Capability Maturity Model Integration (CMMI®) From a Project Management Perspective

Jesse Martak, President
Martak Consulting Services, Inc.
March 30, 2004
Presentation Topics

• Background on CMM® and CMMI®
• Features of the CMMI® model
• CMMI® emphasis on project management
• CMM® and CMMI® Implementation
• Lessons Learned
The Software Engineering Institute (SEI)

- Federally Funded Research & Development Center (FFRDC) at Carnegie Mellon University
- Mission is to foster improvement of project and software processes
- Developed Capability Maturity Model® (CMM®) and Assessment Methodology (CBA IPI)
- Developed Capability Maturity Model Integration (CMMI®) and Appraisal Methodology (SCAMPI℠)
- SEI authorizes lead appraisers to facilitate CBA IPI and SCAMPI℠ appraisals
The Evolution of CMMI from Other Models

Best Value/Best Practice
- Organization
- Industry Reports

Industry Standards
- SEI CMM
- SE CM & EIA 731
- ISO

Capability Model Integration
- CMMI

Customer Needs

Best Value/Value Added

Prime Contractor Specs

EIA/IS 731 Key to Rapid CMMI Transition
What are the CMM® and CMMI®?

- Models for organizational Process Improvement (PI) and improved practices
  - They benchmark the process not the product
- Community-owned PI framework to support an organization’s process improvement project
  - Facilitates identifying, importing, and adopting best practices
  - Framework includes reference models, training products and appraisal methods
- An underlying structure for reliable and consistent project and organization process appraisals
Process Management Premise

• An undefined process cannot be controlled (or measured)
• An uncontrolled process cannot be improved
• Attempting to improve an unstable process yields further instability

Adapted from SEI
CMMI® Models and Representations

• CMMI® Models
  – CMMI® - SW (Software only)
  – CMMI® - SE/SW (Systems & Software)
  – CMMI® - SE/SW/IPPD (+Integrated Product & Process Development)
  – CMMI® - SE/SW/IPPD/SS (+Supplier Sourcing)

• CMMI® Representations
  – Staged Representation
  – Continuous Representation
## The Evolution of Process Areas from CMM® to CMMI®

<table>
<thead>
<tr>
<th>Level</th>
<th>CMM Key Process Areas (KPA’s)</th>
<th>CMMI Process Areas (PAs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 Optimizing</td>
<td>Process Change Management&lt;br&gt;Technology Change Management&lt;br&gt;Defect Prevention ..................</td>
<td>Organizational Innovation and Deployment&lt;br&gt;Causal Analysis and Resolution</td>
</tr>
<tr>
<td>4 Quantitatively Managed</td>
<td>Software Quality Management&lt;br&gt;Quantitative Process Management</td>
<td>Organizational Process Performance&lt;br&gt;Quantitative Project Management</td>
</tr>
<tr>
<td>3 Defined</td>
<td>Software Product Engineering&lt;br&gt;Peer Reviews ..................................................</td>
<td>Requirements Development&lt;br&gt;Technical Solution&lt;br&gt;Verification&lt;br&gt;Validation&lt;br&gt;Organizational Process Focus&lt;br&gt;Organizational Process Definition&lt;br&gt;Organizational Training</td>
</tr>
<tr>
<td></td>
<td>Organizational Process Focus ..................&lt;br&gt;Organizational Process Definition ..........&lt;br&gt;Training Program ..................&lt;br&gt;Intergroup Coordination&lt;br&gt;Integrated software Management ..............</td>
<td></td>
</tr>
<tr>
<td>2 Managed</td>
<td>Requirements Management&lt;br&gt;Software Project Planning&lt;br&gt;Software Project Tracking &amp; Oversight&lt;br&gt;Software Sub-contract Management</td>
<td>Requirements Management&lt;br&gt;Project Planning&lt;br&gt;Project Monitoring and Control&lt;br&gt;Supplier Agreement Management&lt;br&gt;Measurement and Analysis&lt;br&gt;Process and Product Quality Assurance&lt;br&gt;Configuration Management</td>
</tr>
<tr>
<td>1 Initial</td>
<td>Requirements Management&lt;br&gt;Project Planning&lt;br&gt;Software Project Planning&lt;br&gt;Software Project Tracking &amp; Oversight&lt;br&gt;Software Sub-contract Management</td>
<td>Requirements Management&lt;br&gt;Project Planning&lt;br&gt;Project Monitoring and Control&lt;br&gt;Supplier Agreement Management&lt;br&gt;Measurement and Analysis&lt;br&gt;Process and Product Quality Assurance&lt;br&gt;Configuration Management</td>
</tr>
</tbody>
</table>
The Continuous Representation Has Six Capability Levels

