PSP, TSP, XP, CMMI…
eating the alphabet soup!

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Agenda

Robust, fragile, agile
From CMMI to TSP
The manifesto
XP and SCRUM vs. CMMI
PSP and TSP at work
Earned value for the rest of us
Synergy
Surf the next wave!
Different tacks
Manifesto for Agile Software Development

We are uncovering better ways of developing software by doing it and helping others do it. Through this work we have come to value:

Individuals and interactions over processes and tools
Working software over comprehensive documentation
Customer collaboration over contract negotiation
Responding to change over following a plan

That is, while there is value in the items on the right, we value the items on the left more.

Kent Beck           James Grenning       Robert C. Martin
Mike Beedle         Jim Highsmith        Steve Mellor
Arie van Bennekum   Andrew Hunt         Ken Schwaber
Alistair Cockburn   Ron Jeffries        Jeff Sutherland
Ward Cunningham      Jon Kern            Dave Thomas
Martin Fowler        Brian Marick
XP 12 KPs

The Planning Game | Pair Programming
Small Releases     | Collective Ownership
Metaphor           | Coding Standards
Simple Design      | 40-hour Week
Incremental testing| On-site Customer
Refactoring        | Continuous integration
<table>
<thead>
<tr>
<th>Level</th>
<th>Focus</th>
<th>Process Areas</th>
</tr>
</thead>
</table>
| 5 Optimizing | Continuous process improvement | Organizational Performance Management  
Causal Analysis and Resolution                                                   |
| 4 Quantitat. Managed | Quantitative management | Organizational Process Performance  
Quantitative Project Management                                                   |
| 3 Defined   | Organization engineering process standardization | Requirements Development  
Technical Solution  
Verification  
Validation  
Organization Process Focus  
Organization Process Definition  
Organizational Training  
Integrated Project Management  
Risk management  
Decision Analysis and Resolution  
Product Integration                                                |
| 2 Managed   | Basic Project management       | Requirements management  
Project Planning  
Project Monitoring and Control  
Supplier Agreement Management  
Measurement and Analysis  
Process and Product Quality Assurance  
Configuration Management                                                      |
From CMMI to TSP

The CMMI

– demonstrates development practices and improvement techniques at the individual and small team level
– provides a framework for data-driven improvement
The experience factory

Project organization

Set goals
Choose process
Plan

Execute plan
Collect data

Experience factory

Tailoring

Processes, models
tools, components

Data, lessons learned

Project/risk analysis

From ‘The experimental paradigm in software eng.’,
Rombach, Basili, Selby, Springer-Verlag, 1994
What’s a PSP?

The PSP is a self improvement paradigm based on individual procedures and data
A small set of scripts, standards and forms
A simple but highly effective measurement framework
Self management based on individual metrics
Fostering commitment to quality principles
It is an agile level 5 process for individuals
It is also a one person implementation of Basili’s Quality Improvement Paradigm (experience factory)
“At the Software Engineering Lab (NASA GSFC) we have applied evolutionary improvement concepts (PDSA) to the development domain...

With this [PSP] book, Watts Humphrey has developed an evolutionary improvement paradigm at the personal level by providing a mechanism for learning through experience, measurement and feedback.”

Vic Basili foreword to Watts’ book
A discipline for software engineering
Yield - All Students, All Programs

\[ \text{Yield} = \frac{\text{Defects found BEFORE compile}}{\text{Defects injected before compile}} \]

Yield %

Program Number

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Program Number

Max

Avg

Min

Personal reviews
Introduced at day 7
The following table shows projected integration and system test (I&S) rework costs per KLOC for engineers before and after PSP training.

Example from Microsoft

It took 250 engineers an entire year to remove 30,000 defects from Windows NT 4.0. At 2,000 h per staff year that’s 500kh. Or 500/30=16.7 ~17h per defect.

Integration and system test rework savings are 150 hours per KLOC (training costs recovered in less than 6 weeks of work!)

<table>
<thead>
<tr>
<th>Defects/KLOC into Unit Test</th>
<th>Before PSP</th>
<th>After PSP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yield for Unit Test</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>Defects/KLOC into I&amp;S Test</td>
<td>20</td>
<td>5</td>
</tr>
<tr>
<td>I&amp;S Defect fix time/KLOC</td>
<td>200</td>
<td>50</td>
</tr>
</tbody>
</table>
PSP: An experience workshop?

PSP exercise:
- Set goals
- Study process
- Plan

Execute plan:
- Collect data

Exercise characteristics:
- Process, model
- Tools, components

Data, lessons learned:
- Immediate feedback

PSP experience:
- Improvement
- PSP elements, data & reports
- Post Mortem
What’s a TSP?

The Team Software Process uses the PSP principles to

- Apply the PSP sound **engineering discipline** to project work
- Form and help perform outstanding self-directed **teams**
- Produce an aggressive but realistic plan owned by the team
- Proactively track project progress against the plan
- Continuously measure and improve the processes
- To produce world class products

PSP/TSP accelerate CMMI maturation by a factor 2..3 (level 1 to 4 in 24 months)\(^1\)

The TSP is an agile **level 5 process for small teams**

The TSP starts with a project “launch”

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1- Julie Switzer, NAVAIR TSP symposium 2008

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What’s a launch?

