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# **System Development Performance Measurement Working Group In-process Status**

sponsored by the

**NDIA Systems Engineering Division**  
**Systems Engineering Effectiveness Committee**  
(In conjunction with Practical Software and Systems Measurement)

14 July 2010

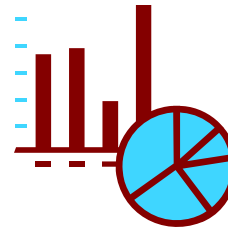


# Working Group Goal



Identify potential high value

- measures,
- indicators, and
- methods



for managing programs, particularly in support of

- making better technical decisions and
- providing better insight into technical risk

at key program milestones during

- Technology Development and
- Engineering and Manufacturing Development

for both the acquirer and supplier





# Drivers



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## Weapons Systems Acquisition Reform Act 2009 (WSARA)

Track and report on Major Defense Acquisition Program (MDAP) achievement of measureable performance criteria

## USD (AT&L) memo “Better Buying Power” (Sept. 14, 2010)

Conduct reviews that “support major investment decisions or to uncover and respond to significant program execution issues”

## NDIA Top Systems Engineering (SE) Issues (2010)

Issue #4: Decision makers do not have the right information at the right time to support informed and proactive decision making

## SE Division Brief BY Mr. Welby SEP Streamlining Methodology (Feb 16, 2011)

Define set of data-driven successful data products required for program execution.

Focus on Engineering Tables, quantitative data, rather than words



# Working Group Imperatives



- Build on what has already been done
- Focus on technical measures that provide the insight needed at major decision points
- Emphasize leading/predictive measures
- Minimize the effort of data collection and analysis but improve the usage of objective performance data
- Understand impacts of the right – and wrong – measures on program effectiveness
  - Measures of cost, time, and technical performance: only measure what provides genuine insight



# What the Working Group Looked For



- How should DoD and industry program executives use the measure(s) to gain insight into what they need to know?
  - Leading insight provided
  - Interpretation guidance
  - Typical decision criteria
- What should DoD and industry program executives need to look out for in order to use an indicator well?
  - Does its utility vary with where the program is in the lifecycle?
  - Assumptions
  - Implementation criteria or limitations

## Measures with the right characteristics:

- Relevance
- Completeness
- Timeliness
- Simplicity
- Cost Effectiveness
- Repeatability
- Accuracy



