Anchoring the Software Process

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Outline

- Problems with Previous Anchor Points
- Emerging Nonprescriptive Process Standards
- Problems with Absence of Anchor Points
- Proposed Common Anchor Points
  - Resolution of Earlier Problems
- Recommendations
Previous Anchor Point Problems
Waterfall: Complete Requirements Spec

- Premature decisions
  - GUI features
- Inflexible point solutions
  - GUI hard-coded to spec
- Gold plating
  - Overambitious performance specs
- High-risk sleepers
  - Automated pattern recognition in spec
- Cost/schedule/quality oversights
  - Focus on writing specs
- Software vs system focus
  - CSCI integration, operational test problems

Overambitious Performance Specs

<table>
<thead>
<tr>
<th>Original Spec</th>
<th>After Processing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>

Response Time (ms)
Anchor Point Problems
Evolutionary Development: Beta-Test Code

- High-risk sleepers
  - Neglect security, fault tolerance
- Inflexible point solutions
  - Everything in main memory
- Capabilities too far from user needs
  - Inadequate user analysis

Emerging Process Standards

  - "Activities... may overlap, may be applied iteratively..."
- ISO/IEC 12207
  - "Activities... can be performed sequentially, repeated, and combined according to the project's choice of life cycle model(s)."
Strengths of 498/016 and 12207

- Good mix of flexibility and discipline
  - Tailor your milestones to fit your situation
  - And commit to these milestones for planning and control
- Emphasis on activities, not phases
  - Co-evolution of requirements and architecture
- Accommodation of COTS and reuse
- Accommodation of new representations (e.g., OO)
- Accommodation of electronic, tool-oriented deliverables

498/016 and 12207: A Few Things Still Missing

- Emphasis on stakeholder concurrence
- Emphasis on business case analysis
- Emphasis on requirements-evolution vector
  - Specifications in requirements
  - Accommodation in architecture
- Feasibility rationale as integral part of specifications
  - Optional “Notes” item in 498
- Emphasis on risk resolution as architecture evaluation criterion
Outline

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  - Proposed Common Anchor Points
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  - Recommendations

Problems with Absence of Anchor Points

- No common framework for planning, controlling, training, tooling
  - No cost and schedule estimation framework
- Startup delays in establishing processes
  - Or hasty lock-in to wrong process
- Cross-project milestone synchronization
Proposed Common Anchor Points

- Life Cycle Objectives (LCO)
- Life Cycle Architecture (LCA)
- Initial Operational Capability (IOC)

<table>
<thead>
<tr>
<th>Milestone Element</th>
<th>Life Cycle Objectives (LCO)</th>
<th>Life Cycle Architecture (LCA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definition of Operational Concept</td>
<td>- Mission requirements and capabilities</td>
<td>- Architecture requirements and capabilities</td>
</tr>
<tr>
<td>Definition of System Requirements</td>
<td>- System design documents and specifications</td>
<td>- Architecture design documents and specifications</td>
</tr>
<tr>
<td>Definition of System and Software Architecture</td>
<td>- Architecture design documents and specifications</td>
<td>- Architecture design documents and specifications</td>
</tr>
<tr>
<td>Definition of Life-Cycle Plan</td>
<td>- Project plan, schedule, milestones, resources, etc.</td>
<td>- Architecture plan, schedule, milestones, resources, etc.</td>
</tr>
</tbody>
</table>

Elements of Critical Front End Milestone

(Way-directed level of detail for each element)
**Initial Operational Capability (IOC)**

- Software preparation
  - Operational and support software
  - Data preparation, COTS licenses
  - Operational readiness testing
- Site preparation
  - Facilities, equipment, supplies, vendor support
- Uses, operator, and maintainer preparation
  - Selection, teambuilding, training

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**Process/Anchor Point Examples**

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Spiral-type</td>
<td>LCO, LCA</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sys Devel</th>
<th>Waterfall, Spiral-type</th>
<th>W'fall, IncDev, EvDev, Spiral, Design-to-Cost, etc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spiral-type</td>
<td>LCO</td>
<td>LCA</td>
</tr>
</tbody>
</table>
Relation of Win Win Spiral Model to LCO and LCA Milestones

<table>
<thead>
<tr>
<th>Cycle 1</th>
<th>Cycle 2</th>
<th>Cycle 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>LCO</td>
<td>LCA</td>
<td>LCO</td>
</tr>
<tr>
<td>LC0</td>
<td>LC*</td>
<td>LC0</td>
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<tr>
<td>Milestones</td>
<td>Milestones</td>
<td>Milestones</td>
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<tr>
<td></td>
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</tr>
<tr>
<td>Problem</td>
<td>LCO Resolution</td>
<td>LCA Resolution</td>
</tr>
<tr>
<td>Premature decisions</td>
<td>Risk-driven detail of specifications</td>
<td>Risk-driven detail of specifications</td>
</tr>
<tr>
<td>Inflexible point solutions</td>
<td>Rgts. growth vectors identified</td>
<td>Rgts. growth vectors specified, accommodated</td>
</tr>
<tr>
<td>Gold plating</td>
<td>Business case analysis</td>
<td>Feasibility analysis and rationale</td>
</tr>
<tr>
<td>High-risk sleepers</td>
<td>Feasibility rationale: risk resolution criterion</td>
<td>Feasibility rationale: risk resolution criterion</td>
</tr>
<tr>
<td>Cost/schedule/quality overights</td>
<td>Life cycle plan, Stakeholder concurrence, Feasibility rationale</td>
<td>Stakeholder concurrence, Risk resolution</td>
</tr>
<tr>
<td>Capabilities too far from user needs</td>
<td>Stakeholder concurrence, Risk resolution</td>
<td>Stakeholder concurrence, Risk resolution</td>
</tr>
<tr>
<td>BW VS. System Focus</td>
<td>System objectives &amp; scope, Ops. concept</td>
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</tr>
</tbody>
</table>

Source: LCO, LCA Milestones

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Recommendations

- Create your own corporate life cycle process framework:
  - Corporate milestones and decision points
  - Avoid process proliferation, getting pushed around
  - Consistent with 12/95 Perry and Kaminski memos
- Adopt LCO, LCA, and IOC as common milestones
- Support mix of flexibility and discipline
- Use risk-driven process tailoring
  - Decision table provides starting point
- Orient process improvement around LCO, LCA, IOC
  - Planning, estimating, tooling, training

Process Model Decision Table

<table>
<thead>
<tr>
<th>Model</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>LCO</td>
<td>Core of any software project</td>
</tr>
<tr>
<td>LCA</td>
<td>Product development project</td>
</tr>
<tr>
<td>IOC</td>
<td>System or system enhancement</td>
</tr>
<tr>
<td>POC</td>
<td>Project or system enhancement</td>
</tr>
<tr>
<td>Risk Driven</td>
<td>Tailored for risk</td>
</tr>
<tr>
<td>Process</td>
<td>Tailored for process</td>
</tr>
<tr>
<td>Improvement</td>
<td>Tailored for improvement</td>
</tr>
</tbody>
</table>

Notes to Table:
- High risk: High risk of failure
- Medium risk: Medium risk of failure
- Low risk: Low risk of failure
- High impact: High impact on project success
- Medium impact: Medium impact on project success
- Low impact: Low impact on project success
- High benefit: High benefit to project success
- Medium benefit: Medium benefit to project success
- Low benefit: Low benefit to project success
- High cost: High cost to project success
- Medium cost: Medium cost to project success
- Low cost: Low cost to project success

Planning, estimating, tooling, training

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