Practical Software and Systems Measurement

A foundation for objective project management

Acquisition Measurement—Workshop #1

Wed July 28, Afternoon
Thurs July 29, Morning

PSM 8th Annual Users' Group Conference

Joe Dean, Tecolote Research
Rita Creel, The Aerospace Corporation
Cheryl Jones, US Army RDECOM

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Objectives of the Workshop

Develop and review draft guidance, based on program office experience, in three areas:

- **Part a: Acquisition Cost Model**
  - Review and refine cost model parameters
- **Part b: Acquisition Measurement Guidance**
  - Discuss lessons learned and success factors in implementing measurement on the Acquisition Organization
- **Part c: Acquisition ICM Table and Measures**
  - Identify Information Needs, Measurable Concepts and candidate Measures related to the acquisition organization's role and tasking

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Workshop Background

- *Part a: Acquisition Cost Model Background*
  - *Originally developed by Air Force Materiel Command to estimate AF acquisition resource needs (now in use primarily for Electronic Systems Center programs); being adapted to other environments*
  - *PSM work began at the July 2003 UG Conference, and continued at the February TWG, with a review of draft cost model input parameters and the related Work Breakdown Structure (WBS).*
  - *This workshop segment will review and refine the model and WBS.*

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Workshop Background Cont.

- *Part b: Acquisition Measurement*
  - *Initiated to provide guidance in measuring acquisition process performance*
    - *Public law 107-314, Section 804 of the Bob Stump National Defense Authorization Act for FY03, requires all military departments and defense agencies that manage Major Defense Acquisition Programs (MDAPs) with a substantial software component to implement a software acquisition process improvement program.*
    - *Measurement is needed to benchmark current process performance, identify issues, and justify and track the impacts of process improvements.*
  - *Similar initiatives are underway for systems acquisition, beginning with Systems Engineering Revitalization programs across the DoD and at other gov't agencies.*
  - *Work in this area is just beginning*

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Workshop Background Cont.

- *Part c: Acquisition ICM Table and Measures*
  - *Purpose is to identify and begin to specify some of the measures that can be used to assess acquisition organization products, processes and resources.*
  - *Work began in July 2003, and was continued at the February 2004 TWG.*
  - *This workshop segment will review and continue the work done thus far.*

Workshop Format

- Agenda
  - Workshop Background / Introduction
  - Three-part Workshop
    - Part a: Acquisition Cost Model (Wed 1:45-3:15)
    - Part b: Acquisition Measurement Guidance (Wed 3:45-5:30 and Thurs, 8:30-9:00)
    - Part c: Acquisition ICM Table and Measures (Thurs 9:00-12:00)
  - Workshop Wrap-up
- Techniques That Will Be Used
  - Review and refinement of work completed to date
  - Round-table discussions
  - Documentation of results and updates to products

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Intended Output - 1

- **Users' Group Conference Products** *(by 30 July)*
  - **Workshop outbrief, meeting minutes, and action items**
    - **Key topics from lessons learned & information needs discussions**
    - **Priority-grouped list of Acquisition Organization Measures and suggested measurement practices**
    - **Recommendations for improvements to strawman, cost model, and ICM table**
    - **Tentative volunteer list & assignments**
- **Interim Products to be Placed on PSM Website**
  - **September 2004**
    - **Acquisition Cost Model & Work Breakdown Structure (WBS), v 1.0**
    - **Strawman Acquisition Measurement Guidance**
    - **Acquisition ICM Table & Measures, draft v 0.1**
  - **March 2005**
    - **Acquisition Measurement Guidance, draft v 0.1**
    - **Acquisition ICM Table & Measures, v 1.0**

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Intended Output - 2

- Final / Updated Products to be Placed on PSM Website
  - March or August 2005, depending on timeliness and nature of feedback
    - Acquisition Cost Model & WBS, v 1.1
    - ICM Table & Measures, v 1.1
  - August 2005
    - Acquisition Measurement Guidance, v 1.0

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Workshop Inputs / Read-Aheads

- *Workshop Description*
- *From Users' Group Conference Website:*
  - *Draft Acquisition Cost Model*
  - *Draft Acquisition Services WBS*
  - *Draft Strawman Acquisition Measurement Guidance*
  - *Draft Acquisition ICM Table and Measures*
- *From PSM Textbook/Guidebook:*
  - *Overview of the PSM process*
  - *Material on planning (called "tailoring" in the Guidebook) measurement*
  - *Material on establishing (called "implementing" in the Guidebook) a measurement process*

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Workshop Logistics

- Sign-in Sheet
- Note-taker & Key Point Logger
  - Volunteer: _____
- Action Item & Side Issue Logger
  - Volunteer: _____

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Workshop Part a
Acquisition Cost Model - ~ 1.5 hrs

Approx. Time	Topic
Wed 1:45-3:15	Introduction & overview Identify the model purpose Define the Structure Go over how and when to use it Next Step

Acquisition Cost Model Background

- Originally developed by Air Force Materiel Command to estimate AF acquisition resource needs (now in use primarily for Electronic Systems Center programs); being adapted to other environments
- PSM work began at the July 2003 UG Conference, and continued at the February TWG, with a review of draft cost model input parameters and the related Work Breakdown Structure (WBS).
- This workshop segment will review and refine the model.