5  Optimizing
4  Quantitatively Managed
3  Defined
2  Managed
1  Performed
0  Incomplete
A Comparison of the Staged and the Continuous

Continuous

...for a single process area
or a set of process areas

Staged

...for a specified set of
process areas across an
organization
Reduced Risk; Improved Productivity and Quality

With increasing maturity
- Accuracy increases
- Variance reduces
- Target improves

Optimizing
Quantitatively
Managed
Defined
Managed
Initial

With increasing maturity
- Accuracy increases
- Variance reduces
- Target improves
How CMMI® Supports Planning and Managing a Project

• Project Management process areas
• Engineering process areas
• Support process areas
• Process Management process areas
### Primary Focus of Project Management Process Areas

<table>
<thead>
<tr>
<th>Area</th>
<th>Tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Planning</td>
<td>• Establish and maintain estimates</td>
</tr>
<tr>
<td></td>
<td>• Develop a project plan</td>
</tr>
<tr>
<td></td>
<td>• Obtain commitments to the plan</td>
</tr>
<tr>
<td>Project Monitoring &amp; Control</td>
<td>• Monitor project against the plan</td>
</tr>
<tr>
<td></td>
<td>• Manage corrective actions to closure</td>
</tr>
<tr>
<td>Risk Management</td>
<td>• Prepare for risk management</td>
</tr>
<tr>
<td></td>
<td>• Identify and analyze risks</td>
</tr>
<tr>
<td></td>
<td>• Mitigate risks</td>
</tr>
<tr>
<td>Supplier Agreement Management</td>
<td>• Establish supplier agreements</td>
</tr>
<tr>
<td></td>
<td>• Satisfy supplier agreements</td>
</tr>
</tbody>
</table>
## Primary Focus of Engineering

### Process Areas

<table>
<thead>
<tr>
<th>Requirements Management</th>
<th>• Manage requirements and reconcile inconsistencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Requirements Development</td>
<td>• Develop customer requirements</td>
</tr>
<tr>
<td></td>
<td>• Develop product requirements</td>
</tr>
<tr>
<td></td>
<td>• Analyze and validate requirements</td>
</tr>
<tr>
<td>Technical Solution</td>
<td>• Select product-component solutions</td>
</tr>
<tr>
<td></td>
<td>• Develop the design</td>
</tr>
<tr>
<td></td>
<td>• Implement the design</td>
</tr>
<tr>
<td>Product Integration</td>
<td>• Prepare for product integration</td>
</tr>
<tr>
<td></td>
<td>• Ensure interface compatibility</td>
</tr>
<tr>
<td></td>
<td>• Assemble product components &amp; deliver product</td>
</tr>
<tr>
<td>Verification &amp; Validation</td>
<td>Prepare for &amp; perform Verification &amp; Validation</td>
</tr>
<tr>
<td></td>
<td>Perform peer reviews</td>
</tr>
</tbody>
</table>
# Primary Focus of Support

## Process Areas

| Configuration Management | • Establish product baselines  
|                         | • Track and control changes  
|                         | • Establish baseline integrity |
| Quality Assurance       | • Objectively evaluate processes and products  
|                         | • Provide objective insight to engineering & management |
| Measurement & Analysis  | • Business focus for measurement & analysis activities  
|                         | • Provide measurement results |
| Decision Analysis & Resolution | • Evaluate alternatives using established criteria |
# Primary Focus of Process Management Process Areas

| Organizational Process Focus | • Determine process improvement opportunities  
|                            | • Plan and implement process improvement opportunities |
| Organizational Process Definition | • Establish organizational process assets |
| Organizational Training | • Establish an organizational training capability  
|                            | • Provide the necessary training |
| Integrated Project Management | • Use organizational assets to establish project’s process  
|                            | • Manage the project using integrated plans  
|                            | • Coordinate and collaborate with relevant stakeholders |
Lessons Learned When Implementing CMM® and CMMI®

