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Surveying Systems Engineering Effectiveness

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Sponsored by the U.S. Department of Defense

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Background

Case studies have shown that properly implemented systems engineering can result in commensurate benefits

Broadly applicable quantification of these costs and benefits remains elusive

- Complicated by the lack of a broadly accepted definition of Systems Engineering
- Insufficient identification and tracking of Systems Engineering costs and efforts
- Exacerbated by increasing complexity and size of systems and Systems of Systems

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The Task

The Office of the Under Secretary of Defense (AT&L) has tasked the NDIA Systems Engineering Division to research and report on the costs and benefits associated with Systems Engineering practices in the acquisition and / or development of military systems.

The Systems Engineering Effectiveness Committee (SEEC) is addressing this task via a survey of program and project managers across the defense industry.

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Survey Objective

Identify the degree of correlation between the use of specific systems engineering practices and activities on projects, and quantitative measures of project / program performance.

Survey Method

Use the resources of NDIA SE Division to reach a broad constituency

The initial survey will focus on industry members of NDIA that are prime contractors and subcontractors

Collect feedback from project / program managers

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Survey Development Plan

1. Define the goal
2. Choose the population
3. Define the means to assess usage of SE practices
4. Define the measured benefits to be studied
5. Develop the survey instrument
6. Execute the survey
7. Analyze the results
8. Report
9. Plan future studies

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Step 1:

Define the Goal

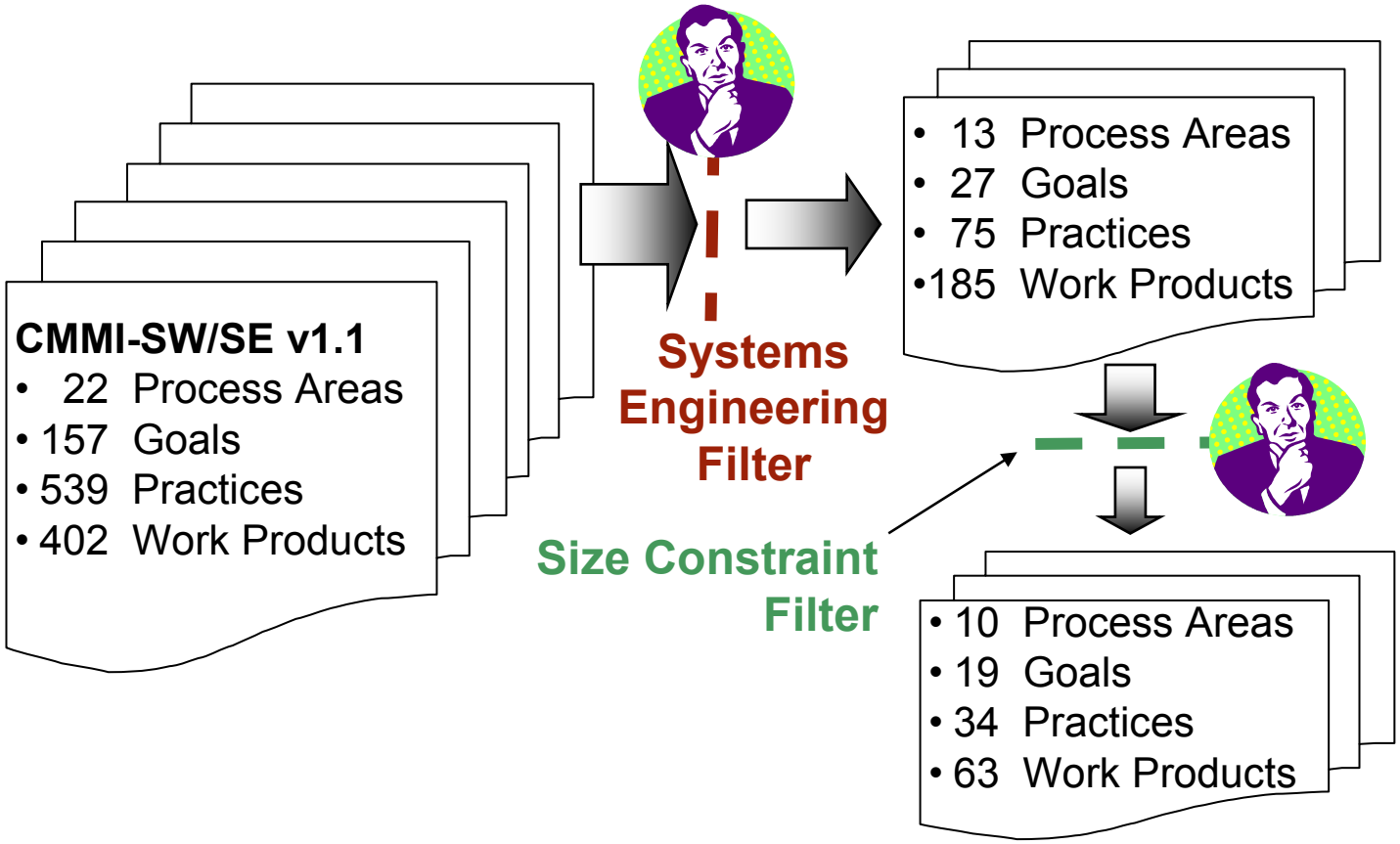
Identify correlations between SE practices and program performance