Purpose of the Acquisition Model - Program Support Resource Model (PSRM)

- Identify the resources a Government Program Office needs to manage a major acquisition/development.
- Provide the justification to the Major Commands to allocate the necessary resources to the Program Manager.
- Our Goal - Genericize and Validate this model to be used in a comparable non-DoD environment.

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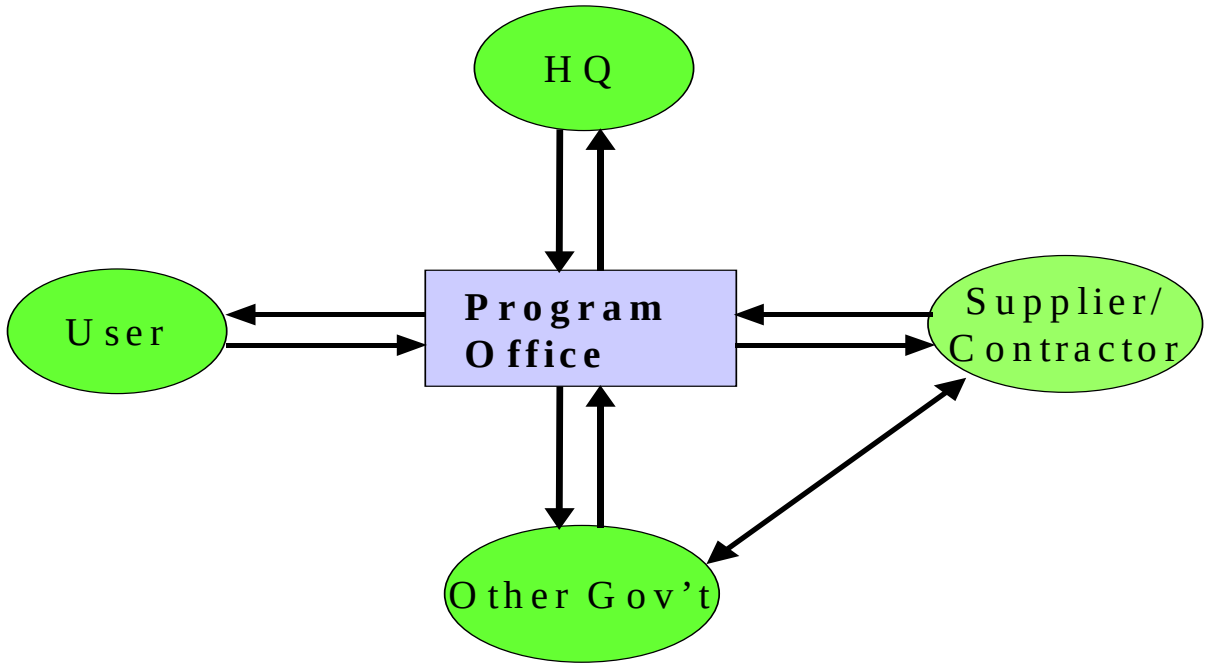
Program Office Impacts



HQ Impact

- Local Headquarters
- Major Command other location
- Component HQ – D.C.
- Office of the Secretary of Defense
- Joint Services

User Impact

- Single user single location
- Single user multiple locations
- Multiple users - CONUS
- Multiple users - Global

Other Government Agencies Impact

- Testing Agencies
- Certification Agencies
- Pollution Control Agencies
- Human Systems Agencies
- Various Government Reporting Agencies
  - DISA
  - CAIGs
  - GAO
  - DFAS
  - DCAA

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Supplier / Contractor Impact

- Single Supplier / Contractor
- Multiple Suppliers / Contractors
- Supplier / Contractor Pools

Using the Model

- Identify what activities - WBS
- Identify level of activity interfaces
- Identify level of required interaction required

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PSRM Primary Categories

- Required Reporting
- User Interface
- Contracting Activities
- Management / Technical Oversight
- Other Government Interfaces

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PSRM Activities

Required Reporting

- Level of reporting
- National Visibility
- Number of Customers
- Stability
- Unscheduled Reporting

User Interface

- Requirements stability
- User Reporting Level
- Number of Operational Users
- Acquisition/Operational Support Concept
- Operations Tempo/Surge

Contracting Activities

- Requirements Definition
- Contract Award / Implementation
- Contract Maintenance
- Closeouts/ULOs/NULOs

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PSRM Activities (Cont.)

