Patterns: An Approach for CMMI Adoption

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Background

- Patterns are a common way of expressing common contexts and problem-solution pairs, and are often used in software design.
- In CMMI-based improvement, patterns can be used to show how sets of improvement practices can be combined to achieve successful improvements.
- This presentation will introduce some typical patterns in process improvement.
The IDEAL Model™

IDEAL provides a usable, understandable approach to continuous improvement by outlining the steps necessary to establish a successful improvement program.

Patterns

- Patterns are a common way of expressing common contexts and problem-solution pairs
  - The context is the organizational situation
  - The problem is what part of an effort needs to be accomplished
  - The solution is the grouping of practice areas and the relations among them that together address the problem for that context

- The book *Software Product Lines: Practices and Patterns* defines 12 patterns and 11 variants

Could patterns be applied to CMMI adoption?

The Adoption Factory pattern is a composite pattern that describes the entire software product line organization.
Example - What to Build Pattern (Software Product Lines)
What Benefits Would Patterns Provide?

- Address recurring CMMI adoption problems that arise in specific situations and present solutions to them
- Document existing, well-proven CMMI adoption experience
- Identify and specify abstractions that are broader in scope than single practice areas
- Provide a common vocabulary and understanding for CMMI adoption
- Document, explain, and plan CMMI adoption efforts
- Help manage the complexity inherent in CMMI adoption
- Can be combined to build complex CMMI adoption solutions

Structure of a Pattern

- **Context:** Organizational situation
  - Defense contractor
  - Commercial contractor
  - Small organization

- **Problem:** What part of an effort needs to be accomplished
  - Adopt CMMI for the first time
  - Transitioning from CMMI v1.1 to v1.2
  - Transitioning from Level 3 to Level 5
  - Maintain Level 5

- **Solution:** The grouping of practice areas and the relations among them that together address the problem for that context
**What Building Blocks Do We Have?**

### Software Product Lines

<table>
<thead>
<tr>
<th>Software Engineering</th>
<th>Technical Management</th>
<th>Organizational Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Architecture Definition</td>
<td>Configuration Management</td>
<td>Building a Business Case</td>
</tr>
<tr>
<td>Architecture Evaluation</td>
<td>Data Collection, Metrics, and Tracking</td>
<td>Customer Interface Management</td>
</tr>
<tr>
<td>Component Development</td>
<td>Make/Buy/Mine/Commission Analysis</td>
<td>Developing an Acquisition Strategy</td>
</tr>
<tr>
<td>COTS Utilization</td>
<td>Process Definition</td>
<td>Funding</td>
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<tr>
<td>Mining Existing Assets</td>
<td>Scoping</td>
<td>Launching and Institutionalizing</td>
</tr>
<tr>
<td>Requirements Engineering</td>
<td>Technical Planning</td>
<td>Market Analysis</td>
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<tr>
<td>Software System Integration</td>
<td>Technical Risk Management</td>
<td>Operations</td>
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<td>Testing</td>
<td>Tool Support</td>
<td>Organizational Planning</td>
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<tr>
<td>Understanding Relevant Domains</td>
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<td>Organizational Risk Management</td>
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<tr>
<td></td>
<td></td>
<td>Structuring the Organization</td>
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<td>Technology Forecasting</td>
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<td>Training</td>
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</tbody>
</table>

**IDEAL Model**

- Stimulus for Change
- Establish Context
- Build Sponsorship
- Charter Infrastructure
- Characterize Current and Desired State
- Develop Recommendations
- Set Priorities
- Develop Approach
- Create Solution
- Test/Pilot Solution
- Plan Actions
- Create Solution
- Test/Pilot Solution
- Refine Solution
- Install Solution
- Analyze and Validate
- Propose Future Actions
# A Preliminary Set of CMMI Adoption Practice Areas

<table>
<thead>
<tr>
<th>Initializing</th>
<th>Diagnosing</th>
<th>Establishing</th>
<th>Acting</th>
<th>Learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identify Need for Change</td>
<td>Learn Model</td>
<td>Identify Potential Improvements</td>
<td>Develop Infrastructure</td>
<td>Determine Appraisal Readiness</td>
</tr>
<tr>
<td>Scope Improvement Context</td>
<td>Identify Appraisal Goals</td>
<td>Establish Priorities</td>
<td>Pilot Implementations</td>
<td>Plan SCAMPI A</td>
</tr>
<tr>
<td>Establish Sponsorship</td>
<td>Select Appraisers</td>
<td>Strategize Approach to Infrastructure</td>
<td>Implement Project Improvements</td>
<td>Conduct SCAMPI A</td>
</tr>
<tr>
<td>Establish Diagnosing Responsibilities</td>
<td>Plan Gap Appraisal</td>
<td>Strategize Project Improvements</td>
<td>Implement Organizational Improvements</td>
<td>Conduct Causal Analysis on Findings</td>
</tr>
<tr>
<td>Identify Business Goals</td>
<td>Complete PIIDs</td>
<td>Strategize Organizational Improvements</td>
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<td>Implement Corrective Actions</td>
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<td></td>
<td>Validate PIIDs</td>
<td>Establish Improvement Responsibilities</td>
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<td>Implement Preventative Actions</td>
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<td>Conduct Gap Appraisal</td>
<td>Plan and Budget Improvements</td>
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<td></td>
<td>Analyze Process Performance</td>
<td>Secure Sponsorship</td>
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Example – Transitioning from CMMI v1.1 to V1.2

- Context: Organization that has achieved their CMMI v1.1 goals
- Problem: Achieve similar goals against v1.2 quickly and cheaply

Reference: “A Practical Roadmap for Transitioning to CMMI v1.2”, R. Hefner, 2006 CMMI Technology Conference and User Group
Example – Transitioning from Level 3 to Level 5

- **Context:** Organization that has achieved CMMI Level 3
- **Problem:** Achieve Level 5, building on the Level 3 practices

Reference: “A Practical Guide to Implementing Levels 4 and 5” (tutorial), R. Hefner, 2006 CMMI Technology Conference and User Group
Example – Maintaining CMMI Level 5

- **Context:** Organization that has achieved CMMI Level 5
- **Problem:** Maintain Level 5 process performance in light of changing business goals

Conclusions

- Patterns can be used to show how sets of improvement practices can be combined to achieve successful CMMI adoption
- Further work must be done to fully define the set of practice areas and the most common context-problem-solution sets