Using CMMI® Effectively for Small Business

— Panel —

(With interactive discussion from panel and audience recorded in slides)

NDIA CMMI® Working Group
NDIA Systems Engineering Division

2010 CMMI Technology Conference
Is CMMI for Small Business?

The NDIA CMMI Working Group was tasked to investigate common questions on the applicability of CMMI to small business

- Is CMMI appropriate for small businesses?
- Is CMMI a barrier to competition in the defense market?
- What data substantiates the adoption of CMMI by small business?
- What challenges do small businesses face for adoption?
- How can acquirers use CMMI to manage their acquisition risks with small suppliers?


Panel discussions will be recorded in this slide set, as applicable.
Panelists –
Using CMMI Effectively for Small Business

Lynn Penn
Lockheed Martin

Girish Seshagiri
Advanced Information Services (AIS)

Rosalind Singh
Raytheon Company

Dr. Rick Welch
Northrop Grumman
What advantages and obstacles do small businesses face relative to CMMI adoption?

<table>
<thead>
<tr>
<th>Small Business Advantages</th>
<th>Small Business Obstacles</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Innovation, speed, agility</td>
<td>• CMMI: too big, too complex? Sometimes more perception than reality – usually appears in plans</td>
</tr>
<tr>
<td>• Commonality across projects, tailoring?</td>
<td>• Fewer dedicated resources (staff, $). Everybody is a shared resource, sharing time with competing demands.</td>
</tr>
<tr>
<td>• Fewer communication paths</td>
<td>• Roles, responsibilities - multiple hats (QA, Test, Process Group, training, …)</td>
</tr>
<tr>
<td>• Simpler process/tools (low tech solutions)?</td>
<td>• Infrastructure/overhead costs, amortization?</td>
</tr>
<tr>
<td>• Easier institutionalization across projects?</td>
<td>• Cultural resistance or bias?</td>
</tr>
<tr>
<td>• Fewer people filling multiple roles allows easier to connect the dots</td>
<td>• Small project, site, organization</td>
</tr>
<tr>
<td>• Able to be more nimble, react to changes more quickly</td>
<td>• Run out of people to provide objective input. Must procure external resources to provide feedback.</td>
</tr>
<tr>
<td>• Fewer approvals and needed, greater coverage.</td>
<td>• Can be difficult to restructure existing working relationships – doing things differently. “Culture eats process for lunch”</td>
</tr>
<tr>
<td>• Less documentation needed for fewer people – 1 page descriptions can suffice. Set thresholds, entry/exit criteria, etc.</td>
<td></td>
</tr>
<tr>
<td>• Alignment and communication of objectives is straightforward.</td>
<td></td>
</tr>
<tr>
<td>• Clear rationale for process changes.</td>
<td></td>
</tr>
</tbody>
</table>
Improving Processes in Small Settings (IPSS)

Just enough process, just in time to support the needs in small settings

Obstacles were outweighed by the advantages – similar to the prior slide

Integrating best practices, listening, facilitating

Defining the process tolerance
Supporting Small Suppliers

Acquirers (such as prime contractors) often use CMMI practices to select, manage, and support their small suppliers.

Typical uses of CMMI within larger companies when working with smaller suppliers:

- CMMI maturity level requirements rarely specified to subs unless levied by external customer
- Use CMMI practices in key areas to evaluate supplier risks
- Checklists or tools used for supplier selection
- May require suppliers to follow prime contractor’s processes
- Provide direct support to suppliers – training, mentoring, tools, etc.
- Customize areas of interest per the situation.
- Subcontracting, partnering
- Find gaps that need to be filled (e.g., EVMS, federal contracting)
- Smaller companies may not have in-house expertise in some CMMI PAs (e.g., HiMat)

Risk Based Subcontractor Assessment
Lockheed Martin Corporation
Developed Resources

- Created Risk-Based Subcontractor Assessment Guidebook:
  - Includes initial and on-going evaluations
  - Defines assessment team roles and responsibilities
  - Explains how and who to interview during a subcontractor evaluation
  - Provides information on how to generate a risk management plan based on the results of the evaluation

- Created a Risk-Based Assessment Tool (RBAT)
  - Comprehensive questionnaires
  - Scoring/Weighting
  - Tailoring (adding / deleting)
  - Summary roll-up
Screen Shot of Summary Sheet of RBAT

Pre-Award Subcontractor Assessment

Subcontractor:
Company: [blank]
Address: [blank]

Assessment Date: [blank]
State: [blank] Country: [blank]
Zip: [blank] Province: [blank]