Mgmt/Technical Oversight

- Acquisition/Sustainment Management Approach
- Performance Risk
- Complexity
- Funding
- Support/Age of Fleet
- Number of Systems/Configurations

Other Government Interfaces

- Management Interfaces
- Security
- Test
- GFSS
- Interoperability

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Acquisition Support

- Technical Tasks
- Internal Task Management

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Technical Tasks

- *Acquisition Planning Support*
- *Source Selection Support*
- *Risk Management*
- *Measurement & Analysis*
- *Documentation Analysis*
- *Process Assessments*
- *Requirements Analysis*
- *Design Analysis*
- *Code Analysis*
- *Test Analysis*
- *Software Safety Analysis*
- *Software Evaluation Planning and Witness*
- *Software Evaluation Execution and Witness*
- *Functional/Physical Configuration Audit*
- *Delivery of Final SEDP to SWE CM Project*
- *Materiel Release Package Preparation*
- *Generic Software Quality PM Support*
- *Support Environment*

Internal Task Management

- *WBS Development & Estimating*
- *Project Plan Development*
- *Peer Reviews*
- *Transition Planning*
- *Internal Quality Assurance Activities*
- *Subcontract Management*
- *Internal Risk Mgt & Performance Measurement*
- *Management Reviews*
- *Submission of Lessons Learned*
- *Interval CM Control*
- *Training*
- *Product Management*
- *Security*

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Scoring Example

GATO MC2 (GA)

Program

	Individual Score	GATM Avg Score	GATM Selected Score
Required Reporting		3.4	3
Lvl of reporting	5		
National Importance	5		
Number of Customers	3		
Stability	3		
Unscheduled Rqmts	1		

Level of Reporting Activity

Descriptors		
		Level of recurring reporting
Level 1		Most recurring reporting to the DAC or lower level, infrequent OSD/Air Staff interest, some HQ AFMC interest
Level 2		Between Level 3 and Level 1

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Level of Reporting Activity – Cont.

Descriptors		
Level 3		Infrequent congressional and OSD recurring reporting. Frequent Air Staff interaction (mostly at PEO or action officer level, frequent interaction with HQ AFMC, some joint interest may drive reporting to other services. May be PEO program with resident single manager. Regular reporting requirements to the AF/IL and the IL staff at the flag officer level. Streamlined reporting to levels outlined in level 5. SAR/DAES may be required. Some reporting to international
Level 4		Between Level 5 and Level 3

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Level of Reporting Activity – Cont.

Descriptors		
Level 5		ACAT 1D. Frequent OSD level recurring reporting, congressional/staff interaction, frequent flag officer interest at HQ USAF, if joint, frequent reporting to other service's. Major reviews such as DAB. Regular reporting of support status to the AF CSAF or AF Board. SAR/DAES part of standard reporting requirements (mandatory for level 5 score). If reporting to these levels, probably not in an expedited or "blue line" format. Significant reporting to international committees.

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PSRM Results

Workload Score	Nominal Number	Range
25	300	270-360
24	270	240-300
23	240	210-270
22	190	165-220
21	150	125-180
20	125	105-150
19	105	85-125
18	85	70-105
17	70	55-85
16	55	45-70
15	45	35-55
14	35	25-45
13	25	20-35
12	20	15-30
11	15	10-25
10	11	6-16
9	9	5-14
8	7	4-11
7	5	3-9
6	3	1-7
5	1.5	1-4

Next Step

- Define Sub Set of Generic Activities that change based on size of the project.
  - Current Activities
  - New Activities
- Different Domains
- Define weighting schema from 1 to ?
- Have organizations try it out - Validate
- Develop report for PSM Conference 2005 – White Paper

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Workshop Part b
Acquisition Measurement Guidance - ~ 2 hrs

Approx. Time	Topic
Wed 3:45-4:00	Introduction & overview Distinction between 2 facets of Acquisition Measurement, Acquisition Organization Measurement (AOM) and Supplier Monitoring (SMM) Measurement, and their interrelationships.
Wed 4:00-5:30	Relating Acquisition Organization Measurement to reality Program office problems, issues & lessons learned Process changes that might be beneficial Data that might support process changes How this data could actually be applied / prioritizing measures
Thurs 8:00-8:15	Approaches to getting sponsorship and buy-in for AOM
Thurs 8:15-8:30	Wrap-up Review of key points, action items, and side issues.

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Acquisition Measurement Guidance

