

## **Practical Software and Systems Measurement**

*A foundation for objective project management*



### **Affordability Measurement Workshop**

**29 July 2010**

**Pete McLoone, Jim Hoxsie,  
Lockheed Martin**

*PSM Users Group Conference  
26-30 July 2010  
New Orleans, LA*

## **Affordability Measurement**

*This workshop will explore methods and techniques for performing affordability measurement at both the enterprise and project levels. We are planning to do this work as a collaborative project with the INCOSE and the NDIA. The objective is to develop a white paper addressing this topic by early 2012.*

## **Objectives of the Workshop**

- *Plan of action and milestones for development of a white paper addressing this topic.*
- *Outline of white paper*

## **Workshop Format**

- *Agenda*
  - *1:30 – 2:00 Intros and Expectations*
  - *2:00 – 3:00 Brainstorming*
  - *3:00 – 3:30 Break*
  - *3:30 – 4:00 White Paper Outline*
  - *4:00 – 5:00 Plan of Action, Outbrief*
- *Techniques that will be used*
  - *Group interaction*
  - *Review and discussion*

## ***Workshop Background***

- *No specific PSM history in this area*
- *Where we're heading*
- *Issues, questions, and topics*

## ***Intended Output***

- *See objectives*

## ***What is Affordability?***

- ***Affordability of accessing the internet from a handheld device***
- ***Affordable Housing Index***

## ***Affordability (Defense Acquisition Guidebook)***

- Affordability is the degree to which the life-cycle cost of an acquisition program is in consonance with the long-range investment and force structure plans of the Customer
- Affordability balances Total Life-Cycle Costs/Risks, Capabilities/Requirements, Customer Long-Term Needs, and the Available Budget.
- In general Affordability needs to address four major areas
  - Product Design and Development
  - Product Production
  - Operations
  - Indirect Costs

## **Engineering and Measurement**

- ***Affordability Engineering is a process that enables companies to reduce costs and improve value throughout the whole life cycle of a product by the use of cost and schedule estimating , technical performance, and risk information, especially at the conceptual design stage.***
- ***Affordability Measurement is the use of quantitative methods to provide insight into the effectiveness of affordability engineering.***

## **Partners**

- ***INCOSE Affordability Working Group for advancing the state of the practice for Design for Affordability. This goal focuses on the development and deployment of technology, products, operating, support, and other concepts to make systems affordable that are applicable in the Community of Practice known as Systems Engineering.***
- ***NDIA Systems Engineering Division, Lifecycle Support Committee, LCC-Affordability Project***
- ***Wg27 MORS***

## Practical Software and Systems Measurement

### Possible White Paper Views

- Acquisition Team
- Supplier Team: Analysis of Alternatives
- Both: Program Execution
- Supplier Organization

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## Practical Software and Systems Measurement From: PSM Users Group 2009, Workshop on Acquisition Measurement Case Study

Acquisition Measurement ICM Table

Information Categories	Questions Addressed	Measurable Concepts	Measures	Notes
Enterprise Schedule & Progress	Are the projects within this enterprise on track?	Milestone Completion	Milestone Progress Interim Progress Trend	Milestones mean major milestones such as major reviews and delivery dates. For the enterprise, want some early indication of whether major milestones will be met.
	What is the degree of risk associated with each project? Which projects are most at risk?	Risk Status	Risk Likelihood and Impact	At the highest level. Likelihood and Consequence for the top 10 risks on each project.
	What is the enterprise work backlog? What should be scheduled next?	Work Backlog	Open Defects Enhancements Needs	Measure/categorize open defects, enhancements, and needs by priority level
Resources & Cost	Does the enterprise budget and funding process support the financial needs of the projects?	Financial Adequacy	Obligation Rates Disbursement Rates Funding Availability	Is funding available for each project as needed? Consider: - spread of money across the year for multiple projects - color of money and plus-ups for government projects - funding blocks, pull-backs - studies, management reserve, as well as development and maintenance projects
	Within the enterprise, are there sufficient qualified resources (people)?	Personnel Effort	Effort Experience Level Staff Turnover Workforce Age Profiles Education/Training Profiles	Consider: - turnover rate - military rotations - training, education - motivation - etc.
Product Size & Stability	How many systems are in development? How big are they? How many systems are being maintained? How big are they? What are the trends over time? Are requirements (needs) and architecture elements stable?	Physical Size and Stability Functional Size and Stability Functional Size and Stability	Interfaces Interface Complexity Lines of Code Requirements Requirements Volatility Architecture Elements Volatility	
Product Quality	Are the projects delivering quality products that meet performance requirements?	Functional Correctness Dependability-Reliability	Needs Tested Successfully Defect Density Defect Escapes Components Accepted	At the aggregate level. Does the project meet: - user expectations (needs, not specifications) - TPMs - delivery criteria - permissible levels of delivered defects?
Process Performance	Are known problems being resolved? Are the processes sufficient to operate efficiently in support of the acquisition activities? What are enterprise norms for completing acquisition activities (schedule, cost, productivity)?	Functional Correctness Process Effectiveness Process Efficiency	Defects Resolved Process Capability Process Adherence Cycle Time Effort Productivity	During warranty or against backlog of issues E.g. Capability (and not level) with respect to CMMI-ACQ process areas. Setting projects on contract in a timely manner with a sufficient level of quality E.g. get a RFP package out, review proposals, review CDRLs, etc. (assuming sufficient level of quality)
Technology Effectiveness	Does the enterprise have sufficient technology insertion plans and implementations?	Technology Adoption	Needs Met by Technology Insertion Technology Refresh Rate	
Customer Satisfaction	Are user needs / concerns being met? Is the enterprise delivering the products that are needed with sufficient functionality and performance for the mission?	Customer Feedback Customer Support	Satisfaction Ratings Requests for Support	