Step 2:

Choose the population

Chosen population consists of contractors and subcontractors providing products to the DoD

Step 3:
Define assessment of SE practices



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Step 4:
Define performance measures

Utilize measures common to many organizations

- Earned Value
- Award Fees
- Technical Requirements Satisfaction
- Milestone Satisfaction
- Problem Reports

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Step 5:
Develop the survey instrument

Self-administration
- formatted for web-based deployment

Confidentiality
- No elicitation of identifying data
- Anonymous response collection
- Responses accessible only to authorized SEI staff

Integrity
- Data used only for stated purpose
- No attempt to extract identification data

Self-checking

Section 1
Project Characterization

Section 2
Systems Engineering Evidence

Section 3
Project / Program Performance Metrics

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Section 1 - Characterization

Characterization of the project / program under consideration

- **Project / program**
  - Size
  - Stability
  - Lifecycle phase
  - Subcontracting
  - Application domain
  - Customer / User
  - etc.
- **Organization**
  - Size
  - Organizational capability
  - Related experience
  - etc.

Section 1: Characterization

The objective of this section is to gather information to characterize the project under consideration. This information will assist the survey analysts in categorizing the project, and the executing organization to better understand your responses.

1.1	**Project** – information to characterize the specific project under discussion. Size, stability, lifecycle phase, subcontracting, and application domain are among the parameters used for program characterization.	
1.1.1	What phases of the integrated product lifecycle comprise this project (check all that apply), and what phase are you presently executing (check 1)?	**Included in project (check all that apply** / **Current phase (check 1)** ☐ ☐ Concept Refinement ☐ ☐ Technology Development and Demonstration ☐ ☐ Development ☐ ☐ Manufacturing ☐ ☐ Verification ☐ ☐ Training ☐ ☐ Deployment ☐ ☐ Operation ☐ ☐ Support ☐ ☐ Disposal
1.1.2	What is the current total contract value (US$) of your project?	$ _____
1.1.3	What was the initial contract value (US$) of your project?	$ _____
1.1.4	How many contract change orders have been received?	_____

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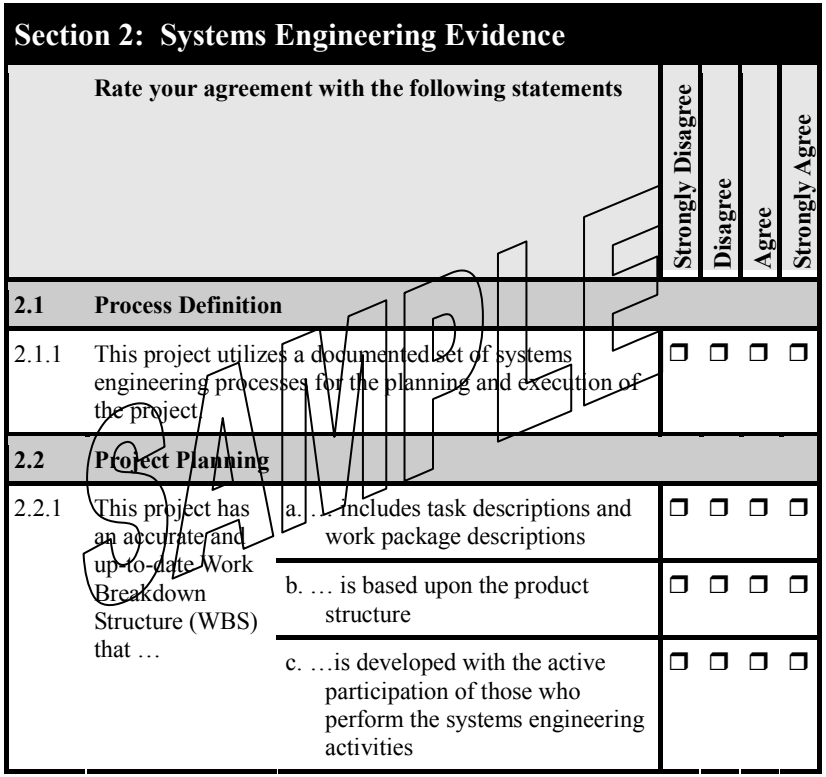
Section 2: SE Evidence