Introduction & Overview ~15 min, 3:45-4:00

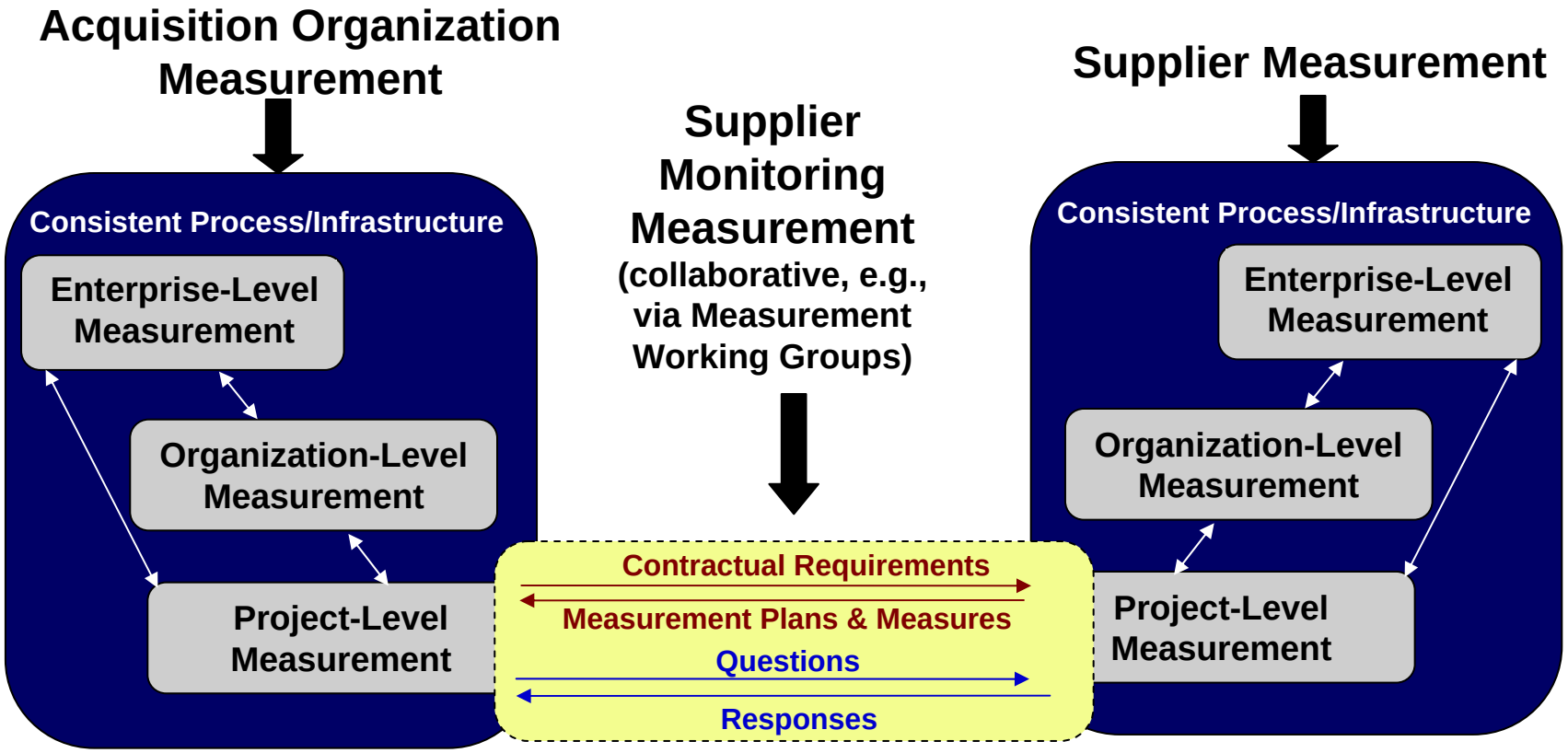
- **Acquisition Measurement Definitions**

  The process an acquirer uses to establish and sustain, plan, perform, and evaluate its measurement activities, has two facets for the acquisition organization:

  - Supplier Monitoring Measurement (SMM) focuses on ***the acquirer's role and tasks in obtaining, analyzing and applying contractor data for the purpose of monitoring the supplier. This application of measurement is addressed by existing PSM guidance***
  - Acquisition Organization Measurement (AOM) focuses on ***selecting, defining, collecting, and analyzing data for the purposes of managing and monitoring an acquisition organization's internal products, processes and resources. There are few resources to help the acquirer establish and apply this kind of measurement.***

The intended focus of this workshop is Acquisition Organization Measurement (AOM).

Acquirer-Supplier Measurement Relationships



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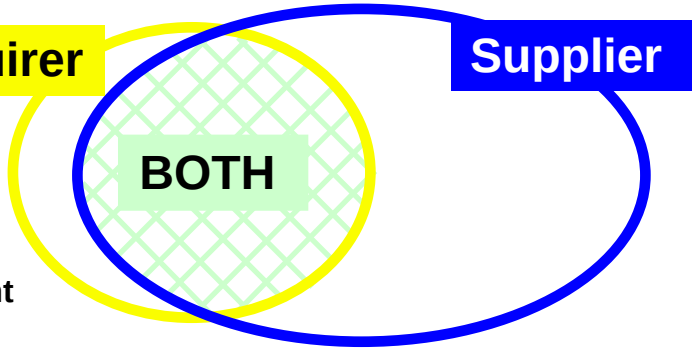
Acquisition Measurement Examples



Acquirer Measure Uses (AOM)
- Pre-Acquisition management of CONOPs, capabilities, and architecture development and associated trades & analyses
- Acquisition project management (of work done by acquirer)
- Acquisition process improvement
- Acquisition risk management (not the same as supplier's!)
- Acquisition financial management
- Examples:
  - RFP development progress & quality assessment
  - Staffing profiles for architecture/capabilities definition
  - Cycle time/effectiveness of supplier work product reviews
  - O&M cost vs. delayed deployment risk assessment
  - Projected funded staff for program office vs. estimated effort for work planned