Contact (POC):
Name: [blank]
Title: [blank]
Email: [blank]
Phone: [blank]
Fax: [blank]

Assessment Team:
Assessor POC: [blank]
Title: [blank]
Email: [blank]
Notes: [blank]

Overall Results
0 0 Weighted: [blank]

Penetration
Score Actual Max Possible Weight Factor Weighted Score

| x to include | Risk Area | Topic | | | |
|--------------|-----------|-------|------------|------------|------------|-------------|
| x | 1 | Requirements Management | | 0 | 0 |
| x | 2 | Project Planning | | 0 | 0 |
| x | 3 | Project Monitor and Control | | 0 | 0 |
| x | 9 | Requirements Development | | 0 | 0 |
| x | 10 | Product Integration | | 0 | 0 |

Click to jump to that Risk Area Worksheet
Place an ‘x’ in this column to include this Risk Area in the Assessment; make it blank to hide that worksheet.

Click on the Risk Area number or Topic to jump to that worksheet.

Assign a Weight Factor to each Risk Area which can increase/decrease its significance in the overall results.

Data from here on down are automatically calculated on the Risk Area worksheets. See the Introduction worksheet for.
Screen Shot of Risk Sheet of RBAT

### Risk Area: Requirements Management

**Description:**
The purpose of Requirements Management (REQM) is to:
1. Develop an understanding of the requirements from the customer.
2. Obtain commitment from project participants.
3. Manage changes to requirements as they evolve.
4. Maintain traceability between requirements and project plans.
5. Identify inconsistencies between requirements and plans.

**Navigation:**
- Jump to previous Worksheet
- Jump to the Summary Worksheet
- Advance to next Worksheet

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<table>
<thead>
<tr>
<th>#</th>
<th>Question</th>
<th>Listen For</th>
<th>Objective Evidence</th>
<th>Evaluator Notes</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>Describe how to select projects.</td>
<td>What to listen for in the Subcontractor’s response to the question. Not included in the Pre-Assessment workbook.</td>
<td>Change control, meeting with “customer” to understand intent, templates for inclusion of primary/secondary requirements, established and maintained.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.3</td>
<td>Describe your change control process.</td>
<td></td>
<td>Procedure or documented process</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.4</td>
<td>What tools are utilized to support the requirements management activities during the engineering and development life cycle?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**
Room to detail their response. Only the first 1000 characters will show when you click on the cell. 32000 max

**Completion column:**
- 'X' To signify when a question is completed
- 'N' No result is attached to this type of item used to introduce a high-level probing question
- Blank: Question has not been resolved. Use dropdown box to choose

**Results:**
Final Score given for question. Use dropdown box to choose:
- 5: Fully compliant
- 3: Partially compliant
- 0: Deficient
- N/E: Not Evaluated

Lefthand side is a Probing Question, righthand side is a follow-up. An underlined Probing value means it is the average of all related follow-up questions.
What risks or issues do acquirers see from working with small suppliers?

<table>
<thead>
<tr>
<th>Risks / Issues</th>
<th>Acquirer Mitigation Approach?</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Processes: completeness, integration?</td>
<td></td>
</tr>
<tr>
<td>• Product reqts, interfaces, integration?</td>
<td></td>
</tr>
</tbody>
</table>
How do you approach integrating prime/supplier processes and products?

<table>
<thead>
<tr>
<th>Process/product integration techniques</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Common processes/tools? Integrated processes/tools? Separate processes/tools?</td>
</tr>
</tbody>
</table>
What recommendations do you have for small businesses interested in adopting CMMI?

<table>
<thead>
<tr>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Look at your teams – PSP, TSP. Within 2 years planning processes will be in place. Do gap analyses to improve. Achieve ML3 in 36 months, Level 5 using PSP/TSP.</td>
</tr>
<tr>
<td>• Use the company’s culture and terminology to communicate in their terms – not CMMI.</td>
</tr>
<tr>
<td>• Appraisals used to be discovery oriented – appraisal did the evaluation and mapping to CMMI. Now, the emphasis is on preparing artifacts and evidence, with little value to the business.</td>
</tr>
<tr>
<td>• Top management buy-in – important in companies of all sizes.</td>
</tr>
<tr>
<td>• Language used in CMMI can be difficult to relate to – more in the context of a large defense contractor. Translation to a small company can be very difficult.</td>
</tr>
<tr>
<td>• Treat process improvement like a project – project plans, etc.</td>
</tr>
</tbody>
</table>
For More Information….

