How Semat Can Change The Future of Software Engineering

Paul E. McMahon
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Introduction

- SEMAT stands for Software Engineering Method and Theory
  - Includes industry, academia, and research
  - “refound software engineering based on a solid theory, proven principles and best practices”

Semat founders
Bertrand Meyer, Richard Soley, Ivar Jacobson
Topics

✓ Background and Goals

✓ The Challenge & Big Picture Solution
✓ Semat Architecture & Way Work Accomplished
✓ What We Have Achieved So Far

✓ A Little More Detail
  • A Few Terms
  • The Universals

✓ Why Semat is Important to Future and Potential Significant Savings it Can Bring
Software engineering is gravely hampered today by immature practices. Specific problems include:

- The prevalence of fads more typical of fashion industry than of an engineering discipline.
- The lack of a sound, widely accepted theoretical basis.
- The huge number of methods and method variants, with differences little understood and artificially magnified.
- The lack of credible experimental evaluation and validation.
- The split between industry practice and academic research.

Also curriculum
Background

✓ July, 2009 call for action

✓ February, 2010 Semat Vision Statement published

✓ February, 2011
  • 9 Corporate Sponsors
  • Over 1400 Supporters
  • 35 individual signatories
  • Over 20 volunteers have contributed significant time
    – Multiple tracks met periodically in 2010
    – Three workshops held in 2010

Note: Watts Humphrey was an initial signatory
Goal

Note: Quite small!

✓ A “kernel of widely agreed elements”

Note: Referred to as “Universals”

✓ This common ground will allow people to easily describe the essentials of their current and future practices and methods so that they can be composed, simulated, compared, evaluated, used, measured, taught and researched, adapted
The Challenge:
Today’s Process Aids Landscape

Just how different are all these process aids when it comes to helping people get their job done?

Large have Process Engineers, What about small & medium size organizations?
Objectives of Semat

- Help users **compare** practices and make better decisions

- But more... also about **using**... practices what do, not just what say we do
  - As team’s understanding **evolves** it’s practices must **adapt** – but must occur with appropriate degree of **monitoring**

- Can think of Semat as reference framework – but not kind you might think
  - **Essentials underlie** best practices, not best practices
Big Picture Solution: What Semat Will Produce?

The Semat Method Architecture

- **Methods**
- **Practices**
- **Common Ground Elements**
- **Kernel Language**

**Existing & new Practices, Methods, will need to be represented in Semat structure**

**Elements used to compose practices, & methods**

**The “rules” to compose or represent practices**

**Language to model our practices**

**The Primary Product of Semat is The Kernel**
The Way The Work Accomplished So Far: Multiple Tracks

- Requirements (active early 2010)
- Universals (currently active)
  - Develop the Universals
- Kernel Language (currently active)
  - Develop Use Cases (e.g. Define Practice)
  - “Well-formed” rules to form practices, methods
- Assessment (active throughout 2010)
  - Help users self-assess use of Semat
  - “Certify” practices
- Theory (planned future activity)
- Architecture (new track October 2010)
  - Coordinates activities of other tracks through Architecture “Spikes”
  - Theories supporting Universals & states
What We Have Achieved So Far: 2010 Workshops Held

- Zurich, Switzerland, March 17-18
  - Position papers presented by 28 attendees
  - Track leaders identified & track work initiated

- Washington, D.C., July 13-14
  - Track progress reports provided by track leaders to 21 attendees

- Milan, Italy, Sept 30-Oct 1
  - Track progress reports provided by track leaders
  - 1st Architecture spike report provided
What We Have Achieved So Far: Products

✓ A set of use cases (e.g. Define Practice) driving the work on the kernel language

✓ An initial set of Universals (8 kernel elements)

✓ A draft kernel language specification

✓ A draft assessment framework

✓ An initial architecture spike
Example From 1st Architecture Spike

- Applied “Define Practice” Use Case to Scrum
- Results reported at 3rd Semat Workshop in Milan

✓ Demonstrated
  ✓ One way to “represent” Scrum in Semat Structure
  ✓ Potential to aid in comparing & aiding decisions
  ✓ “Holes” and “clashes” visibility can help

Note: Results might be obvious to expert Process Engineer, but intent to help Practitioner

Example how it can help later - actual case study
A Little More Detail:  
A Few Terms (still evolving)

- **Practice**
  - A repeatable approach to doing something with a specific purpose in mind
  - *Note: We spend a great deal of time seeking widely acceptable terms*

- **Way of working**
  - The tailored set of *practices* and tools used by a *team* to guide and support their *work*

**Universals (or Kernel elements)**
- The essential elements in all software engineering endeavors
Don’t expect model to get much larger (risk?)