Joint Uses for an Acquisition Program (SMM)
- Assess Supplier's:
  - Schedule and Progress
  - Size and Stability
  - Resources and Cost
  - Product Quality
  - Process Performance
  - Technology Effectiveness
  - Customer Satisfaction
- Examples (see PSM guidebook)

Supplier Measure Uses (Supplier Internal Measurement, or SIM)
- Project management
- Process improvement
- Risk management
- Financial management
- Examples:
  - Project monitoring and control
  - Statistical process control-defect data analysis
  - Assess relative risk to award fee of a replan vs. a recovery attempt
  - Assess costs vs. benefits of investing in new infrastructure

ACRONYMS

AOM: Acquisition Organization Measurement
SMM: Supplier Monitoring Measurement
SIM: Supplier Organization Measurement

RFP: Request for Proposal
O&M: Operations and Maintenance

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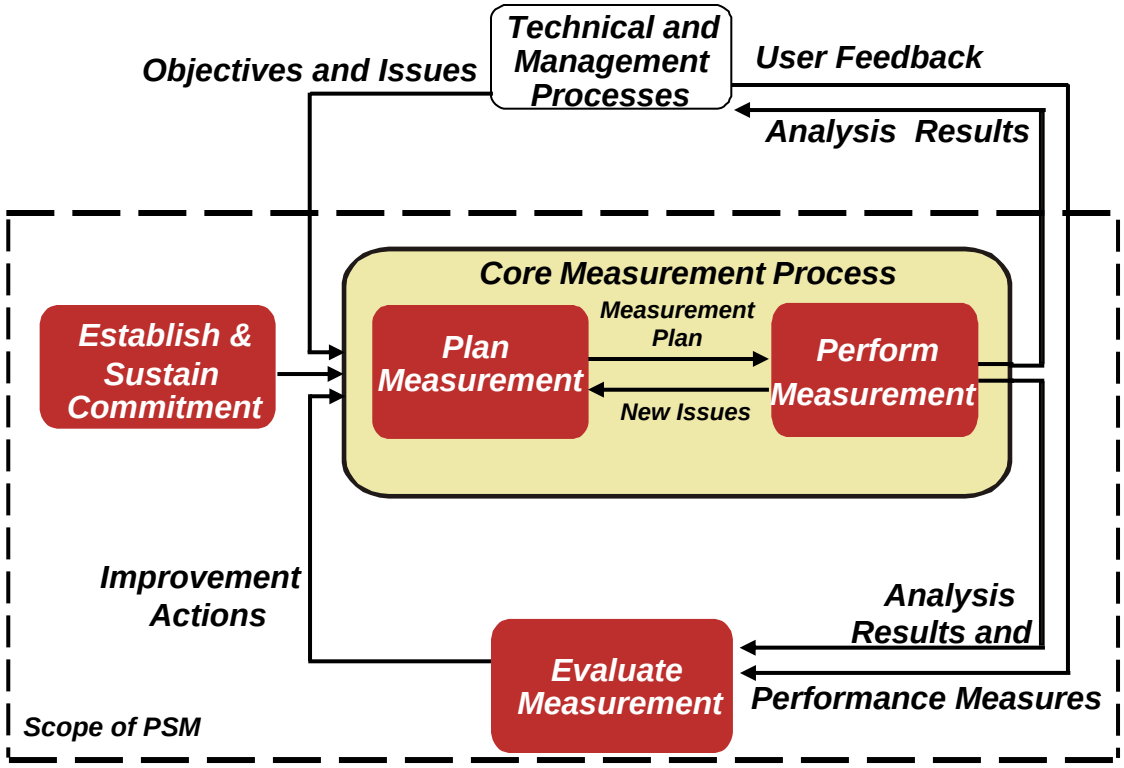
Core Measurement Process Differences: AOM vs. SSM

PLAN
- For AOM, develop plan for "self-measurement"
- For SMM, develop SOW language and DIDs, & obtain/review supplier Measurement Plan

PERFORM
- For AOM, collect, validate, & analyze data; and report results & recommendations
- For SMM, obtain delivered data, validate & analyze, and report results & recommendations



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Introductions

- Name & organization
- Why you're here:
  - Why is this topic important or interesting to you?
  - Are you doing AOM now?

Reminder: Flip Charts

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Acquisition Measurement Guidance
Problems, Issues & Lessons Learned ~30 min, 4:00-4:30

- **Discussion Question: What experiences have we had that might be due to poor processes and/or lack of quantitative information that would help manage and monitor program office work, and justify program office decisions? You may want to refer to the Acquisition Services Work Breakdown Structure (WBS) as a memory aid.**
- **Starter list:**
- **Discussion & additions:**
- **Volunteers to submit more experiences, or elaborate on those identified thus far**

Reminder: Note Actions, Side Issues, Key Points!