Process definition
Project /program planning
Risk management
Requirements development
Requirements management
Trade studies
Interfaces
Product structure
Product integration
Test and verification
Project / program reviews
Validation
Configuration management



Section 2: Systems Engineering Evidence			Strongly Disagree	Disagree	Agree	Strongly Agree
	Rate your agreement with the following statements					
2.1	**Process Definition**					
2.1.1	This project utilizes a documented set of systems engineering processes for the planning and execution of the project		❒	❒	❒	❒
2.2	**Project Planning**					
2.2.1	This project has an accurate and up-to-date Work Breakdown Structure (WBS) that …	a. … includes task descriptions and work package descriptions	❒	❒	❒	❒
		b. … is based upon the product structure	❒	❒	❒	❒
		c. …is developed with the active participation of those who perform the systems engineering activities	❒	❒	❒	❒

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Section 3: Performance Metrics

- Earned Value
- Award fees
- Technical requirements satisfaction
- Milestone satisfaction
- Problem reports

Section 3: Project Performance Metrics

3.1	Earned Value Management System (EVMS)				
	Rate your agreement with the following statements	**Strongly Disagree**	**Disagree**	**Agree**	**Strongly Agree**
3.1.1	Your customer requires that you supply EVMS data?	❒	❒	❒	❒
3.1.2	EVMS data is available to decision makers in a timely manner (i.e. current within 2 weeks)?	❒	❒	❒	❒
3.1.3	The requirement to track and report EVMS data is levied upon the project's suppliers.	❒	❒	❒	❒
3.1.4	Variance thresholds for CPI and SPI variance are defined, documented, and used to determine when	❒	❒	❒	❒

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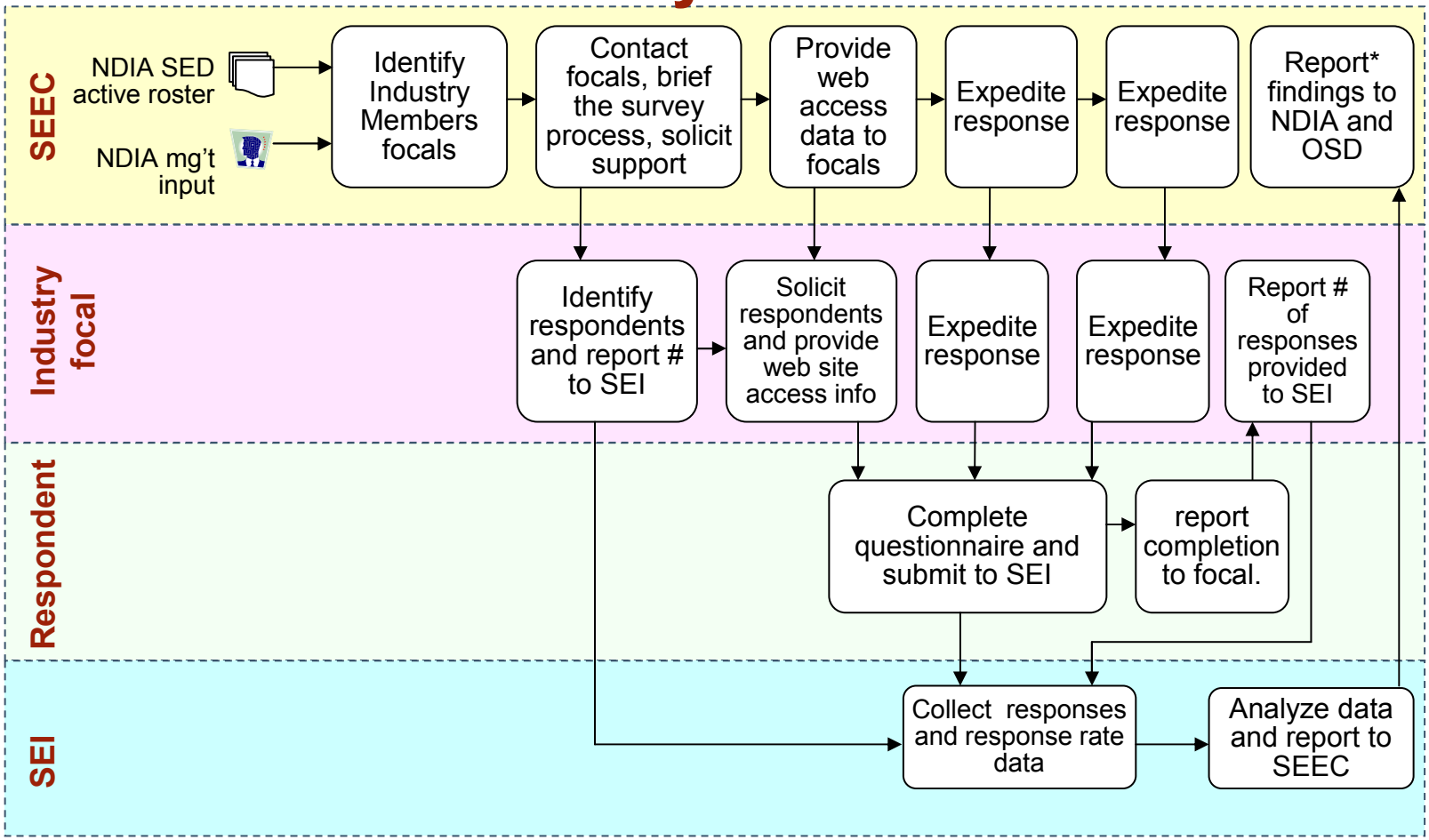
Step 6:

