Fundamentals of Maturity Models

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Maturity Model - Concept

A Maturity Model is a technique that is proved to be valuable to measure a certain aspect of an organization. It represents a path towards increasingly organized and systematic way of “doing things” in organizations.

Maturity Model - Concept

- Typical Maturity Models are Staged Models consisting of a set of maturity levels (the number of maturity levels is specific of each model)

- Each maturity level can be decomposed in:
  - Dimensions and sub-dimensions;
  - Elements;
  - Attributes;
  - Etc.

Maturity Model - Motivation

- It can provide information for benchmarking and internal auditing;
- It can support measuring of progress (assessment);
- It can help identifying strengths and weaknesses in an organization;
- It can help identifying gaps between the as-is state and actions in progress and the to-be state;
- It can support project portfolio management (identification and planning of efforts and priorities).

Maturity Model - History

- In 1974 R. L. Nolan proposed four stages of growth for the IT department:
  1. McFarlan - Phases of assimilation based on Nolan’s work;
  2. Sullivan – Reviewed McFarlan’s Model;
  3. Earl – Based on Sullivan’s Model;
  4. Galliers – Based on Earl’s Model.

Maturity Model – Examples

<table>
<thead>
<tr>
<th>Scope</th>
<th>Maturity Levels</th>
<th># Dimensions</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stanford Data Governance</td>
<td>5</td>
<td>3</td>
<td>High</td>
</tr>
<tr>
<td>Asset Management</td>
<td>5</td>
<td>4</td>
<td>High</td>
</tr>
<tr>
<td>Records Management</td>
<td>4</td>
<td>9</td>
<td>Medium</td>
</tr>
<tr>
<td>Digital Asset Management</td>
<td>5</td>
<td>14/15</td>
<td>Medium</td>
</tr>
<tr>
<td>Information Governance</td>
<td>5</td>
<td>8</td>
<td>High</td>
</tr>
</tbody>
</table>

Stages versus Continuous

- **Concept: Capability** Maturity Models (Continuous Models)
  - Consist of a set of capability levels (capability = what things can we do…);
  - Relevant for “process maturity” (process = established rules for how should we do things…)
  - Example:

<table>
<thead>
<tr>
<th>Level</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Optimizing process</td>
</tr>
<tr>
<td>4</td>
<td>Predictable process</td>
</tr>
<tr>
<td>3</td>
<td>Established process</td>
</tr>
<tr>
<td>2</td>
<td>Managed process</td>
</tr>
<tr>
<td>1</td>
<td>Performed process</td>
</tr>
<tr>
<td>0</td>
<td>Incomplete process</td>
</tr>
</tbody>
</table>
Stages versus Continuous

- Typical Maturity Models: Focus on Organizational Maturity, which "emphasizes sets of process areas that are intended to define proven stages of process maturity across an organization". [CMMI V1.3]

- Capability Maturity Models: Focus on Process Capability, which "focuses on establishing baselines and measuring improvement results in each area individually". [CMMI V1.3]

From the CMMI project (focus on software development as a business)

**Capability Maturity Model – Integrated**

<table>
<thead>
<tr>
<th>Level</th>
<th>Focus</th>
<th>Process Areas</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Optimizing</td>
<td>Continuous process improvement</td>
<td>Productivity &amp; Quality</td>
</tr>
<tr>
<td>4</td>
<td>Quantitatively Managed</td>
<td>Quantitative process management</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Defined</td>
<td>Process standardization</td>
<td>Requirements Development</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Technical Solution</td>
<td>Product Integration</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Verification</td>
<td>Validation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Organizational Process Focus</td>
<td>Organizational Process</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Definition</td>
<td>Organizational Training</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Project Management</td>
<td>Integrated Project</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Management</td>
<td>Management</td>
</tr>
<tr>
<td>2</td>
<td>Managed</td>
<td>Basic project management</td>
<td>Requirements Management</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Project Planning</td>
<td>Project Monitoring &amp; Control</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Supplier Agreement Management</td>
<td>Supplier Agreement</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Measurement &amp; Analysis</td>
<td>Process &amp; Product Quality</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Assurance</td>
<td>Assurance Management</td>
</tr>
<tr>
<td>1</td>
<td>Initial</td>
<td>Competent people and heros</td>
<td></td>
</tr>
</tbody>
</table>


