A Framework to Compare Software Process Assessment Methods Dedicated to Small and Very Small Organizations

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Outline

• Introduction: Small and Very Small Enterprises
• What methods are available for SPA
• Who needs comparing SPA methods and why?
• Related Work
• What criteria are currently available for comparisons
• The new criteria for comparing SPA methods
• Sample comparison results
Introduction: Small and Very Small Enterprises

• VSEs are typically organizations having 1 - 25 employees

• Small organizations are typically organizations having 26 - 50 employees

• Large portion of the IT sector is considered to be VSE, e.g. in Europe around 85% of the IT sector is VSEs while in Montreal area around 80% is VSEs
What do we mean by SPI and SPA

• SPI (Software Process Improvement) is the act of creating a new and improved software process in order to obtain a benefit

• Model-based SPI initiative usually starts with an assessment process (SPA - Software Process Assessment) to assess the current organization’s processes
Why this type of VSE organizations is different?

1. Availability of resources (Time and Cost)

2. Undefined organization structure and responsibilities

3. Organization success is based on individual skills

4. Long term return of investment (ROI)
What methods are available for SPA

Several SPA methods are available to assess VSEs.

- TOPS: Toward Organized Process in SMEs.
- MARES: A methodology for software process assessment in small software companies.
- RAPID: Rapid Assessment for Process Improvement for Software Development.
- FAME: Fraunhofer Assessment Method
- EAP: Express Process Appraisal Method
Who needs comparing SPA methods and why?

The comparison of different SPA methods is useful for both:

1. SPA method designer
   The author of a new assessment method would like to compare his method with other methods to determine the differences and similarities, as well as the way in which his method is aligned with other methods.

2. Organizations planning to conduct assessment process
   Organizations with little SPI knowledge planning to conduct a self-assessment process to evaluate the capability levels of their processes need to compare the various SPA methods currently available and choose one of them.
Related Work

A number of comparisons of several well-known SPI models, such as CMM, ISO 15504 and ISO 9000 as well as SPA methods, have already been performed, e.g.

• Tingey’s detailed comparison of the CMM, ISO 9000 and the Malcolm Baldrige National Quality Award (MBA)

• El-Emam textual comparison of SPICE and ISO 9000 to show their differences and provides a mapping of the two standards

• Paulk’s comparison of ISO 9000 and the CMM

• Analetco comparison of several lightweight process assessment methods for small organizations

• McCaffrey comparison of his proposed assessment method dedicated to small organizations to other lightweight assessment methods.
Note:

Most of the comparison work done above is not dedicated to small organizations only:

- The previous comparisons are at a very detailed level

- While VSEs need brief and quick comparisons providing sufficient information to enable a choice to be made among available SPA methods to start their SPI initiative.
What criteria are currently available for comparisons

The proposed comparison framework will be based on two sources:

1. Halvorsen taxonomy
   Halvorsen recognized four different classes of methods for comparing SPI frameworks
   - *Characteristics comparison method.*
   - *Framework mapping comparison method.*
   - *Bilateral comparison method.*
   - *Needs mapping comparison method*

Halvorsen proposed a taxonomy that falls into the “Characteristics comparison method”. In his taxonomy, 25 different characteristics are defined to compare SPI frameworks.
### Halvorsen used his taxonomy to compare six SPI frameworks: TQM, CMM v1.1, ISO9000, ISO/IEC 15504 (SPICE), GQM and SPIQ

### Halvorsen’s taxonomy includes a long list of characteristics which can be used to compare the SPA methods which are built based on the SPI frameworks.

### We will use this taxonomy to compare SPA methods dedicated to small and very small organizations;
2. Anacleto Comparison

Anacleto et al. have used a tabular comparison of five different assessment methods for small organizations with the aim of comparing their new method MARES with the other methods. Their comparison is based on the following criteria:

- Low cost.
- Reliable results
- Detailed description of the assessment process.
- Guidance for process selection.
- Detailed definition of the assessment method.
- Support for identification of risks and suggestions for improvement.
- Support for high-level process modeling.
- Conformity to ISO/IEC 15504.
- No specific software engineering knowledge required from the company representative.
- Tool support.
- Integrated into the assessment methodology
- Public availability.
The new criteria for comparing SPA methods

• Halvorsen comparison criteria is a comprehensive one suitable for comprehensive SPI frameworks. However, this detailed comprehensiveness leads to redundant data when used to compare VSE assessment methods.

• Anacleto comparison criteria is a brief one designed to provide a general comparison view between MARES, the proposed assessment method, and some other methods. This set of comparison criteria lacks some other informative details for the VSE assessment method comparison.

• Our proposed comparison framework combines several characteristics from both Halvorsen’s and Anacleto’s methods + some additional characteristics.
List of characteristics for the improved comparison framework

<table>
<thead>
<tr>
<th>Halvorsen Characteristics</th>
<th>Anacleto Characteristics</th>
<th>New Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Geographic origin</td>
<td>- Cost</td>
<td>- Number of assessed processes</td>
</tr>
<tr>
<td>- Development/stability</td>
<td>- Support for identification of risk and improvements suggestions</td>
<td>- Number of processes to be improved</td>
</tr>
<tr>
<td>- popularity</td>
<td>- Need for specific SE knowledge from the company representative</td>
<td>- Assessment duration</td>
</tr>
<tr>
<td>- Analysis techniques</td>
<td>- Tool support</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Public availability</td>
<td></td>
</tr>
</tbody>
</table>
• The above framework is used to compare the different methods mentioned previously

• The information about the different methods is collected from the published papers and reports.

