



The Effects of CMMI[®] on Program Performance

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Question

Case studies have shown that CMMI-based process improvement can produce significant returns on investment

And yet, high maturity organizations can still be seen performing poorly on development programs.

WHY ?



Often Heard “Answers”

The high-maturity organizations are not applying high-maturity practices to these unsuccessful programs

Process is just one element of program success. The program failures may arise from weaknesses in the people or the technology applied to the project.

A low-maturity acquirer prevents the organization from performing at a high maturity level.

The programs are unprecedented, and the required technology is not available.

... and many more



The “Real” Answer

We don't know !

We need to collect and analyze evidence from both successful and unsuccessful programs to understand the problem



Finding the Answer 1

The OSD (AT&L) has tasked the NDIA Systems Engineering Division to research and report on the costs and benefits of 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.

- **Survey objective** - Identify correlations between the use of specific systems engineering practices and activities on projects, and quantitative measures of project / program performance.



Finding the Answer ₂

This survey addresses individual programs

- It assesses key SE practices used on those programs
 - *The assessed practices are derived from the CMMI*
- It collects other characteristics of those programs
 - *Acquirer capabilities, technological difficulty, contractor experience, etc.*
- It collects performance metrics on those programs

Analysis of the survey data will enable us to see correlations between program performance and:

- CMMI practices (individual and ensemble)
- Other program characteristics



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



Step 1:

Define the Goal

Identify correlations between SE practices and program performance

Step 2:

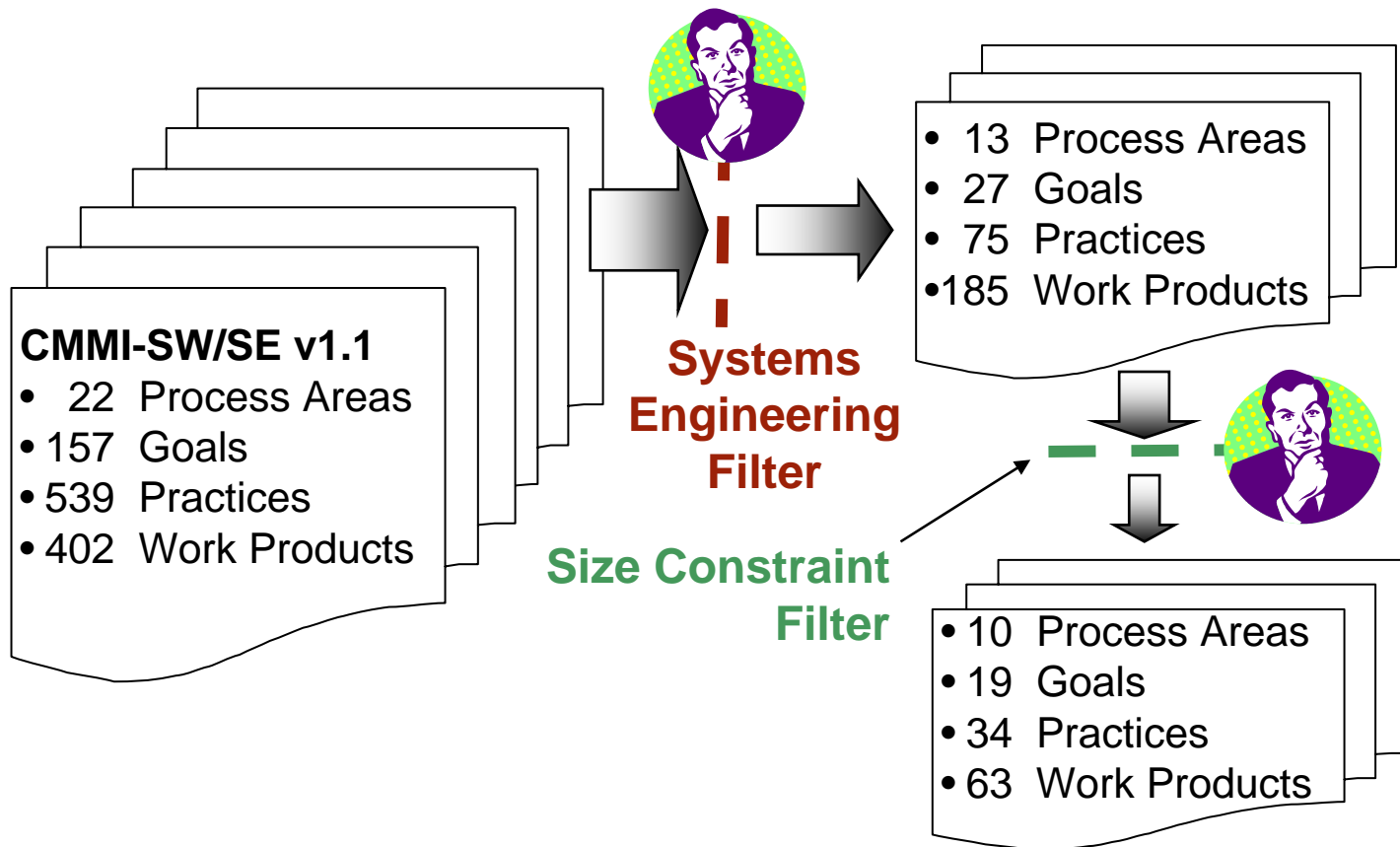
Choose the population

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



Step 3:

Define assessment of SE practices





Step 4:

Define performance measures

Utilize measures common to many organizations

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



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**



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	<p>What phases of the integrated product lifecycle comprise this project (check all that apply), and what phase are you presently executing (check 1)?</p> <div style="display: flex; align-items: center;"> <div style="font-size: 4em; margin-right: 20px; opacity: 0.5;">SAMPLE</div> <div style="border: 1px solid black; padding: 5px;"> <p>Included in project (check all that apply)</p> <p>Current phase (check 1)</p> <p><input type="checkbox"/> Concept Refinement</p> <p><input type="checkbox"/> Technology Development and Demonstration</p> <p><input type="checkbox"/> Development</p> <p><input type="checkbox"/> Manufacturing</p> <p><input type="checkbox"/> Verification</p> <p><input type="checkbox"/> Training</p> <p><input type="checkbox"/> Deployment</p> <p><input type="checkbox"/> Operation</p> <p><input type="checkbox"/> Support</p> <p><input type="checkbox"/> Disposal</p> </div> </div>
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? _____



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		Rate your agreement with the following statements				
		Strongly Disagree	Disagree	Agree	Strongly Agree	
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	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
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	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		b. ... is based upon the product structure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		c. ... is developed with the active participation of those who perform the systems engineering activities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Section 3: Performance Metrics

