CMMI:
Fitting a Vision to Program Execution Needs

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The initial vision for CMMI was to integrate the competing maturity models and provide a framework for more consistent process improvement

- Cause integration of the functional disciplines within organizations and across programs
- Increase systems engineering and software process maturity as organizations migrate from the sun-setting CMMs to CMMI

*Extract: 2004, 2005, 2006 CMMI Conference Keynotes*
Progress Toward Executing the Vision

We have attained the original vision
We have taken steps to address CMMI issues:
  - Integrity issues with appraisals
  - Guidance for acquiring organizations

Current Issues:
  - Staged vs. Continuous
    - Cost of levels versus Return on Investment
  - High Maturity
    - Level 4 and 5 inconsistency
    - High maturity appraisals and training
    - Relationship to other continuous process improvement initiatives
  - Next Gen Process Improvement
    - How do we revise the CMMI vision to meet program execution needs?
What are the systemic issues that need to be addressed?
The Real World and CMMI: Relationship between CMMI and Program Execution*

- Programs adhering to organizational processes:
  - 85% of programs find the supplier performs their defined processes with minor non-compliance

- For programs that don’t adhere to processes:
  - Primary reasons are schedule, cost, and customer impact

- There does not appear to be a link between maturity levels and program performance
  - No correlation between maturity levels and cost variance or CPI
  - Indication of negative correlation between ML and schedule variance or SPI

- There does not appear to be cost and schedule improvement from ML3 -> ML5

*DCMA Data Findings (2007)
Program Support Review Activity
(since March 2004)

- PSRs/NARs completed: 42
- AOTRs completed: 10
- Nunn-McCurdy Certifications: 10
- Participation on Service-led IRTs: 2
- Technical Reviews: 9
- Reviews planned for remainder FY07
  - PSRs/NARs: 12
  - AOTRs: 2
  - Nunn-McCurdy: 6
  - Technical Reviews: 3

Service-Managed Acquisitions

- Air Force: 39%
- Marine Corps: 8%
- Navy: 19%
- Army: 26%
- Agencies: 8%

Programs by Domain Area

- Missiles: 8%
- Fixed Wing: 21%
- Business: 3%
- Space: 5%
- Rotary Wing: 16%
- Munitions: 4%
- Ships: 7%
- Unmanned: 4%
- Other: 7%
- Land: 15%
- C2-ISR: 10%
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| 1. Management | IPT roles, responsibilities, authority, poor communication  
Inexperienced staff, lack of technical expertise |
| 2. Requirements | Creep/stability  
Tangible, measurable, testable |
| 3. Systems Engineering | Lack of a rigorous approach, technical expertise  
**Process compliance ≠ Program execution** |
| 4. Staffing | Inadequate Government program office staff |
| 5. Reliability | Ambitious growth curves, unrealistic requirements  
Inadequate test time for statistical calculations |
| 6. Acquisition Strategy | Competing budget priorities, schedule-driven  
Contracting issues, poor technical assumptions |
| 7. Schedule | Realism, compression |
| 8. Test Planning | Breadth, depth, resources |
| 9. Software | Architecture, design/development discipline  
Staffing/skill levels, organizational competency (process) |
| 10. Maintainability/Logistics | Sustainment costs not fully considered (short-sighted)  
Supportability considerations traded |
Nine key visible failures:

- Change in doctrine, driving quantity or mission changes
- Requirements problems (immature, unrealistic, not stable, creep, etc)
- Lack of a robust baseline
- Inadequate SE/T&E, risk management, and/or FMECA
- Inadequate staffing/experience/oversight levels
- Poor reliability
- Acquisition reform
- Schedule/cost realism (concurrency, estimation, etc)
- Contract (warranty, price curves, TSPR, etc)