Universals (Kernel elements):
So far...

Opportunity

Stakeholder Community

Requirement

Software System

Work

Team

Way-of-Working

Practice

Area of Concern

Customer

Product

Team

What team does, Not just what say do (not static)

Significant time spent on word selection

< provides

< meets

< performs

< follows

< guides

< scopes

< addresses

< address
Current Universals Challenge: Measuring Health & Progress

- **Example: Work**

  ✓ Can we agree on a set of Universal states and definitions?
  
  - Initiated
    - Work has been requested
  - Prepared
    - All pre-conditions for starting the work have been met

  - Underway…
  - Under control…
  - Concluded…
  - Closed…

  **Potential great value to Industry (more later)**

  - Checklists support definition using small consistent vocabulary
  - Critical to potential value
  - Keep in mind essential states can be extended, but not deleted or redefined
Why Important to Academia?

- Today different universities have different requirements related to how software engineering should be taught and what should be taught.

- To academia a kernel based on a common ground means a consistent foundation to teach software engineering and to demonstrate to students the pros and cons of different ways of working.

Engaging the Universities is a priority of Semat.
Why Important to Practitioner?

- Can apply directly
  - JAVA, C++
- Great deal to read, digest
- Unique terms, acronyms
  - Practice, method, procedure,
  - process..
- How practices described can vary greatly

Caution: Not standardize wrong things
Encourage new methodologies, but built on “common ground”

Learning curve expensive for all of us & frustrating to practitioner
Why Important to Industry?

- Consider the significant expenditures that occur today on each new project start up
  - Terminology reinvention
  - How progress measured and reported
  - Process tailoring

- Are the differences across different projects and different companies large enough to warrant the degree of **continual reinvention**?

- We believe what we need to agree on is **very small**, but the potential savings is significant in **project start up costs**, improved **communication & training**!

Next: Measurement Example
Why Important to Industry: Measurement Example

- Think of the potential value of a “common ground” starting point for measurement

- If we can agree to essential states, & their meaning, we can set target states & assess & communicate progress more consistently

- Today great companies do this, but each grows their own-- but are they looking at the right things?
  - Example later

Improving progress measurement has huge cost savings potential
Why Semat Goals Are Achievable: Common Ground Same as Tailor Up From “Must dos”

- Tailor up from “must dos”
  - Proven approach
  - Refer to BOND and GEAR case studies in [1]

Saves significant project start up and training costs because don’t need to discuss & reinvent on each project!

Keep aware:
- Small project may need little more, but
- Depending on project specific factors, you extend, or “tailor up” focusing your start up effort on value-added areas

[1] Integrating CMMI and Agile Development: Case Studies And Proven Techniques for Faster Performance Improvement
Actual Case Study Example: Measurement

- LACM is Case Study discussed in previously referenced book[1]
- Defined states for “work” in common way across projects, and tracked work progress
- Frequent unplanned “work” leading to schedule over-runs
- Representing their practices using Semat kernel raises visibility of a “hole”

Tracked work, not requirements

How Semat kernel can raise visibility of why organizations have trouble meeting schedules
Summary:
What Is Really Different About Semat?

- Semat will not produce a methodology, nor will it compete with any previous movements
  - We don’t believe past movements, or existing aids (e.g. CMMI) were failures (value in each)

- In fact we believe underneath the constant change across last 4 decades lies “universals” that do not change
  - Essentials that remain when one movement loses steam, and another rises – “common ground”

- If can agree on terminology, language, how to describe practices & methods, then we will have made a significant contribution that can be counted on for a long time
Contact Information & Questions

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- WEB: www.pemsystems.com
- Blog: www.paulemcmahon.wordpress.com

Questions???

- Do you have a “common ground” in your organization? Is it working for you?
- Do you believe a “common ground” can be found for all software engineering endeavors?
Acronyms & References

Acronyms
CMMI – Capability Maturity Model Integration
Semat – Software Engineering Method and Theory
SPEM – Software & Systems Process Engineering Meta-model
TSP – Team Software Process
Scrum – Not an acronym, mechanisms in game of rugby for getting an out-of-play ball back into play

References & Notes
Parts of this presentation have been developed based on previous Semat presentations given at:
• Rochester Institute of Technology
  “How Semat Can Change the Future of Software Engineering”, Paul McMahon, October 2010
• SEPG Conference Portland, Oregon 2011
  “The Quest for the Holy Grail of Software Engineering” Winifred Menezes, Paul McMahon