Software Development Methodologies

Lecturer: Raman Ramsin

Lecture 16

Situational Method Engineering
Methodology Engineering

- Motivated by the prevalent belief that no one methodology fits all situations.

- First introduced by Kumar and Welke in 1992 as a discipline aimed at constructing methodologies to match given organizational settings or specific development projects.

- Later came to be known as *Method Engineering*, a term proposed by Brinkkemper in 1996;

  - Definition: “The engineering discipline to design, construct, and adapt methods, techniques and tools for the development of information systems”.

- The most well-known subfield is *Situational* Method Engineering (SME): concerned with the construction/adaptation of a methodology specifically attuned to the project at hand.
Methodology Engineering: Alternative Approaches

- **Ad-hoc**: Concerned with constructing a new methodology from scratch.

- **Configuration-based**: Concerned with configuring methodologies and method components based on the situational context at hand.

- **Activity-diagram-based**: Concerned with application of UML Activity Diagrams for representing process-focused actions by Activities.

- **Deontic-matrices-based**: Concerned with using matrices of values for representing relationships of Activity-Task pairs chosen from OPF repository.

- **Paradigm-based**: Concerned with instantiating, abstracting or adapting an existing meta-model in order to produce the target methodology.

- **Extension-based**: Concerned with enhancing an existing methodology with new concepts and properties by using extension patterns.

- **Assembly-based**: Concerned with constructing the target methodology or enhancing an existing methodology by reusing parts of other methodologies.
Generic Model for Situational Method Engineering

[Henderson-Sellers et al. 2014]
Extension-Based SME

Start

Select a meta pattern

Extend a method

Pattern-based strategy

Domain-driven strategy

Pattern-matching strategy

Stop

Completeness strategy

[Henderson-Sellers et al. 2014]
Paradigm-Based SME

[Graph depicting the Paradigm-Based SME process with nodes for Start, Adaptation, Instantiation, Abstraction, Construct a product model, Construct a process model, Refinement, Simple way, Tactical way, Strategic way, Pattern-based, Completeness validation, and Stop.]

[Reference: Henderson-Sellers et al. 2014]
Assembly-Based SME

[Select a method part]

- **Start**
  - Requirements driven
  - Decomposition
  - Evaluation
  - Aggregation
  - Refinement

- **Stop**
  - Completeness validation
  - Integration
  - Association

- **Assemble method parts**
  - Completeness validation

[Henderson-Sellers et al. 2014]
Assembly-Based SME

[Mirbel and Ralyté 2006]
Method Chunk

[Mirbel and Ralyté 2006]
Assembly-Based ME In OPEN/OPF

[Framework/metamodel]

- Concept A
- Concept B
- Concept C
- Role 1
- Role 2

[Repository of process components]

- Example 1 of Concept A
- Example 2 of Concept A
- Example 1 of Concept B
- Example 2 of Concept B
- Example 1 of Concept C
- Example 2 of Concept C
- Example 1 Role 1
- Example 2 Role 1
- Example 1 Role 2
- Example 2 Role 2

[Henderson-Sellers 2003]
Assembly-Based ME In OPEN/OPF

[OPEN Process Framework]

Method/Process Metamodel

Repository of Predefined Method/Process Components

Construction Guidelines

Methodology (Including Process)

Method/Process Instance

Step 1. Method/Process Engineer selects Method/Process Components and constructs Methodology

Step 2. Project Manager creates Method/Process Instance by allocating specific resources

Henderson-Sellers 2003
OPF Repository

- Contains a range of predefined instances for each class and subclass in the OPF metamodel; e.g.:
  - 30 predefined instances of Activity
  - 160 instances of Task
  - 200 instances of Techniques
  - 76 instances of Role
## OPF: Task-Activity Matrix

<table>
<thead>
<tr>
<th>Task</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Code</td>
<td>1</td>
</tr>
<tr>
<td>Construct the object model</td>
<td>2</td>
</tr>
<tr>
<td>Develop and implement resource allocation plan</td>
<td>3</td>
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<tr>
<td>- develop iteration plan</td>
<td>4</td>
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<tr>
<td>- develop timebox plan</td>
<td>5</td>
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<td>- set up metrics collection program</td>
<td>6</td>
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<td>- specify quality goals</td>
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<tr>
<td>Evaluate quality</td>
<td>x</td>
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<tr>
<td>Identify CIRTs (Class, Instance, Role, or Type)</td>
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<tr>
<td>Map roles onto classes</td>
<td>x(OOP)</td>
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<tr>
<td>Test</td>
<td>x</td>
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<tr>
<td>Write manuals and other documentation</td>
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<td>key</td>
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<td>1. Project planning</td>
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<tr>
<td>2. Modeling and implementation: OO analysis, design, programming</td>
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<td>3. Verification and validation</td>
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<td>4. User review</td>
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<td>5. Consolidation</td>
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<td>6. Evaluation</td>
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[Henderson-Sellers 2003]
## OPF: Technique-Task Matrix

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**Key**
1. Code
2. Construct the object model
3. Develop and implement resource allocation plan
4. Evaluate quality
5. Identify CIRTs
6. Map roles onto classes
7. Test

[Henderson-Sellers 2003]
Hybrid Methodology Design

- **Alternative Approaches:**
  - *Instantiation approach:* instantiating an already available process metamodel
  - *Artefact-oriented approach:* devising a seamless complementary chain of artefacts and building the process around it
  - *Composition approach:* using one of the already available libraries of process patterns
  - *Integration approach:* integrating features, ideas and techniques from existing methodologies

- **Hybrid design approach:** using different alternatives from among the above-mentioned for different parts of the process and/or at different levels of abstraction
Hybrid Design Process

1. Prioritize Requirements
2. Define and Apply Hybrid Design Method
3. Process-Centred Description of Methodologies
4. Identify Next Abstraction Level and Revise Requirements
5. Methodology Analysis Results
6. Prioritized Requirements
7. Refine and Revise Methodology
8. Methodology Elements
9. Integrate Elements into Methodology
10. Final Methodology

If Stabilized and Complete, Finalize Methodology

[Ramsin 2006]
Hybrid Design: Emphasis on Approaches during Design
Hybrid Design: Sample Iterations

- Analysis
- Design
- Implementation
- Test
- Transition

[ Ramsin 2006 ]
Hybrid Design: Sample Iterations

Iteration 1

- Preliminary Analysis
- Detailed Analysis
- Architectural Design
- Detailed Design
- Implementation and Test
- Transition

[Ramsin 2006]
Hybrid Design: Sample Iterations

Iteration 1

- Preliminary Analysis
- Detailed Analysis
- Architectural Design
- Detailed Design
- Implementation and Test
- Transition

Iteration 2

- Preliminary Analysis
- Detailed Analysis
- Architectural Design
- Detailed Design
- Implementation and Test
- Transition

[Context Model] → [System Model] → [Executable Package]

[Ramsin 2006]
Hybrid Design: Sample Iterations (Contd.)

Iteration 2

- Preliminary Analysis
- Detailed Analysis: Context Model
- Architectural Design: System Model
- Detailed Design
- Implementation and Test: Executable Package
- Transition
Hybrid Design: Sample Iterations (Contd.)
Hybrid Design: Sample Iterations (Contd.)
References