NDIA CMMI Working Group


Jim Armstrong  
Stevens Institute  

Geoff Draper  
Harris Corporation  

Wendell Mullison  
General Dynamics, Land Systems  

Steve Austin  
Lockheed Martin  

Jeffrey L. Dutton  
Jacobs Technology  

Rick Welch  
Northrop Grumman  

Dan Blazer  
SAIC  

Nancy Fleischer  
Raytheon Company  

Michael Campo  
Raytheon Company  

Kathy Smith  
Hewlett Packard EDS  

With special appreciation to our panelists:

Lynn Penn, Lockheed Martin  
Rosalind Singh, Raytheon Company  

Rick Welch, Northrop Grumman  
Girish Seshagiri, AIS
Risk Based Subcontractor Assessment

Lockheed Martin Corporation
Risk Based Subcontractor Assessment Topics

- Issues
- Identification of Risk Areas
- Developed Resources
- Initial and On-going Evaluations
- Risk Areas for Evaluation
- Risk Area Questionnaire
- Risk Report
- Summary
Analysis has shown that engineering subcontractors may impact Lockheed Martin Company program success:
- Subcontract content and design responsibility on programs continues to grow
- Lack of diligence in subcontract management can be a primary cause of program failure

Issues become more obvious when the subcontractor is:
- A major program contributor (greater than 10% of the total contract value)
- A Sole Source supplier
- On the program critical path
- Considered a medium to high risk to program performance
- New to Lockheed Martin with no performance history
- A past supplier to Lockheed Martin with problematic performance history
Identification of Risk Areas

- Multiple studies conducted to identify key risk areas
  - Multiple recurring problem themes
  - Results were consistent with the Software Engineering Institute’s CMMI for Development model
- Adopted the framework of CMMI–DEV to focus on the likelihood of a subcontractor’s success
Developed Resources

- Created Risk-Based Subcontractor Assessment Guidebook:
  - Includes initial and on-going evaluations
  - Defines assessment team roles and responsibilities
  - Explains how and who to interview during a subcontractor evaluation
  - Provides information on how to generate a risk management plan based on the results of the evaluation

- Created a Risk-Based Assessment Tool (RBAT)
  - Comprehensive questionnaires
  - Scoring/Weighting
  - Tailoring (adding / deleting)
  - Summary roll-up
**Screen Shot of Summary Sheet of RBAT**

### Pre-Award Subcontractor Assessment

#### Contact Data
- **Subcontractor:**
  - Company: [ ]
  - Address: [ ]
  - Assessment Date: [ ]
- **State:** [ ]
- **Zip:** [ ]
- **Country:** [ ]
- **Province:** [ ]

#### Assessment Team
- **Assessor POC:**
  - Name: [ ]
  - Title: [ ]
  - Email: [ ]

#### Overall Results
- [ ] 0
- [ ] 0
- Weighted: [ ]

### Click to jump to that Risk Area Worksheet

<table>
<thead>
<tr>
<th>x to include</th>
<th>Risk Area</th>
<th>Topic</th>
<th>Score</th>
<th>Penetration</th>
</tr>
</thead>
<tbody>
<tr>
<td>x</td>
<td>1</td>
<td>Requirements Management</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>x</td>
<td>2</td>
<td>Project Planning</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>x</td>
<td>3</td>
<td>Project Monitor and Control</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>x</td>
<td>4</td>
<td>Quality Assurance</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>x</td>
<td>5</td>
<td>Technical Solution</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>x</td>
<td>6</td>
<td>Product Integration</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**Assign a Weight Factor to each Risk Area which can increase/decrease its significance in the overall results.**

**Click on the Risk Area number or Topic to jump to that worksheet.**

**Place an ‘x’ in this column to include this Risk Area in the Assessment; make it blank to hide that worksheet.**

**Data from here on down are automatically calculated on the Risk Area worksheets. See the Introduction worksheet for**

**Help for this worksheet.**

**Jump to Introduction.**

**Advance to next worksheet.**

**Hide these annoying boxes.**
**Screen Shot of Risk Sheet of RBAT**

### Risk Area 1: Requirements Management

**Description:**

The purpose of Requirements Management (REQM) is to:
1. Develop an understanding of the requirements for the project.
2. Obtain commitment from project participants.
3. Manage changes to requirements as they evolve.
4. Maintain traceability between requirements and plans.
5. Identify inconsistencies between requirements and the project's plans and work products.