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Acquisition Measurement Guidance

Potentially Beneficial Process Changes ~30 min, 4:30-5:00

- **Discussion Question: Based on the experiences listed in the last segment, what kinds of process changes might be able to help? Let's pick two and discuss potential process changes; try to pick those with the greatest potential (in feasibility and benefit of the process change itself, and in feasibility and benefit of using measurement).**
- **Problems/issues and potential process changes:**

- **Volunteers to (a) submit potential process changes related to other problems, issues & lessons learned, or (b) comment/add to above:**

Reminder: Note Actions, Side Issues, Key Points!

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Acquisition Measurement Guidance

Data that Might Support Process Changes; Application Scenarios, to Illustrate Usefulness ~30 min, 5:00-5:30

- **Discussion Question: Based on the process changes identified in the last segment, what kinds of measurement could be used to help (e.g., to highlight concerns, justify initiatives, or track the impact of process changes) and how?**
- **Process changes, kinds of data and application scenario:**

- **Volunteers to (a) submit other measures for process changes and (b) other application scenarios:**

Reminder: Note Actions, Side Issues, Key Points!

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Acquisition Measurement Guidance

Approaches to Getting Sponsorship Buy-In ~ 15 min, 8:00-8:15

- **Discussion Question: What are the keys to gaining sponsorship and buy-in for Acquisition Organization Measurement?**
- **Initial Thoughts:**

- **Volunteers to submit their own list of keys, horror stories, and success stories in sponsorship/buy-in for measurement:**

Reminder: Note Actions, Side Issues, Key Points!

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Acquisition Measurement Guidance

Wrap-Up ~ 15 min, 8:15-8:30

- Review Key Points
- Review Action Items
- Review Side Issues
- Volunteers to review post-workshop materials
  - Oct-Nov 2004
  - Apr-May 2005
  - Oct-Nov 2005
- Volunteers to participate in upcoming Working Group meetings
  - Chantilly, VA, September 27-29 2004
    - Provide name and contact info if you're interested & we'll send details
  - Northern VA, February/March 2005

Reminder: Note Actions, Side Issues, Key Points!

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Acquisition Measurement Workshop -- Agenda July 29

- Day 1 Recap
  - Acquisition Cost Model Segment
  - Acquisition Measurement Segment
- Acquisition Measurement Wrap Up
- Acquisition Measures ICM Table Segment

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Day 1 Recap – Acquisition Cost Model

- *Discussed Purposes of Program Support Resource Model:*
  - *Identify the resources a Government Program Office needs (program office size) to manage a major acquisition/development.*
  - *Provide the justification to the Major Commands to allocate the necessary resources to the Program Manager.*
- *Discussed GOAL of Working Group*
  - *Genericize and validate the Acquisition Work Breakdown Structure, model, and input parameters to expand applicability beyond DoD*

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Day 1 Recap – Acquisition Cost Model

- Briefly reviewed Acquisition Services Work Breakdown Structure (WBS) used to develop key model elements:
  - workload descriptors, activities, interfaces/interactions
- Looked at the five groups of workload descriptors:
  - Required Reporting, User Interface, Contracting Activities, Technical and Management/Oversight, and Other Government Interfaces
- Solicited reviewers for WBS and model elements (we will meet to continue work in Chantilly in October)
  - If you are interested in this work, but can't review all items, please choose one and send us (Joe, Cheryl & Rita) your comments
- Identified some Action Items (to be listed and distributed, along with notes, following the conference)

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Day 1 Recap – Acquisition Measurement

- Defined two aspects of Acquisition Measurement (Acquirer Measurement)
  - Supplier Monitoring Measurement
    - How well is the supplier doing in terms of meeting plans for cost, schedule, performance, quality, development processes, change management, and risk management?
  - Acquisition Organization Measurement (this consists of Acquisition Process Improvement Measurement and Acquisition Performance Measurement)
    - How well is the acquirer doing its job?
- Workshop focus is on Acquisition Process Improvement Measurement
  - In support of Section 804 improvement goals
  - In support of improving life in the program office!

