



Software
Division

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

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Outline

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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.
- Micro-Evaluation: OWPL Micro Assessment Method.
- MARES: A methodology for software process assessment in small software companies.
- SPM: Software Process Matrix.
- 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.

General	Process	Organization	Quality	Result
Geographic origin/spread Scientific origin Development/stability Popularity Software specific Prescriptive/descriptive Adaptive	Assessment Assessor Proc. improvement method Improvement Initiation Focus Analysis Techniques	Actors/roles/stakeholders Organization size Coherence	Quality perspective Progression Causal relation Comparative	Goal Process artifacts Certification Cost of implementation Validation

- 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

Halvorsen Characteristics	Anacleto Characteristics	New Characteristics
<ul style="list-style-type: none"> - Geographic origin - Scientific Origin - Development/stability - popularity - Analysis techniques 	<ul style="list-style-type: none"> - Cost - Guidance for process selection - Support for identification of risk and improvements suggestions - Need for specific SE knowledge from the company representative - Tool support - Public availability 	<ul style="list-style-type: none"> - Number of assessed processes - Assessed processes. - Number of processes to be improved - Assessment duration

- 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

Criteria	MARES	TOPS	FAME	RAPID	SPM	EAP	Micro-Evaluation
Geographic origin/Spread	Brazil	Italy	Germany	Australia	Ireland	Ireland	Belgium
Scientific origin	ISO 15504	ISO 15504	ISO 15504/Bootstrap	ISO 15504	Quality Function Deployment	CMMI Compliant with the ARC 1.1	OWPL
Cost	Low	Low	NA	Low	Low	Low	Low
Development/Stability	NA	NA	NA	Since 1999	Since 1999	Since 2003	Since 1998
Popularity	Regional	Regional	Regional	Regional	Regional	NA	Belgium/Quebec/France
Analysis techniques	Interview	Interview	Interview	Interview	Questionnaire	Interview	Short interview
Number of processes assessed	26	3	4	8	47 Process with 135 practices	6	5
Number of processes to be improved	2-3	3	4	8	Max. 10 practices	6	5
Assessed processes	Selected after identifying strengths and weakness based on SWOT analysis	ENG. 2, ENG. 5, CUS. 4	ENG. 2, ENG. 3, ENG. 4, ENG. 5	CUS. 3, ENG. 1, MAN. 2, SUP. 2, SUP. 3, SUP. 4, MAN. 4, ORG. 1	Selected according to a prioritized list based on QFD calculations	1-Requirement Management 2-Configuration Management 3-Project Planning 4-Project Management 5-Project monitor & control 6-Process & Product QA	1. Quality Assurance 2. Customer Management 3. Supplier Management 4. Project Management 5. Product Management 6. Training and Human Resource Management
Tool support	NA	Paper forms	Data collection, analyses and rating tools	Paper forms	NA	Paper forms + data collection & analysis tools	Paper forms + Excel sheet

Assessment duration	1 day	Half a day	NA	1 day	NA	1 day	Half an hour
Public availability	Yes	Yes	No	No	NA	No	No
Guidance for process selection	Yes By using a contextualization phase	No	NA	No	NA	No	No
Support for identification of risk and improvement suggestions	Yes By using a risk management Phase	Partially supported	Partially supported	No	NA	Yes	Partially supported
Need for specific SE knowledge on the part of the company representative	No	Yes	Yes	Yes	NA	No	No

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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