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

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

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

CMMI-SW/SE v1.1
- 22 Process Areas
- 157 Goals
- 539 Practices
- 402 Work Products

Systems Engineering Filter
- 13 Process Areas
- 27 Goals
- 75 Practices
- 185 Work Products

Size Constraint Filter
- 10 Process Areas
- 19 Goals
- 34 Practices
- 63 Work Products
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 - 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.

<table>
<thead>
<tr>
<th>Section 1: Characterization</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
</tr>
</tbody>
</table>

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)?

<table>
<thead>
<tr>
<th>Included in project (check all that apply)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concept Refinement Technology Development and Demonstration</td>
</tr>
<tr>
<td>Development Manufacturing Verification Training Deployment Operation Support Disposal</td>
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</tbody>
</table>

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 3: Performance Metrics

Earned Value

Award fees

Technical requirements satisfaction

Milestone satisfaction

Problem reports

<table>
<thead>
<tr>
<th>Section 3: Project Performance Metrics</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1 Earned Value Management System (EVMS)</td>
<td>Rate your agreement with the following statements</td>
<td></td>
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<tr>
<td>3.1.1 Your customer requires that you supply EVMS data?</td>
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<td>3.1.2 EVMS data is available to decision makers in a timely manner (i.e. current within 2 weeks)?</td>
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<td>3.1.3 The requirement to track and report EVMS data is levied upon the project’s suppliers.</td>
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<td>3.1.4 Variance thresholds for CPI and SPI variance are defined, documented, and used to determine when</td>
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</table>
Step 6:
Execute the survey

**SEEC**
- NDIA SED active roster
- NDIA mg't input

**Industry focal**
- Identify Industry Members focal
- Contact focal, brief the survey process, solicit support
- Provide web access data to focal
- Expedite response
- Expedite response
- Expedite response

**Respondent**
- Identify respondents and report # to SEI
- Solicit respondents and provide web site access info
- Expedite response
- Expedite response
- Expedite response

**SEI**
- Complete questionnaire and submit to SEI
- Collect responses and response rate data
- Analyze data and report to SEEC

* 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.
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

<table>
<thead>
<tr>
<th>Name</th>
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<tbody>
<tr>
<td>Dennis Ahearn</td>
<td>Marvin Anthony</td>
<td>Ben Badami</td>
</tr>
<tr>
<td>David P. Ball</td>
<td>Al Brown*</td>
<td>Al Bruns</td>
</tr>
<tr>
<td>Thomas Christian</td>
<td>Jack Crowley</td>
<td>John Colombi</td>
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<tr>
<td>Greg DiBenedetto</td>
<td>Jim Dietz</td>
<td>Brian Donahue</td>
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<tr>
<td>Terry Doran</td>
<td>Joseph Elm</td>
<td>John P. Gaddie</td>
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<td>Donald J. Gantzer</td>
<td>Dennis Goldenson</td>
<td>Dennis E. Hecht</td>
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<td>Ellis Hitte</td>
<td>James Holton</td>
<td>George Kailiawai</td>
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<td>Ed Kunay</td>
<td>Jeff Loren</td>
<td>John Miller</td>
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<td>Gordon F. Neary*</td>
<td>Brad Nelson*</td>
<td>Rick Neupert</td>
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<td>Brooks Nolan</td>
<td>Michael Persson*</td>
<td>Bob Rassa</td>
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<td>Rusty Rentsch</td>
<td>Paul Robitaille</td>
<td>Garry Roedler</td>
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<td>Rex Sallade</td>
<td>Jay R. Schrand</td>
<td>Sarah Sheard</td>
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<td>Jack Stockdale</td>
<td>Jason Stripinis</td>
<td>Mike Ucchino*</td>
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<tr>
<td>Ruth Wuenschel</td>
<td>Brenda Zettervall</td>
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* co-chair
Conclusion

Questions?

Contact information

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jelm@sei.cmu.edu

THANK YOU
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.