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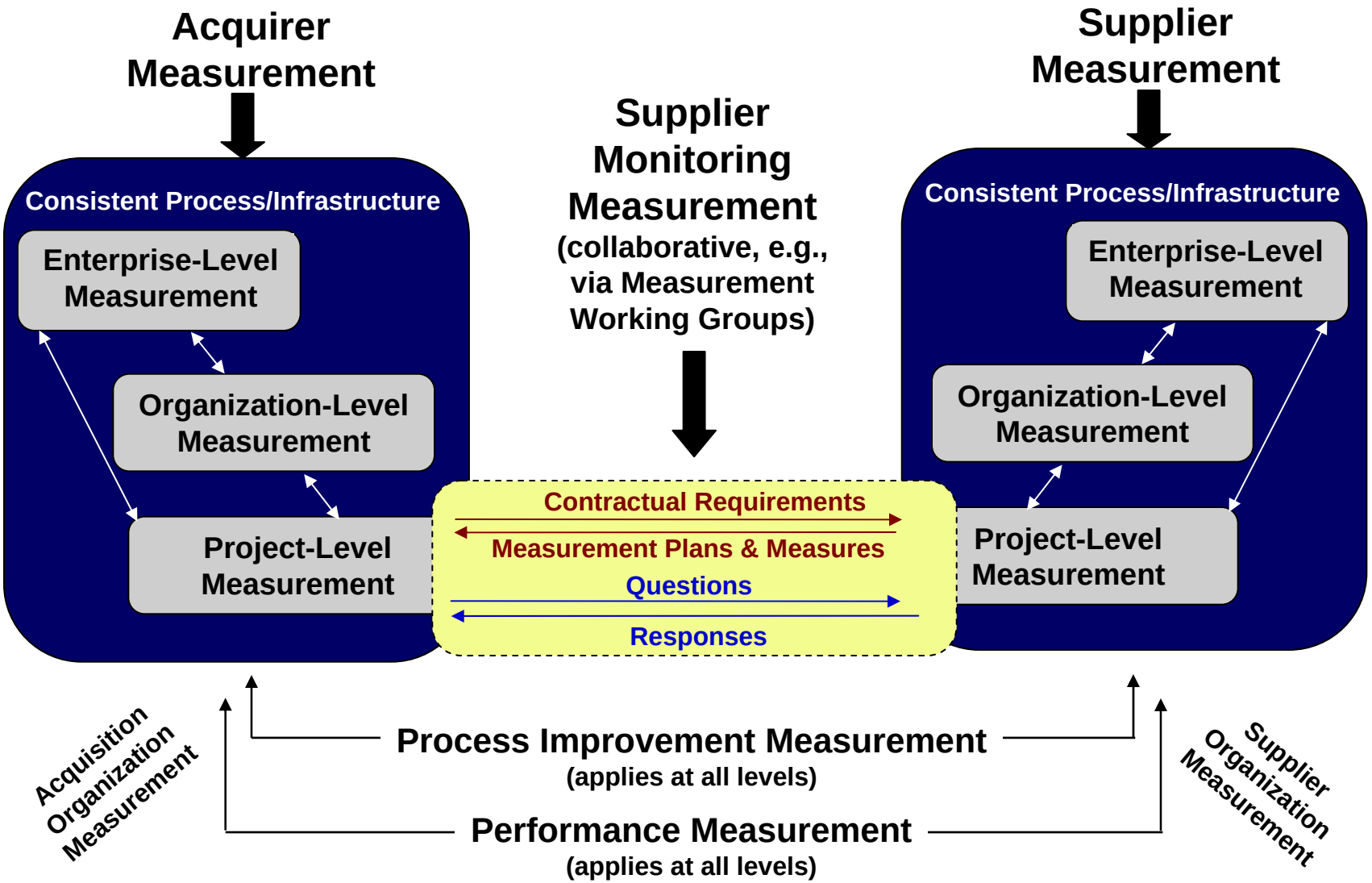
Acquirer-Supplier Measurement Relationships



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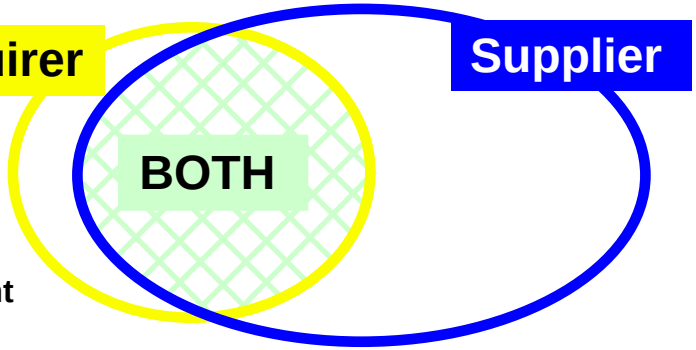
Acquisition Measurement Examples



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- Examples (see PSM guidebook)

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Day 1 Recap – Acquisition Measurement

- Listed participant inputs on key issues and problems in acquisition program offices that are reflections of process problems
- For three of these, discussed some information needs and concepts from which to derive measures to help guide improvement
  - Example:
    - Issue: Requirements Volatility (caused by poor acquisition process)
    - Perceived Problem (there were several of these): Program Offices allow too much change
    - Perceived Causes: Insufficient upfront analysis and definition (not enough time, not the right personnel, acquisition reform effect)
    - Impacts: Rebaselining, rework, dangers of program cancellation, etc…
    - Proposed Improvement Approaches: Criteria for accepting requirements changes, ability to trace and quantify the impacts of requirements changes, better resourcing of requirements analysis activities
    - Information Needs / Concepts for Measurement: Quantifying/categorizing changes, quantifying adherence to change criteria, quantifying $ and schedule associated with changes, quantifying staff qualifications and effort.