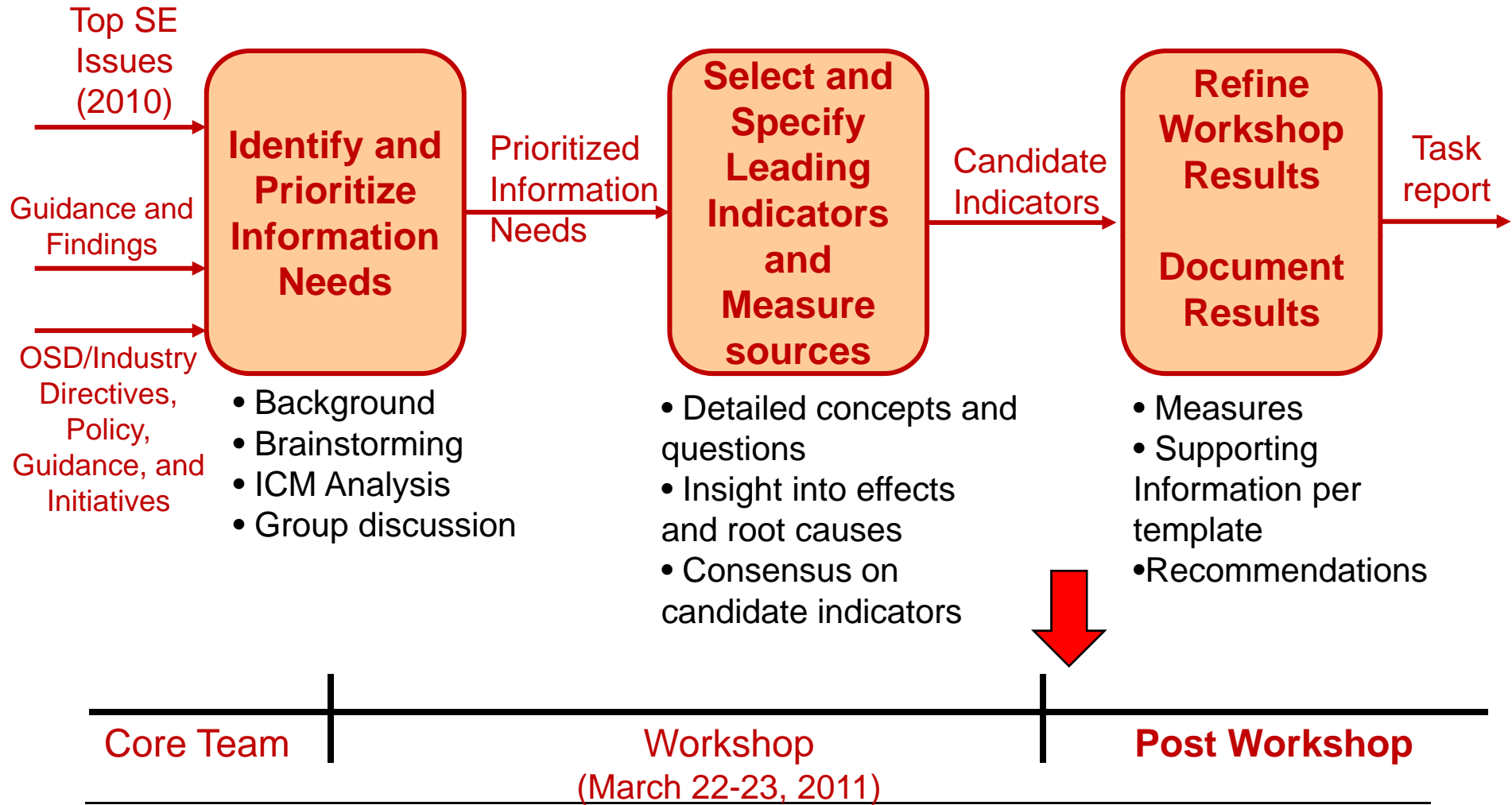
# Expected Working Group Outcomes



- Succinct guidance on the most beneficial quantitative measures for providing insight into technical risks and issues
  - Informed decisions for program DoD and industry executives at key program milestones
  - Improved alignment of Industry practices with program plans
- Consideration of the impact of the life cycle on the measures utilized
- Initial recommendations on benchmarking and data repositories



# Where we are in Process

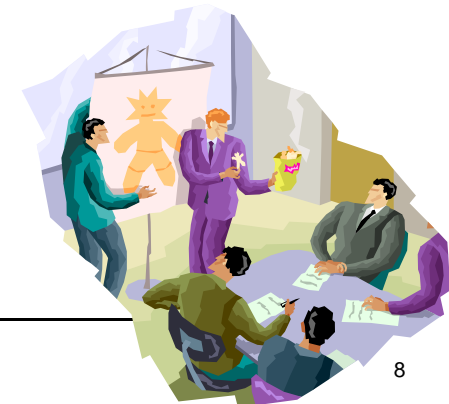




# March 22-23 Workshop



- Thirty five senior managers and engineers from industry (30) and government (5) participated
- Identified eighteen information needs
- Addressed the nine information needs considered most important by the workshop via three breakout teams
- Breakout teams identified leading indicators, and discussed possible measures and issues associated with the most important information needs







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# Information Needs Identified



## *Considered Most Important Based on Prioritization Determined by Workshop Participants*

- Requirements
- Interfaces
- Staffing and Skills
- Technical Performance
- Technology Maturity
- Architecture
- Affordability
- Risk Management
- Manufacturability

## *Ranked Lower in Prioritization by Workshop Participants; not considered by breakout teams*

- Testability
- Requirements Verification and Validation
- Defects and Errors
- System Assurance
- Process Compliance
- Work Product Progress
- Facility and Equipment
- Change Backlog
- Review Action Item Closure



# Workshop Results and Follow-on Analysis



- 43 leading indicators initially identified across the nine information needs addressed
- 10 indicators have been identified as highly important by the core team using the following criteria:
  - Strongly addresses the information need
  - Feasible to produce
  - Raw data exists and easily processed
  - Already frequently utilized
  - Leading or predictive
  - Applicable to TD and E&MD
- Manufacturability did not have any indicator rated highly important (Team plans to revisit this area in collaboration with the NDIA Manufacturing Committee)
- Many of the high importance indicators have analogs in the Systems Engineering Leading Indicators Guide



