

Xtreme Programming FORUM

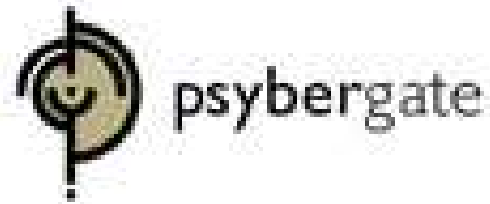


Improve software development efficiency using TSP/PSP

Presented by

Prof Barry Dwolatzky

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Xtreme Programming FORUM



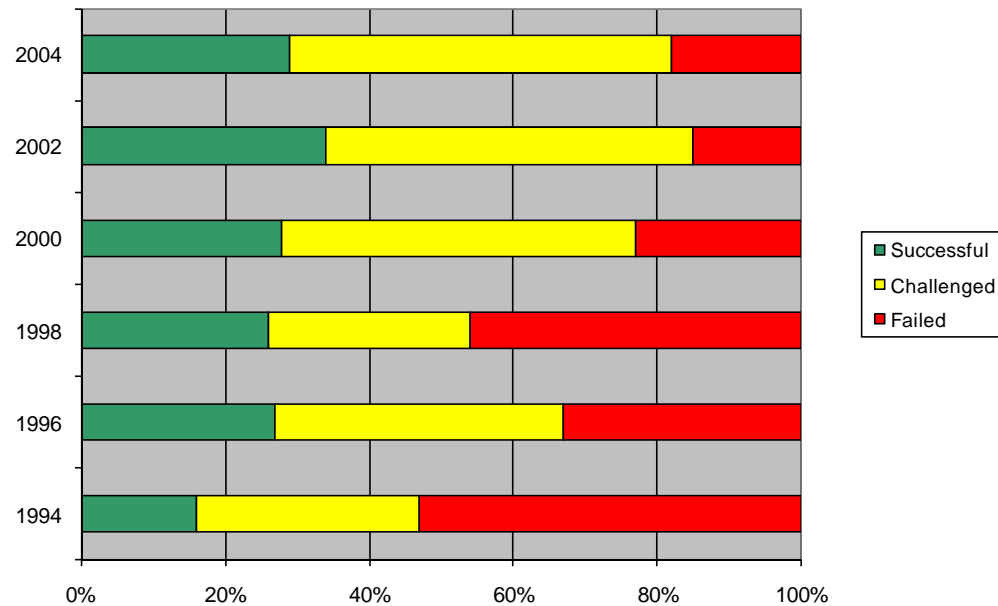
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|---------------|---|
| 16:00 – 16:45 | Improve software development efficiency using TSP/PSP
<i>Prof. Barry Dwolatzky</i> |
| 16:45 – 17:30 | Discussion |
| 17:30 – 18:00 | Drinks and snacks |

Overview

- So what is wrong with software development?
- Measurement: the heart of the matter
- What is PSP?
- What is TSP?
- Some actual results
- Is TSP Agile?
- TSP in South Africa ... next steps



So what is wrong with s/ware dev?



Successful projects delivered on time, on budget, with required features and functions.

Challenged projects estimated a 43% average cost overrun, time overruns of 83%, and delivered only 52% of required features and functions (in 2002).

Failed projects were cancelled prior to completion or delivered and never used.

(This chart represents over 50,000 IT projects in large, medium, and small cross-industry world-wide companies tested by The Standish Group since 1994.)



So what is wrong with s/ware dev?

- Software is the only modern technology that ignores quality until test.
- Most software defects are found in or after test when defect removal is the most expensive and least effective.
- This strategy results in buggy products and unnecessary rework, inflating development costs.
- Rework often exceeds 50% of total cost or schedule.
- Delivered product quality is poor, from 1 to 7 defects per 1000 instructions.
- Software defects are also a principal cause of software security vulnerabilities.



Measurement: the heart of the matter



Who are the golfers?

What is your handicap?

What is your best round ever?



Who are the runners?

What is your personal best?



Who are the F1 fans?



Measurement: the heart of the matter



Who are the programmers?



How many bugs do you introduce per thousand lines of code?



How many lines of code do you write per day?



What is TSP and PSP?

- They are methodologies developed by Watts Humphrey and others at the Software Engineering Institute (SEI), Carnegie Mellon University, Pittsburgh, USA



Software Engineering Institute

- DoD R&D Laboratory FFRDC
- Charter – improve the practice of software engineering
- Contracted to Carnegie Mellon University
- Created in 1984
- Offices in
 - Pittsburgh, PA
 - Arlington, VA
 - Huntsville, AL
 - Europe



SEI Technical Program

Software Engineering Process Management

- Capability Maturity Model Integration
- Team Software Process
- Software Engineering Measurement and Analysis

Product Line Systems

- Product Line Practice
- Software Architecture Technology
- Predictable Assembly from Certifiable Components

Networked Systems Survivability

- Survivable Systems Engineering
- Survivable Enterprise Management
- CERT Coordination Center
- Network Situational Awareness
- Practices Development and Training

