” From Delivery Date
- Incrementally Defer Functionality
- Relax Process Requirements
- Postpone Rework
- Minimize Functional Testing
- Ease Exit Criteria
- Reduce Requirements
Quantitative Software Management

1. **Analyze Risks**
2. **Tailor Measures**
3. **Establish Budgets**
4. **Apply Measures**
5. **Evaluate Performance**

- Risk Plan
- Measurement Plan
- Performance Plan
Practical Software Measurement

Key Concepts

• Software Measurement is a **Process** - Not a Pre-Defined List of Graphs or Reports

• The Measurement Process is Flexible - Adapted To Meet Specific **Program Risks, Issues, and Objectives**

• The Measurement Requirements are **Integrated** Into the Developer’s Software Process
Software Measurement Principles

- **Program Risks, Issues, and Objectives** Drive the Measurement Requirements
- **The Developer’s Process** Defines How the Software is Actually Measured
- Collect and Analyze Data at a **Level of Detail Sufficient to Identify and Isolate Software Problems**
- Implement an **Independent Analysis** Capability
- Use a **Structured Analysis Process** to Trace the Measures to the Decisions
- Interpret the Measurement Results In the **Context** of Other Program Information
- **Integrate** Software Measurement Into the Program Management Process Throughout the Life-Cycle
- **Use the Measurement Process as a Basis for** **Objective Communications**
- **Focus Initially on** **Single Program** Analysis
Software Measurement Activities

Software Measurement Process

- Tailor Measures
- Apply Measures
- Implement Process

Issues, Process Characteristics
Measurement Plan
Data
Actions
External Constraints
Measurement Needs

Software Program Team
Tailoring Software Measures

- Identify and Prioritize Program Issues
- Select and Specify Program Measures
- Integrate Into the Software Process

Common Software Issues

Risk Analysis

Other Program Issues

Proposed Changes

Categories

Program Events

Software Process

Measurement Plan

Performance Plan
PSM Measurement Tailoring “Mechanisms”

Common Issues

Measurement Categories

Measures
Common Issues - Measurement Categories

**Schedule and Progress**
- Milestone Performance
- Work Unit Progress
- Schedule Performance
- Incremental Capability

**Growth and Stability**
- Product Size and Stability
- Functional Size and Stability
- Target Computer Resource Utilization

**Product Quality**
- Defect Profile
- Complexity

**Resources and Cost**
- Effort Profile
- Staff Profile
- Cost Performance
- Environment Availability

**Development Performance**
- Process Maturity
- Productivity
- Rework

**Technical Adequacy**
- Technology Impacts
Applying Software Measures

1. Measurement Plan
2. Collect and Process Data
3. Analyze Issues
4. Make Decisions
5. Actions
Primary Software Tradeoffs

- Cost
- Schedule
- Performance
- Functionality
- Quality
Types of Measurement Analysis

Estimation

Performance Analysis

Feasibility Analysis
PSM Version 3.0

- Risk Management
- Performance Management
- Software Estimation
- Software Analysis Model
- Software Maintenance
- General Guidance Update
PSM User Support
Transitioning measurement into practice
Transitioning Measurement Into Practice

- **PSM Support Center**
  - Naval Undersea Warfare Center

- **PSM Transition Partners**
  - Army Software Metrics Office
  - USAF Software Technology Support Center
  - Lockheed Martin
  - Defense Logistics Agency
  - Federal Aviation Administration
  - Software Productivity Consortium
Practical Software Measurement

PSM Products

- Technical Guidance
- Measurement Workstation
- Training Courses
- Program Support
PSM Product Plan

• *Practical Software Measurement*
  - Ver 3.0, Risk Management - Estimation (10/97)
  - Ver 4.0, Product Engineering (10/98)
  - PSM Insight Measurement Workstation (7/97)

• *Practical Systems Measurement (10/98)*

• *PSM - Measurement for Software Process Management and Improvement (TBD)*

• *Guides, Tools, Courses, Program Support*
Direct Program Measurement Support

• Sponsored by OUSD - A&T

• PSM Transition Efforts
  - Measurement Process Implementation
  - Initial Measurement Training
  - Measurement Tool Development
  - Product Characterization

• Integrated With Other DoD Sponsored Software Initiatives
PSM User Survey Summary

**Organization Characteristics**

- DoD: 45%
- Government Contractor: 20%
- Commercial: 15%
- Other Government: 10%
- Academic: 5%
- Other: 0%

**Domain Characteristics**

- AIS / MIS: 45%
- Weapons / Embedded: 25%
- Telecom: 15%
- Other: 5%

**Primary Software Activity**

- Develop: 30%
- SW Support: 25%
- Acquire: 20%
- Tech Support: 15%
- End User: 10%
- Other: 0%

**Guidance Utilization**

- Reference: 60%
- Implemented on Project(s): 40%
- Adopted as a Standard: 20%
- Other: 0%
PSM Applications

• Government and University Software Engineering Courses

• U.S. and International Commercial Software Process Measurement Standards

• Government Acquisition and Measurement Initiatives

• Government and Industry Program Measurement Implementations
Integrating Software Initiatives

- Practical Software Measurement
- DoD Software Acquisition Best Practices
- DOD 5000.1 DOD 5000.2R
- Software Technology Initiatives
- Software Education & Training
- SEI Software Acquisition CMM
- SEI Software and System CMMs
- Integrated Management & Earned Value

OUSD (A&T)
Welcome to the 1997 Practical Software Measurement User’s Group Conference
Why Are We Doing This?

- To Make the PSM Products Better
- To Find Out How We Can Better Support the PSM Users
Why Are We Here?

• To Learn
• To Contribute
• To Meet People Who Can Help
• To Share Experiences and Ideas
• To Make New Friends
Conference Highlights

- Your Feedback and Input
- Current Software Topics
- User Experiences with PSM
- PSM Version 3.0 Changes
- PSM Insight
- New PSM Initiatives
  - Software Product Engineering
  - Systems Engineering
List of Banned Words
(B-Words)

- Infrastructure
- Paradigm
- Vision
- Leverage
- Stakeholder
- Overarching
- Taxonomy
- Meta - Anything
- Business Process Reengineering
- Seamless
- Ideate
- TQM
- Disambiguate
- Disaggregate
- Processcentric
- Object Oriented
- Year 2000
- Better-Faster-Cheaper
- Acluistic