• An outcome of the use of this proposed comparison framework is presented in the next slides
Sample Comparison Results

<table>
<thead>
<tr>
<th>Criteria</th>
<th>MARES</th>
<th>TOPS</th>
<th>FAME</th>
<th>RAPID</th>
<th>SPM</th>
<th>EAP</th>
<th>Micro-Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geographic origin/spread</td>
<td>Brazil</td>
<td>Italy</td>
<td>Germany</td>
<td>Australia</td>
<td>Ireland</td>
<td>Ireland</td>
<td>Belgium</td>
</tr>
<tr>
<td>Scientific origin</td>
<td>ISO 15504</td>
<td>ISO 15504/ Bootstrap</td>
<td>ISO 15504</td>
<td>Quality Function Deployment</td>
<td>CMMI Compliant with the ARC 1.1</td>
<td>Ireland</td>
<td>OUPL</td>
</tr>
<tr>
<td>Cost</td>
<td>Low</td>
<td>Low</td>
<td>NA</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Development/</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>Since 1999</td>
<td>Since 1999</td>
<td>Since 2003</td>
<td>Since 1999</td>
</tr>
<tr>
<td>Stability</td>
<td>Regional</td>
<td>Regional</td>
<td>Regional</td>
<td>Regional</td>
<td>Regional</td>
<td>NA</td>
<td>Belgium/Quebec/</td>
</tr>
<tr>
<td>Popularity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>France</td>
</tr>
<tr>
<td>Analysis techniques</td>
<td>Interview</td>
<td>Interview</td>
<td>Interview</td>
<td>Interview</td>
<td>Questionnaire</td>
<td>Interview</td>
<td>Short interview</td>
</tr>
<tr>
<td>Number of processes assessed</td>
<td>25</td>
<td>3</td>
<td>4</td>
<td>8</td>
<td>47 Process with 115 practices</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Number of processes to be</td>
<td>2-3</td>
<td>3</td>
<td>4</td>
<td>8</td>
<td>Max. 10 practices</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>improved</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assessed processes</td>
<td>Selected after identifying strengths and weaknesses based on SWOT analysis</td>
<td>ENG 2, ENG 5, CUS 4</td>
<td>ENG 2, ENG 3, ENG 4, ENG 5</td>
<td>CUS 3, ENG 1, MAN 1, SUP 2, SUP 3, SUP 4, MAN 1, ORG 2.1</td>
<td>Selected according to a prioritized list based on QFD calculations</td>
<td>1-Requirement Management, 2-Configuration Management, 3-Project Planning 4-Project Management, 5-Project Monitor &amp; Control, 6-Process &amp; Product QA</td>
<td></td>
</tr>
<tr>
<td>Tool support</td>
<td>NA</td>
<td>Paper forms</td>
<td>Data collection, analyses and rating tools</td>
<td>Paper forms</td>
<td>NA</td>
<td>Paper forms + data collection &amp; analysis tools</td>
<td>Paper forms + Excel sheet</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Assessment duration</th>
<th>1 day</th>
<th>Half a day</th>
<th>NA</th>
<th>1 day</th>
<th>NA</th>
<th>1 day</th>
<th>Half an hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public availability</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>NA</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Guidance for process selection</td>
<td>Yes</td>
<td>No</td>
<td>NA</td>
<td>No</td>
<td>NA</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Support for identification of risks and improvement suggestions</td>
<td>No</td>
<td>Partially supported</td>
<td>Yes</td>
<td>No</td>
<td>NA</td>
<td>Yes</td>
<td>Partially supported</td>
</tr>
<tr>
<td>Need for specific SE knowledge on the part of the company representative</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>NA</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>
Benefits of the proposed framework

• The proposed Framework is a compromised framework between the two other discussed frameworks (it is more informative than Anacleto’s comparison trial and less detailed than Halvorsen’s one) which makes it more informative and more suitable for the needs of small and very small organizations.

• Using Halvorsen’s comparison framework by small and very small organizations would consume more time than using the proposed framework which would provide informative data with short time interval.
Lessons Learned

• Small and Very Small organizations have a special nature & require tailored software process assessment and improvement methods.

• Two main attempts for comparisons in the field of SPI have been explored:
  – Halvorsen taxonomy to compare SPI frameworks using a long list of characteristics
  – Anacleto comparison of light weight assessment methods for small organizations.

• An assessment framework more suitable for the needs of small and very small organizations has been proposed by combining several characteristics from the above two approaches and adding some other new characteristics
Next Step

• More work is still needed to improve not only the comparisons between the different assessment methods for small and very small organizations, but also to evaluate such methods from an engineering perspective.
Thank you…

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