Execute the survey

* Report to include suggested recommendations and actions



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Step 7:

Analyze the results

Partition responses based on project characterizations

Analyze survey responses to look for correlations between the SE practices and the chosen metrics.

Step 8:

Report

Summarize survey results and analysis in a report.

Step 9:

Plan future studies

Based upon the findings from the survey, the need for additional studies may be defined.

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Status

Survey instrument development complete

Web deployment complete

Respondent identification in progress

Response collection through Nov.

Analysis through Dec. and Jan.

Report in Feb.

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SE Effectiveness Committee

Dennis Ahearn	Marvin Anthony	Ben Badami
David P. Ball	Al Brown*	Al Bruns
Thomas Christian	Jack Crowley	John Colombi
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Terry Doran	Joseph Elm	John P. Gaddie
Donald J. Gantzer	Dennis Goldenson	Dennis E. Hecht
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Ed Kunay	Jeff Loren	John Miller
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Brooks Nolan	Michael Persson*	Bob Rassa
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Rex Sallade	Jay R. Schrand	Sarah Sheard
Jack Stockdale	Jason Stripinis	Mike Ucchino*
Ruth Wuenschel	Brenda Zettervall	

* co-chair

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Conclusion

Questions ?

Contact information

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BACK UP

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Target Audience

- AAI Corp.
- Alion Science & Technology
- Allied-Signal
- Anteon Corp
- AT&T
- BAE Systems
- BBN Technologies
- Boeing
- Computer Sciences Corp.
- Concurrent Technologies Corp.
- DCS Corp.
- DRS Technologies
- Foster-Miller Inc.
- GE
- General Dynamics
- Gestalt, LLC
- Harris Corp.
- Honeywell
- Hughes Space & Communications
- Impact Technologies LLC
- ITT Industries
- Jacobs Sverdrup
- L-3 Communications
- Lockheed Martin
- Motorola
- Northrop Grumman
- Orbital Sciences Corp.
- Raytheon
- Rockwell Collins
- SAIC
- Scientific Solutions, Inc.
- SI International
- Simulation Strategies Inc.
- Southwest Research Institute
- SRA International
- Support Systems Associates Inc.
- Systems & Electronics, Inc.
- TERADYNE, Inc.
- Titan Systems Co. (AverStar Group)
- Trident Systems, Inc.
- TRW Inc.
- United Defense LP
- United Technologies
- Virtual Technology Corp.
- Vitech Corp.

Selection criteria:
- Active in NDIA SED
- Contractors delivering products to the government

*Need Point-of-Contact (**Focal**) from each company to expedite survey deployment.*