Earned Value

Award fees

Technical requirements
satisfaction

Milestone satisfaction

Problem reports

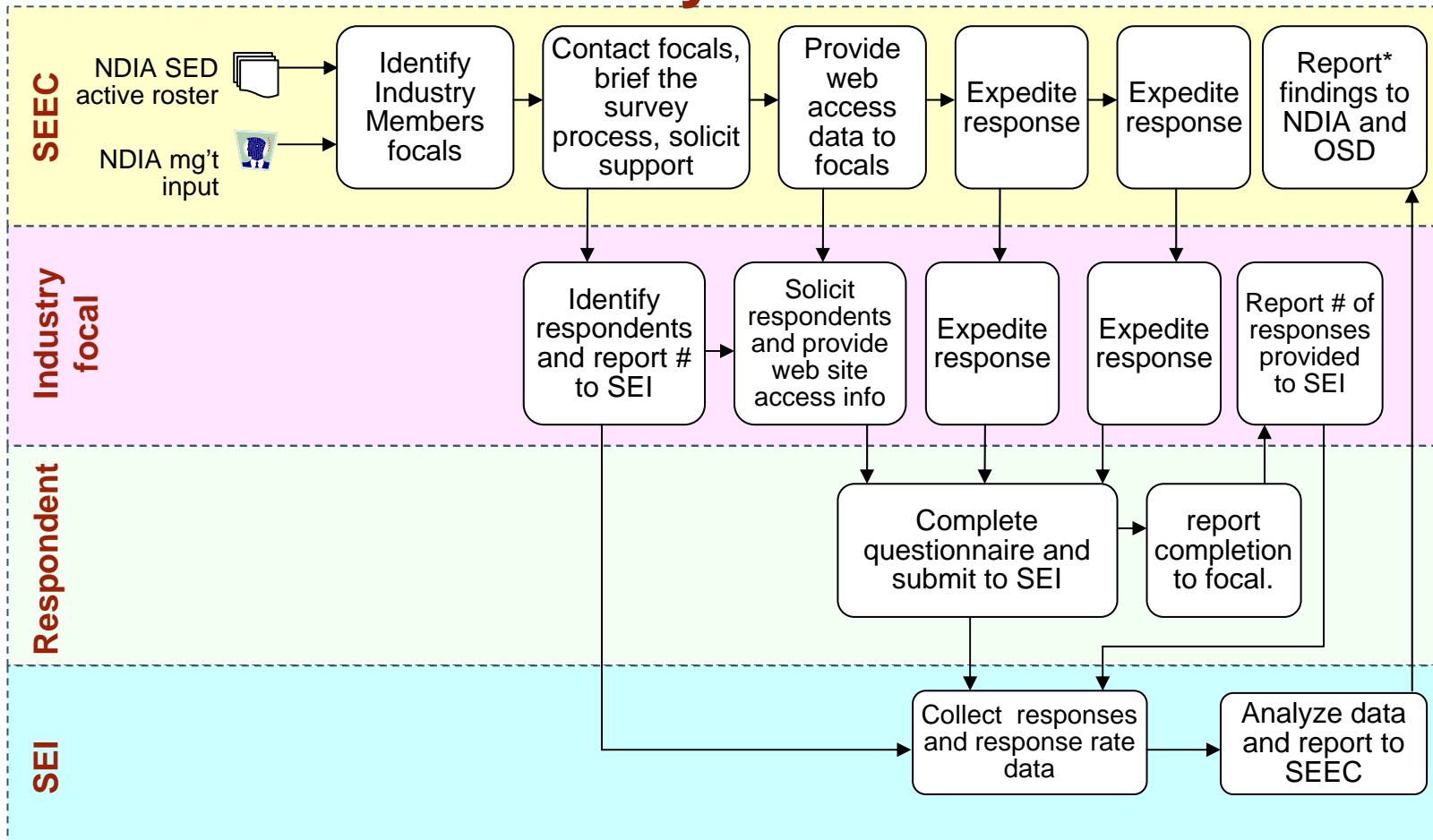
Section 3: Project Performance Metrics					
3.1 Earned Value Management System (EVMS)					
Rate your agreement with the following statements		Strongly Disagree	Disagree	Agree	Strongly Agree
3.1.1	Your customer requires that you supply EVMS data?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.1.2	EVMS data is available to decision makers in a timely manner (i.e. current within 2 weeks)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.1.3	The requirement to track and report EVMS data is levied upon the project's suppliers.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.1.4	Variance thresholds for CPI and SPI variance are defined, documented, and used to determine when	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Step 6:

Execute the survey

* Report to include suggested recommendations and actions





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.



Status

Survey instrument development complete

Web deployment complete

Pilot testing complete

Respondent identification in progress

Response collection through January

Analysis through March and April

Report in May



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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Rex Sallade	Jay R. Schrand	Sarah Sheard
Jack Stockdale	Jason Stripinis	Mike Uchino*
Ruth Wuenschel	Brenda Zettervall	

* co-chair



Conclusion

Questions ?

Contact information

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**Carnegie Mellon
Software Engineering Institute**

BACK UP



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.*