• Establish infrastructure early
• Manage process improvement like a project
• Include project personnel
• Pilot on select projects prior to deployment
• Process training essential to success
• Consider an integrated program plan across all disciplines
Infrastructure Creates Efficiency and Improvement

- Improve Business Performance
- Integrated Enterprise Process
- Electronic Integration
- Fewer is Better
- Single Network

Process

Tools-to-Process Enablers

Standard Tools

Standard Platforms and Network

Metrics
Basics of Getting Started

- Select the appropriate process group staff to achieve goals
  - Project experience
  - QA & CM reps
  - Core group full time
  - Working groups channel part-time resources
  - Outside resources

- Establish the (S)EPG, PAL, Training DB & Measurement System as soon as possible – Level 2 as foundation for higher levels
Successful Planning Includes Designers

- (S)EPG/PCCB: Process Group
- PICT: Process Improvement Core Team (Users’ Group)
- TWG: Technology Working Groups
- Systems, Hardware and Software Engineers
Process Improvement is a “Project” of Itself – Not an Organizational Task

- Requirements must be well defined
- Build a little; test a little for proof of concept & methods
- Use experts to kick start the process
- Long Range Strategic Plan - vision
- Monthly Senior Mgmt reviews
- “Peer Reviews” for “buy-in”
- Staffing Needs and Capabilities Evolve over Time
Piloting Gets The Kinks Out Early Reducing User Dissatisfaction

- Small set of 1 to 3 projects
  - Mature
  - Open minded
- Midcourse Corrections
- Effective (S)EPG Support
- Formal Reviews
- Alternate Funding Sources
- Advantages
  - Verify process & data
  - Obtain buy-in of projects

Before rolling out process to the total organization ...

... mature the process and tools to neutralize the “nay-sayers”
Educating the Work Force

- Use classroom, mentoring and just-in-time training
- Advantages of just-in-time training
  - Mentor/trainer assigned to projects
  - Real project artifacts as homework problems
  - Mentor/trainer helps project tailor process
  - More time efficient for project leaders
- Select right personnel for mentors/trainers
Transition to CMMI Introduced
Process Integration Requirements
as well as Unique Cultural Issues
with Systems and Hardware Engineering
Integrated Program Plan Is Key Element

- Total Program Plan
  - Program Overview
  - Program Organization
  - Integrated Schedules
  - Integrated Metrics

- Comprehensive Plans
  - Processes
  - Work Products
  - Key Milestones
  - Acceptance Criteria
  - Responsibility
Cooperative Effort Yields Success

• Evaluate and adopt software processes that demonstrate value added, such as peer reviews
• Expand software quality role to include “total” process evaluations to program plans
• Eliminate “stovepipe” plans (unless contractual)
• Select program managers & pilots with innovative nature
Higher Levels Focus on Optimizing ROI

- Projects must take charge & drive process
- Data consistency becomes critical
- User participation increases at higher levels (Lots of data - engineer’s dream “FUN”)
- Results must clearly show return on investment (ROI)
Keys to Success – CMM or CMMI

• Get support of *senior management*
• Install *strong managers* in pilot programs
• Include *process lead* in project’s budget
• Provide *mentors* to programs
• Start small - select a few key *pilot projects*
• Maintain involvement of designers as *team members*
• Provide an easy to use *system interface*
• Use *statistics* to provide feedback and improve products
Acknowledgements

- ® CMM, CMMI and Capability Maturity Model are registered in the U.S. Patent and Trademark Office by Carnegie Mellon University

- SMSCAMPI and IDEAL are service marks of Carnegie Mellon University
Jesse Martak, President
Martak Consulting Services, Inc.
3959 White Rose Way
Ellicott City, MD – 21042
Jmartak@aol.com
410-465-3923 (office)
410-804-8954 (cell)