**Processes in place ≠ Program Execution**
## 10 Emerging Systemic Issues from Triage Assessment

<table>
<thead>
<tr>
<th>Issue</th>
<th>Number of Programs</th>
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<tr>
<td>1. Insufficient trade space (resources)</td>
<td>24 programs (37%)</td>
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<td>2. Insufficient schedule trade space</td>
<td>22 programs (34%)</td>
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<td>3. Budget not properly phased/ magnitude to support planned developmental (SE, T&amp;E, production, etc.) efforts</td>
<td>17 programs (26%)</td>
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<td>4. Concurrent test program</td>
<td>16 programs (25%)</td>
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<tr>
<td>5. Insufficient performance/ requirements trade space</td>
<td>16 programs (25%)</td>
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<td>6. Operational or Developmental performance results indicate not effective/ suitable or KPPs not meeting threshold</td>
<td>15 programs (23%)</td>
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<td>7. Lack of JROC-validated requirements document for basic program (ORD, CDD, CPD)</td>
<td>14 programs (22%)</td>
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<td>8. Funding instability</td>
<td>14 programs (22%)</td>
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<td>9. Inadequate implementation of EVMS and use of EVM as a vehicle for planning, executing, and controlling the program</td>
<td>14 programs (22%)</td>
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<td>10. Current unit cost factors indicate significant/ critical APB breach</td>
<td>12 programs (19%)</td>
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Emerging systemic analyses point to the following 2 core root cause areas and their top 4-5 drivers:

**POOR BUSINESS PRACTICES**
- Requirements Definition
- Contracting Practices/Provisions

**CULTURE**
- Management
- Technical Processes (compliance, rigor, technical expertise)

**Acquisition Practices** (competing budgets, poor technical assumptions, etc.)
- Organization
- Communications

*An “Execution Discipline” problem… Solutions need to address “state-of-the-practice” vice “state-of-the-art”*
Let’s Review…

ÂStaged vs. Continuous

ï DoD does not encourage use of levels
ï Current practice of attaining levels
   Â Continues to drive program/enterprise cost
   Â Does not correlate to program success
   Â Contributes to acquirers and developers not having to “think” about program execution

ÂHigh Maturity

ï High maturity is ill defined/narrowly applied -- vice adopting CPI in all required areas

ÂNext Gen Process Improvement

ï Starting programs right ï disciplined execution ï highest probability for program success
ï We must address state of the practice, vice state of the art

**Fit CMMI Vision to Program Execution Needs**
CMMI Vision for the Future

**Current**

- 5 Levels
- Three SCAMPIs
- Constellations for major stakeholders
- High Maturity improvement plans
- Cost of integrity

**Future**

- Foundational best practices
- Tailored to organizational, domain, and program needs
- Focus areas to extend the foundation to specific interest areas (e.g. safety, COTS)
- Structured measurement process aligned with tools for high maturity

*CMMI should continue to ensure foundational best practices; tailored to Org/Domaïn/Program needs*
Backup
Survey and Data Collection*

Å Survey conducted in response to OUSD (AT&L) request:
   Å Is there a relationship between CMMI levels and program performance?

Å 85-142 programs reported each quarter

Å ACAT Levels reported
   Å ACAT IAC    9 programs
   Å ACAT IAM    5 programs
   Å ACAT IC     33 programs
   Å ACAT ID     79 programs
   Å ACAT II     16 programs

Å Claimed maturity levels (MLs)
   Å ML 1      3 programs
   Å ML 2      1 program
   Å ML 3     47 programs
   Å ML 4     17 programs
   Å ML 5     74 programs

* Excerpt from DCMA Data Call Results briefing - Nov 07
CV/SV and Maturity Levels

- CV: CV < 0, CV = 0, CV > 0
- SV: SV < 0, SV = 0, SV > 0

Unfavorable

Number of Programs vs. CV and SV
DCMA Study - Data Assumptions

- Many survey questions are subjective (Local DCMA viewpoints)
- If both Maturity Level (ML) and Capability Level (CL) reported, only captured ML
- Only captured highest Maturity Level achieved
  - Example: ML 5 SW only with ML 3 for SE; ML 5 data was used
- If a range (eg. 5-10%) was given for any EV data, highest value (10%) was recorded
- Only used latest PO/contract for a program
- Not all the totals will add up to the sample size due to unanswered questions
- Have deleted some EV data points due to suspect data (Suspect decimal point issues)