Maturity Models - Assessment Methods

• A maturity assessment can be performed:
  – As a self-assessment;
  – Following an appraisal method such as:
    • ISO 15504-3 – Guidance on performing and assessment;
    • SEI SCAMPI for CMMI:
      – CMMI stands for Capability Maturity Model Integration;

Maturity Models - Assessment Methods – ISO 15504

• ISO/IEC 15504 is a reference model for maturity models
  – It was born as the “Software Process Improvement and Capability Evaluation” (SPICE) in 1993.
  – It helps assessors to give an overall determination of organizations’ capabilities for delivering software, systems or services.

Maturity Models - Assessment Methods – ISO 15504

Maturity Models - Assessment Methods – SCAMPI for CMMI

• The Capability Maturity Model Integration (CMMI) was initially developed by the US Department of Defense and the National Defense Industrial Association (NDIA).

• In 2000 the Software Engineering Institute (SEI) at Carnegie Mellon University took stewardship and produced the first integrated CMMI models, training material and the companion appraisal:

  – SCAMPI - Standard CMMI Appraisal Method for Process Improvement
Maturity Models - Assessment Methods – SCAMPI for CMMI

- The CMMI Suite contains information and guidance to help an organization improve its processes.
- The CMMI models comprise:
  - Materials that help in the evaluation of organization processes, which provides essential information to the management, support and technical activities;
  - Materials which help improve process performance, which provides information which can be used to increase the capability level of an organization's activities.

Maturity Models - Assessment Methods – SCAMPI for CMMI

- There is also material to another constellation, Services, which is intended to support organizations that primarily deliver services rather than products.
- One important aspect to take in consideration is that CMMI uses both the typical maturity levels, and the capability levels through:
  - A Staged Representation, for the typical maturity levels;
  - A Continuous Representation, for the capability levels.

Maturity Models - Assessment Methods – SCAMPI for CMMI

- The Standard CMMI Appraisal Method for Process Improvement details the method to assess the processes that are described in the three constellations of CMMI.

Maturity Models - Assessment Methods – SCAMPI for CMMI

- Plan and Prepare for Assessment
  - Appraisal planning starts with understanding the sponsor’s objectives, requirements, and constraints;
  - All planning, preparation, execution, and reporting of results proceed from this initial activity;
  - Because of the significant investment and logistical planning involved, considerable iteration and refinement of planning activities should be expected in this phase;
  - With each subsequent phase, the amount of iteration will decrease as data are collected, analyzed, refined, and translated into findings of significance relative to the model.
Maturity Models - Assessment Methods – SCAMPI for CMMI

- Conduct Appraisal
  - The appraisal team focuses on collecting data from the appraised organization to judge the extent to which the model is implemented.
  - Integral to this approach is the concept of coverage, which implies two things:
    - The collection of sufficient data for each model component within the model scope selected by the sponsor;
    - Obtaining a representative sample of ongoing processes.

- Report Results
  - The appraisal team provides the findings and ratings to the appraisal sponsor and the organization.
  - These artifacts become part of the appraisal record, which becomes protected data in accordance with the appraisal disclosure statement.
  - A completed appraisal data package, which includes a subset of the contents of the appraisal record, is provided to the SEI. The SEI adds the appraisal data to confidential databases, and provides overall profiles of the community on a periodic basis.

Summary

- A Maturity Model is a method used to develop and refine organization’s processes. It identifies a path of levels, meaning increasingly organized and systematically more mature processes.
- Maturity models can be staged (the typical maturity levels) or continuous (capability levels).
- There are plenty of maturity models for the most diverse domains, developed by the industry, academia, …
- To assess the maturity levels, organizations can opt for self-assessment or follow an existing assessment method.

Questions?

- Further Reading:
  - SEI CMMI:
    - Development: http://www.sei.cmu.edu/reports/10tr033.pdf
    - Acquisition: http://www.sei.cmu.edu/reports/10tr032.pdf
    - Service: http://www.sei.cmu.edu/reports/10tr034.pdf
  - SCAMPI for CMMI: http://www.sei.cmu.edu/reports/11hb001.pdf