# Emerging Leading Indicators



Information Need	Specific Leading Indicator	Related Source Material
Requirements	Requirements Stability	SELI 3.1 Requirements Trends -- Volatility
Requirements	Stakeholder Needs Met	SELI 3.4 Validation Trends, SELI 3.5 Verification Trends
Requirements Affordability	Requirements Tradeoff Impact	SELI 3.16 System Affordability Trends
Interfaces	Interface Trends	SELI 3.3 Interface Trends
Architecture	Critical Success Factor and/or Quality Attribute Requirements Satisfied by the Architecture	SELI 3.17 Architecture Trends
Staffing and Skills	Staffing and Skills Trends	SELI 3.11 Staffing and Skills Trends
Risk Management	Risk Trends	SELI 3.9 Risk Exposure Trends SELI 3.10 Risk Treatment Trends
Technical Performance Technical Maturity	TPM Summary (all TPMs)	SELI 3.13 Technical Measurement Trends
Technical Performance Technical Maturity	TPM Trend (specific TPM)	SELI 3.13 Technical Measurement Trends
Technical Maturity	Technology Readiness Level for each Critical Technology Element	SELI 3.8 Technology Maturity Trends



# Example: Requirements Stability



<b>Measureable Concept</b>	Is the SE effort driving towards stability in the system definition and size?
<b>Leading Insight Provided</b>	<ul style="list-style-type: none"> <li>• Indicates whether the system definition is maturing as expected.</li> <li>• Indicates risks of change to and quality of architecture, design, implementation, verification, and validation.</li> <li>• Indicates schedule and cost risks.</li> <li>• May indicate future need for different level or type of resources/skills.</li> <li>• Indicates potential lack of understanding of stakeholder requirements that may lead to operational or supportability deficiencies.</li> </ul>
<b>Base Measures</b>	<p>Total Requirements at the end of the previous reporting period</p> <p>Requirements Changed during the current reporting period (Added, Modified, Deleted)</p> <p>Major Milestone Schedule</p> <p>Time Profile for Expected Requirements Stability</p>
<b>Derived Measures</b>	<p>Percent Requirements Changed = <math>100 * \text{total requirement changes} / \text{Total Requirements}</math></p> <p>Requirements Stability = <math>100 - \text{Percent Requirements Changed}</math></p>
<b>Decision Criteria</b>	Investigate need for corrective action if the Stability is 10 percent below the expected level and/or the Stability trend for the last three reporting periods is moving toward the threshold.



# Next Steps



- Core Team completion of focused summary refining the results of workshop (*late June*)
- Review of summary by the entire fifty person working group (*mid July*)
- Incorporation of review comments and re-review of the summary (*late July*)
- Complete draft report (*mid August*)
- Review of draft report by the entire working group (*late August*)
- Incorporation of comments and re-review by the working group (*early Sept*)
- Completion of final report (*late Sept*)



# In-progress Discussion with OASD (SE) 7 June 2011

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## Attendees:

- Stephen Welby, Jim Thompson, and Nic Torelli with select Core Team members

## DoD Comments:

- Very supportive of what we're doing
- Finds intrinsic, direct, and objective work product measures more appealing than actual vs. plan comparisons
- Desirable to eventually develop thresholds or control limits that are based on historical data
- Agreement on the need for interpretation guidance and decision criteria
- Very interested in recommendations concerning manufacturability
  - **Action:** Work with the NDIA Joint Committee for System Engineering and Manufacturing
- Discussed the need for a program measurement plan aligned within the Systems Engineering Plan (SEP)



# Points of Contact



- For further information on the Working Group, please contact any of the following:
  - Mr. Peter McLoone, NDIA SED, Working Group Industry Co-chair ([peter.j.mcloone@lmco.com](mailto:peter.j.mcloone@lmco.com))
  - Mr. Martin Meth, representative for OUSD/DDR&E/MPS ([mmeth@rsadvisors.com](mailto:mmeth@rsadvisors.com)) and Working Group OSD Co-chair
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