Technical Measurement Guide

A Collaborative Project

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Practical Software and System Measurement



Measurement Working Group

Motivation

- Technical measurement is very important in the development of systems
 - Performance insight
 - Risk management tool
- No comprehensive set of guidance existed
 - Scattered information
- Filling this void identified as a major need by PSM and INCOSE members

Objectives of the Project

- Determine how Technical Measures (i.e., system product/performance measures) are used in the industry and government
- Create guidance on technical measurement that:
 - Supplements existing general measurement guidance
 - Provides a consistent approach for projects
 - Provides information for predictive usage
 - Is based on lessons learned across DoD and industry
 - Is supported by appropriate implementation mechanisms (e.g., templates, examples) 03/29/06 - 3

Background/Approach

- Leverage existing proven guidance from across industry and government
 - Focus on what is specific to technical measurement
 - Build of previous PSM/INCOSE work
 - Point to PSM and INCOSE for basic measurement guidance
- Collaborate between PSM, INCOSE and industry companies to:
 - Leverage industry resources and knowledge
 - Influence industry guidance to be consistent
- Obtain understanding of state-of-the-industry via administration and analysis of questionnaires
- Issue a guide on Technical Measurement information and guidance
- Incorporate guidance into other documentation, where applicable

Objectives of the Guide

Create guidance on technical measurement that:

- Establishes guidance that reflects state-of-thepractice in industry
- Establishes lessons learned across industry i.e., what are the proven methods
- Provides a consistent approach to technical measurement for projects
- Establishes a list of commonly used measures

Organization of the Guide

- 1. Executive Summary
- 2. Introduction
- 3. Description of Technical Measurement and Types of Technical Measures
- 4. Measurement Process Overview
- The next 3 sections walk through Technical Measurement using the PSM measurement approach nearly ½ of the guide
- 5. Establishing commitment for Technical Measurement
- 6. Planning Technical Measurement
- 7. Performing Technical Measurement
- The remaining sections include addition information to assist the planning and implementation of the technical measurement
- 8. Technical Measurement Checklist
- 9. Application of Technical Measurement in IPTs
- 10. Candidate Technical Measures Matrix Preliminary Draft
- 11. Technology Readiness Levels
- 12. Results of Technical Measurement Questionnaire
- 13. Example of Compatible Set of MOEs, MOPs, and TPMs
- 14. References
- **15.** Acronyms 03/29/06 6

What is Technical Measurement?

- Set of measurement activities and measures used to provide insight into the technical solution
 - Requirements (performance, quality, etc.)
 - Risks
 - Progress
- Tracked across the life cycle
 - Established early in the life cycle
 - Increasing levels of fidelity as technical solution is developed

Measures of Effectiveness (MOE)

- "Operational" measures of success that are closely related to the achievement of the mission or operational objective being evaluated, in the intended operational environment under a specified set of conditions
 - Stated from the user/customer viewpoint
 - Focused on most critical mission performance needs
 - Independent of any particular solution
 - Actual measures at end of development estimates prior
- MOEs are used to:
 - Compare operational alternatives
 - Investigate performance sensitivities to changes in assumptions from the user view
 - Define operational requirement values
 - Assess achievement of intended purpose
 - Mission needs for performance, suitability, and affordability
 - Operational success criteria

Measures of Performance (MOP)

- Measures that characterize physical or functional attributes relating to the system operation
 - Supplier's viewpoint
 - "System" technical requirements vice user needs
 - Measured under specified testing or operational conditions
 - Derived from MOEs (many to one)
 - Assesses delivered solution performance against critical system level specified requirements
 - Risk indicators that are monitored progressively

• MOPs are used to:

- Compare alternatives to quantify technical or performance requirements as derived from MOEs
- Investigate performance sensitivities to changes in assumptions from the technical view
- Define Key Performance Parameters (KPPs)
- Assess achievement KPPs

Technical Performance Measures (TPM)

- Measures used to assess design progress, compliance to performance requirements, and technical risks
 - Focus on the critical technical parameters of specific system elements
 - Definition includes the projected performance, such as a performance profile with tolerance bands of acceptable variance
 - Measures includes range, accuracy, weight, size, availability, and many others
 - Derived from the MOPs (many to one)
 - Measured as solution is designed and implemented
 - Estimates the values of essential performance parameters of the design through engineering analyses and tests
 - Tracked against performance profile with projected final value

Technical Performance Measures (TPM)

- TPMs are used to:
 - Forecast the values to be achieved
 - Identify differences between actual versus planned performance
 - Assess and predict progress towards achieving the performance values
 - Determine the impact of these differences on system effectiveness
 - Provide an indicator of risks and problems requiring management attention (early identification)
 - Determine where opportunities exist to make design trades to reduce overall risk (e.g., where positive margins exist)
 - Support assessment of system element design alternatives or impacts of proposed change alternatives

Relationship of the Technical Measures





PSM Product-Related Measurement Information

Information Category Measurable Concept Measures **Database Size Product Size** Physical Size and and Stability **Stability Components Interfaces** Lines of Code **Physical Dimensions Functional Correctness Defects Product Quality Technical Performance** Supportability-Maint. Time to Restore Maintenance Actions Utilization Efficiency Throughput Timing **Portability** Standards Compliance Usability **Operator Errors** Dependability-Reliability **Failures** Fault Tolerance

> An example set of candidate measures was identified – but is not exhaustive

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Other Technical Measurement Concepts



Uses of Technical Measures

- Indicators of Operational Objectives
 - Ability of technical solution to meet mission needs
- Indicators of Technical Solution Progress
 - Track progress against plan through life cycle
- Indicators of Compliance to Performance Requirements
 - Predict likelihood of meeting performance rqts.
- Indicators of Technical Risk
 - Alert mgt of potential performance deficiencies before irrevocable cost/schedule impact occurs

MOEs, MOPs, TPMs and the "V" Model of System Development



Walk-through of the Guide



Adobe Acrobat 7.0 Document

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Current Status and Next Steps

- Released via PSM, INCOSE, and LM EPI in DEC 05
- Promote Usage across DoD and industry
- Collect feedback through PSM