## Practical Software and Systems Measurement

### From: PSM Users Group 2009, Workshop on Acquisition Measurement Case Study

Project Acquisition	Schedule & Progress	Are acquisition activities and commitments completed as scheduled?	Milestone Completion Work Unit Progress	Milestone Dates Test Cases Attempted and Passed Requirements Documented and Reviewed Requirements Traced and Tested Reviews Completed Action Items Closed	Milestones mean acquisition milestones Work Unit Progress - measure slippage Milestones could include developing the RFP, bidding and source selection, awards, contract modifications, reviewing CDRLs, test progress, developing SAMP, SEMP, TEMP, contract monitoring and review, funding milestones
		What is the degree of risk associated the project? What are the highest risks?	Risk Status	Risk Status	Detailed risks
	Schedule & Progress Resources & Cost	Has the acquisition office established realistic cost and schedule parameters for the system and for acquisition activities? Have the system proposals been evaluated for realistic cost and schedule projections?	Schedule Feasibility Cost Feasibility	Schedule Probability Cost Probability	Evaluate for both acquisition activities and for development activities. Include updates as schedules and funding changes. Note: need to make sure that there is a separate, realistic schedule acquisition office activities, including realistic review and approval times. Is the RFP development schedule realistic? Is the transition to support schedule realistic? Have critical paths been identified? Have we identified and planned for budgetary milestones?
		Is the development schedule and cost realistic?	Schedule Feasibility Cost Feasibility	Schedule Probability Cost Probability	Consider any changes made prior to award/initiation.
	Resources & Cost	Does the project have sufficient money to conduct acquisition activities on this project?	Financial Performance	Cost BCWS, BCWP, ACWP	Requires good EV on acquisition activities.
		Does the project have sufficient qualified resources to conduct acquisition activities on this project?	Personnel Effort	Effort Experience Level Staff Turnover	
		Does the project have sufficient resources / infrastructure to conduct acquisition activities on this project?	Environmental and Support Resources	Quantity Needed and Available Time Available and Used	Facilities, material, test labs and equipment, SCIFs, software tools, simulation tools, etc
	Product Size & Stability	Are the user needs / top-level requirements and architectures stable? What is the impact of changes?	Functional Size and Stability	Needs Volatility Architecture Volatility	Addressing those user needs / top-level requirements managed by the acquirer. Might be documented in operational capability documents, operational scenarios, top-level performance specifications. Want to measure # of architecture-level changes over time, driven by changes in user needs and/or requirements, which can tell us if we have a robust, flexible architecture.
		How many external interfaces exist in a program? Are all external interfaces clearly identified? Are the interfaces stable? Are external interfaces developed and tested as planned?	Functional Size and Stability	External Interface Volatility	External interfaces to other systems or program offices.
	Product Quality	Is the project delivering quality products that meet performance requirements?	Functional Correctness Dependability-Reliability	Needs Tested Successfully Defect Density Defect Escapes TPMs Components Accepted Mean Time to Failure	Does the project meet: - user expectations (needs, not specifications) - TPMs - specifications (i.e. specified requirements that are traced to needs) - delivery criteria - permissible levels of delivered defects?

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### Other Subjects

- A case study in the PSM course

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## ***Workshop Participants***

- *Pete McLoone*
- *Rick Cline*
- *Jim Hoxsie*
- *Michael Denny*
- *Garry Roedler*
- *Mauricio Pena*
- *Kelly Koser*
- *Frances Anderson*
- *Bill Golaz*



## **Summary**

- ***Good group interaction and discussion***
- ***Lots of good discussion on various affordability issues in the acquisition and the contractor communities***
- ***Determined several Information needs as a first step***
- ***Determine several views or perspectives that may influence ICMs (acquirer vs. contractor, enterprise vs. project)***

## **Conclusions, Recommendations, and Results**

- ***An Affordability Measurement Guide is a worthwhile undertaking***
- ***Hey, this was the first meeting; further conclusions, recommendations and results will have to wait***

## ***Next Steps/Action Items***

- ***Engage INCOSE and NDIA teams***
- ***Move forward with more work on information needs***
- ***Compare information needs with existing ICMs***
- ***Target draft document by 2011 Users Group meeting***