**Navigation:**
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**View Risk Area questions**

**Help for this worksheet**

<table>
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<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>Describe how projects.</td>
<td>List for in the Subcontractor's response to the question. Not included in the Pre-Assessment workbook.</td>
<td>Change control, meeting with “customer” to understand intent, templates for inclusion of primary SUPPLEMENTARY requirements data, relationships established and maintained.</td>
<td>1. Meeting minutes from working group or technical exchange meetings 2. Requirements management policy 3. Tools used, sample templates &amp; reports</td>
<td>Blank</td>
</tr>
<tr>
<td>1.1</td>
<td>What to listen for the Subcontractor's response? High-level probing questions end in .0 with a yellow background. Subsequent questions that are right aligned are for follow-up. Only Probing questions will be included in the Progress Assessment workbook.</td>
<td>Questions</td>
<td>1. Sign off sheets from meetings with list of “organizations” represented - not just names (need an Org. chart to trace).</td>
<td>Completion column</td>
<td></td>
</tr>
<tr>
<td>2.0</td>
<td>Describe your change control process.</td>
<td>Objective Evidence: What to look for from the Subcontractor. Optionally included in the Progress Assessment workbook.</td>
<td>1. Checklists that include documents to be reviewed, changes from requirement changes 2. Group reviews / minutes</td>
<td>Results: Final Score given for question. Use dropdown box to choose.</td>
<td></td>
</tr>
<tr>
<td>2.1</td>
<td>What tools are utilized to support the requirements management activities during the engineering development life cycle?</td>
<td>Notes: Room to detail their response. Only the first 1000 characters will show when you click on the cell. 3200 max</td>
<td>1. Procedure or documented process 2. Signoff sheet form (request change) 3. Change Control Board minutes</td>
<td>n/a Not Evaluated</td>
<td></td>
</tr>
</tbody>
</table>

**Completion column:**
- 'X': To signify when a question is completed.
- 'N': No result is attached to this type of item used to introduce a high-level probing question.

**Blank:** Question has not been resolved. Use dropdown box to choose a score.
## Initial and On-Going Evaluations

Differences in two types of Evaluations

<table>
<thead>
<tr>
<th></th>
<th>Initial</th>
<th>On-Going</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>When</strong></td>
<td>Prior to Contract Award</td>
<td>Anytime after Contract Award: Regular intervals or on demand</td>
</tr>
<tr>
<td><strong>Duration</strong></td>
<td>1 – 2 days</td>
<td>1 day</td>
</tr>
<tr>
<td><strong>Emphasis</strong></td>
<td>Generalized Fact Finding</td>
<td>Project implementation and risk</td>
</tr>
<tr>
<td><strong>Quantitative Results Important</strong></td>
<td>Yes – for multiple Subcontractor Evaluation No – for sole source</td>
<td>No</td>
</tr>
<tr>
<td><strong>Scope of Review</strong></td>
<td>Subcontractor</td>
<td>Subcontractor, Lockheed Martin Prime, Customer</td>
</tr>
<tr>
<td><strong>Risk Areas</strong></td>
<td>Potentially all</td>
<td>Can be more focused, depending on the lifecycle phase</td>
</tr>
</tbody>
</table>
Risk Area – Starter Set

17 key Risk Areas, but what constitutes a good “starter set”?

- Requirements Management
- Risk Management
- Verification
- Validation
- Measurement and Analysis
- …and perhaps Supplier Agreement Management, if next tier suppliers exist

Tool allows for tailoring, prioritizing, and custom probing
Risk Area Questionnaire

Probing a Risk Area – Best Practices

- Keep it simple
- Limited number of good questions
- Backup questions (for added clarity)
- Review objective evidence if available
- Be mindful of expected responses
- Look for integration themes (threading)
- Tailor/add/delete/prioritize questions for effectiveness
- Note risks as they are uncovered
- Keep Subcontractor grading feedback to a minimum during evaluation
- Limit evaluation duration (within a day in most cases)
- Generate a risk report and execute to it
Risk Reports

- No Subcontractor is a perfect match
- Using a standard evaluation strategy and querying multiple potential risk areas should:
  - Provide a more accurate portrayal of Subcontractor capability earlier in the lifecycle
  - Enable risk management kickoff, when necessary
  - Ultimately strengthen the LMC/Subcontractor relationship
Guidebook and Tool provide our LM companies with information that enables:

- More confident source selection
- On-going review / risk management during a program’s development cycle
- More sharing of subcontractor evaluation data across the corporation

Process and tool can be used with any size Subcontractor

Completing an assessment AND proactive risk management compose the solution framework