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Day 1 Recap – Acquisition Measurement

- *Other Issues Raised: estimation processes (especially review/validation of estimates); data and knowledge management; risk management; organizational issues: staffing/rotation of gov't personnel, military rank*
- *To be continued!*
  - *For Requirements Volatility, look at SA-CMM Requirements Management and Requirements Development Process Areas*
  - *Look at work from 804 Measures Workshop!*
  - *Review "Draft Strawman" – In particular, help us fill out the tables in this document (note that terminology in Strawman may change a bit)*
  - *We will meet to continue work in Chantilly in October. Info & workshop notes will be distributed after the conference.*
- *Next Topic Today (before moving on to the ICM table):*
  - *Discussion, questions, additions with respect to yesterday's work*
  - *Keys to gaining sponsorship and buy-in for Acquisition Organization Measurement*

Workshop Part c: Acquisition ICM Table and Measures - 0900 - 1200

- ICM Table - 0900-1100
  - What are the key information needs related to acquisition measurement? We will review the strawman table that has been started, and add additional information needs, questions, and measures, based on attendees experiences.
  - After the conference, participants will be asked to provide review comments on the draft ICM table.
- Sample Measurement Specifications - 1100-1200
  - Attendees will discuss measurement specifications that have been developed.
  - We will ask for volunteers to develop additional measures related to this topic.

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Day 2 Recap – Acquisition Measurement

- Discussion on Workshop Part b raised more key issues:
  - Architecture Instability, Teamwork, and Acquisition Planning
- Workshop notes will detail the discussion on the issues raised, perceived causes, potential root causes, improvements, and means for measuring improvements
- Solicited reviewers for current draft of white paper
- Part c, Acquisition Measurement ICM Table and Measures, was next

Day 2 Recap - Acquisition ICM Table and Measures – 1140-1200

- ICM Table
  - Brainstormed through each of the PSM Information Categories and listed key Information Needs, in the form of questions
- Sample Measurement Specifications
  - Did not get to Measurement specifications
- Writing up questions
- Solicited reviewers for ICM table and questions

Workshop Wrap-Up Steps

- Prepare and present outbrief of results, 30 July 2004
- Complete meeting notes & send to participants and other interested parties, 9 August 2004
- Volunteer to review post-workshop materials
  - Aug-Nov 2004
  - Apr-May 2005
  - Aug-Nov 2005
- Volunteers to participate in upcoming Working Group meetings
  - Chantilly, VA, October 13-15 2004
    - Provide name and contact info if you're interested & we'll send details
  - Northern VA, February/March 2005

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Workshop Participants

- Steve Hawald
- Kevin Mooney
- Tim Morgan
- Mary Ann McGarry
- Ali Nikolai
- Harpal Dhama
- Paul Cymerman
- Rick Holcomb
- Don Reifer
- Paul Caseley
- Cheryl Jones
- Joe Dean
- Rita Creel

Restatement of Objectives

Develop and review draft guidance, based on program office experience, in three areas:

- **Part a: Acquisition Cost Model**
  - Review and refine cost model parameters
- **Part b: Acquisition Measurement Guidance**
  - Discuss lessons learned and success factors in implementing measurement on the Acquisition Organization
- **Part c: Acquisition ICM Table and Measures**
  - Identify Information Needs, Measurable Concepts and candidate Measures related to the acquisition organization's role and tasking

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Part a: Acquisition Cost Model

- Summary of Discussion
  - Presented WBS and Cost Model
  - Discussed model input parameters
- Action Items
  - Review WBS and model input parameters – All send comments by 31 August
  - Update WBS and model based on comments – Joe Dean by 30 September
  - Review updates prior to workshop – All by 13 October
- Next Steps
  - Workshop 13-15 October
  - Validate the Acquisition Cost Model

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Part b: Acquisition Measurement Guidance

- Summary of Discussion
  - Discussed Acquisition issues (symptoms and perceived causes) and areas for improvement
  - Considered approaches to measurement for improvement in these areas
- Action Items
  - Review draft white paper – All send comments by 31 August
  - Update white paper based on comments – Rita Creel by 30 September
  - Review updates prior to workshop – All by 13 October
- Next Steps
  - Workshop 13-15 October
  - Expand scope of Acquisition Measurement covered

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Part c: Acquisition ICM Table

- Summary of Discussion
  - Brainstormed Information Needs for each PSM Information Category
- Action Items
  - Provide strawman ICM table and related questions – Cheryl by 30 September
  - Review strawman prior to workshop – All by 13 October
- Next Steps
  - Workshop 13-15 October
  - Expand ICM table to all aspects of Acquisition Measurement:
    - Acquisition process improvement, at the enterprise, organizational, and project level (workshop focus)
    - Acquisition performance, at the enterprise, organizational and project level
    - Supplier monitoring (primarily project level)
  - Draft sample measurement specifications

Practical Software and Systems Measurement

Invitation to Participate

- If you're interested in participating, send an e-mail to Cheryl.jones5@us.army.mil
- Workshop to be held 13-15 October, Chantilly, VA, Aerospace Corporation – registration required