Day 1

1. Establish product and business goals
2. Assign roles and define team goals
3. Produce development strategy and process

Day 2

4. Build top-down and next-phase plans
5. Develop the quality plan
6. Build bottom-up and consolidated plans

Day 3

7. Conduct risk assessment
8. Prepare management briefing and launch report

Day 4

9. Hold management review

Launch postmortem

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Building High-Performance Teams

The TSP strategy is to improve performance from the bottom up.

This strategy starts with PSP training.
PSP/TSP impact

Average Effort Deviation - Range

Average Schedule Deviation - Range

Defects/KLOC in Acceptance Test - Range

Post-Release Defects/KLOC - Range
<table>
<thead>
<tr>
<th>My week</th>
<th>EV</th>
<th>Estim.</th>
<th>Sum</th>
<th>Done by</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prepare presentation</td>
<td>25%</td>
<td>5h</td>
<td>5h</td>
<td>Tuesday</td>
</tr>
<tr>
<td>Design a little</td>
<td>15%</td>
<td>3h</td>
<td>8h</td>
<td>Tuesday</td>
</tr>
<tr>
<td>Attend useless meeting</td>
<td>7.5%</td>
<td>1.5h</td>
<td>9.5h</td>
<td>Wednesday</td>
</tr>
<tr>
<td>Code a little</td>
<td>35%</td>
<td>7h</td>
<td>16.5h</td>
<td>Friday</td>
</tr>
<tr>
<td>Test a little</td>
<td>12.5%</td>
<td>2.5h</td>
<td>19h</td>
<td>Friday</td>
</tr>
<tr>
<td>Write status report</td>
<td>5%</td>
<td>1h</td>
<td>20h</td>
<td>Friday</td>
</tr>
</tbody>
</table>

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First PSP/TSP project in PRC
September 2008..March 2009

Cumulative Plan/Earned Value

Plan: 4% per week
Replan: 3.5% per week
=> 65/3.5 = 19 more weeks
Actual: 35% in 10 weeks

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Predictable Schedules

Schedule Deviation Individual Value Control Chart - Commercial Systems

Date of Project Start

- Individual Data Points
- Mean
- Upper Natural Process Limit
- Lower Natural Process Limit
- One Standard Deviation

Source: AIS

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Rigor continuum

Ironclad contract

CMM-I

Risk driven models

SCRUM

PSP/TSP

XP

Sandbox hacking

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Agile CMMI vs. “pure” agile

**Similarities**

- Self directed teams
- Well defined roles
- Working sw and biz value
- Incremental development
- Manager as coach
- Quick reaction/incremental Reviews/inspections
- Meaningful meetings
- People interaction
- Cultural evolution

**Differences**

True blue agile quite a bit more:

- collegial
- code driven
- project centered
- test focused
- time boxed

And quite a bit less worried about

- detailed process documentation
- early phases planning/tracking
- product doc. (except code)
- detailed data (but there is some)
- CMM stuff!!!
### Levels

<table>
<thead>
<tr>
<th>5</th>
<th>Optimizing</th>
<th>Continuous Capability Improvement</th>
<th>Organizational Performance Alignment</th>
<th>Continuous Workforce Innovation</th>
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</thead>
<tbody>
<tr>
<td>4</td>
<td>Predictable</td>
<td>Competency Integration</td>
<td>Quantitative Performance Management</td>
<td>Organizational Capability Management</td>
</tr>
<tr>
<td>3</td>
<td>Defined</td>
<td>Empowered Workgroups</td>
<td>Workgroup Development</td>
<td>Competency Based Practices</td>
</tr>
<tr>
<td>2</td>
<td>Managed</td>
<td>Training and Development</td>
<td>Communication &amp; Coordination</td>
<td>Compensation Performance Management</td>
</tr>
</tbody>
</table>

#### People CMM Threads

- **Developing Capability & Competency**
  - Mentoring
  - Competency Based Assets
  - Competency Development
  - Competency Analysis

- **Building Workgroups & Culture**
  - Competency Integration
  - Empowered Workgroups
  - Workgroup Development
  - Participatory Culture

- **Motivating & Managing Performance**
  - Communication & Coordination

- **Shaping the Workforce**
  - Staffing
  - Work Environment
  - Career Development

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Process synergy: AIM

- **CMMI** - Builds organizational capability
- **TSP** - Builds quality products on cost and schedule
- **PSP** - Builds project team skill & discipline

P-CMM – enables process capability

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AIM: The next wave

India has successfully used the CMM but rising labor costs are a concern.

Indian companies are looking for cost advantages.

But rising labor costs are a concern.

Competition:

– China
– Ex soviet union labor
– Latin America

Every company is striving for consistent measurable quality advantage.

In five years, I want the world to be asking, "How did India software industry do it?"

Every competing country must now demonstrate a consistent measurable quality advantage.

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Conclusion

Identify, mentor, nurture and lavishly praise local leadership

- Get a (preferably knowledgeable) champion
- Work the management chain before and after the TSP-like SPI planning session

Make the culture data hungry one byte at a time
You’re not good at planning? Plan often!
Surf the next wave: Go PSP/TSP (it is part of AIM)
Watch failure cost of quality go down, show ROI and celebrate…  But keep going!
Questions?