Dynamic Systems

- Integration of Software-Intensive Systems
- Performance-Critical Systems

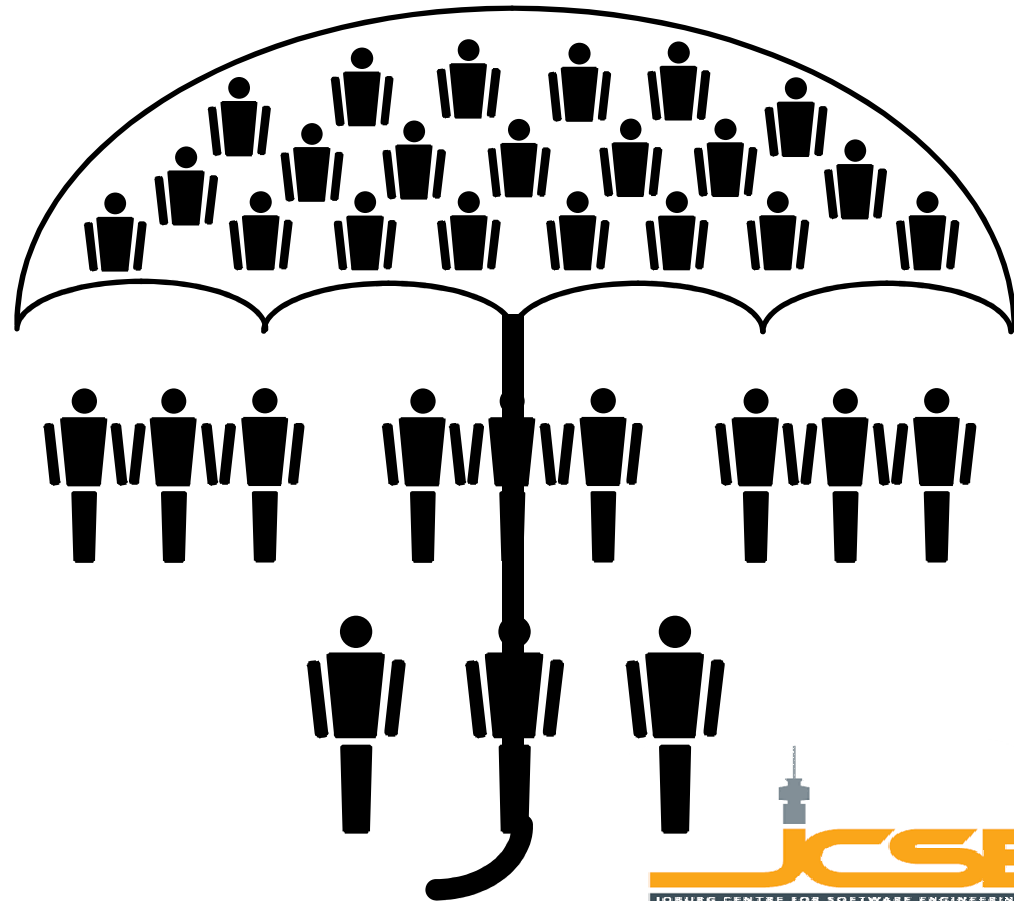


Improving Software Practice

*CMMI – Model of
organizational
capability*

*TSP – Instance
of high-maturity
practice for
teams*

*PSP – Instance
of high-maturity
practice for
individuals*



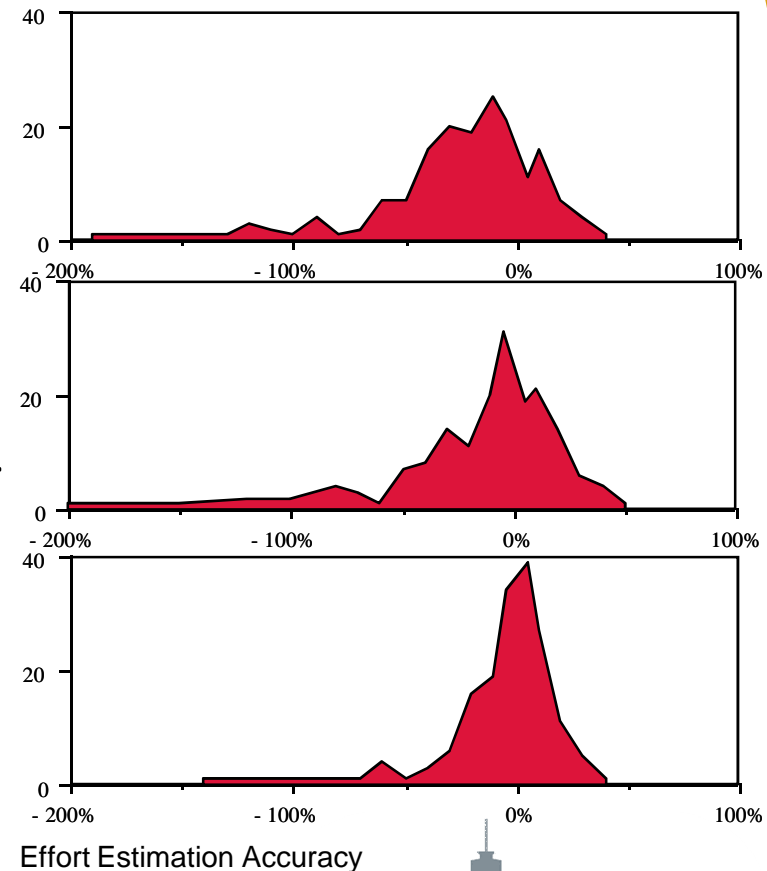
Personal Software Process

- The PSP is a process designed for individual use that applies to structured personal tasks.
- With PSP, developers use defined and measured personal processes.
- They gather size, time, and defect data as they work.
- They use the data to
 - plan and track their work
 - manage the quality of the products they produce
 - measurably improve performance



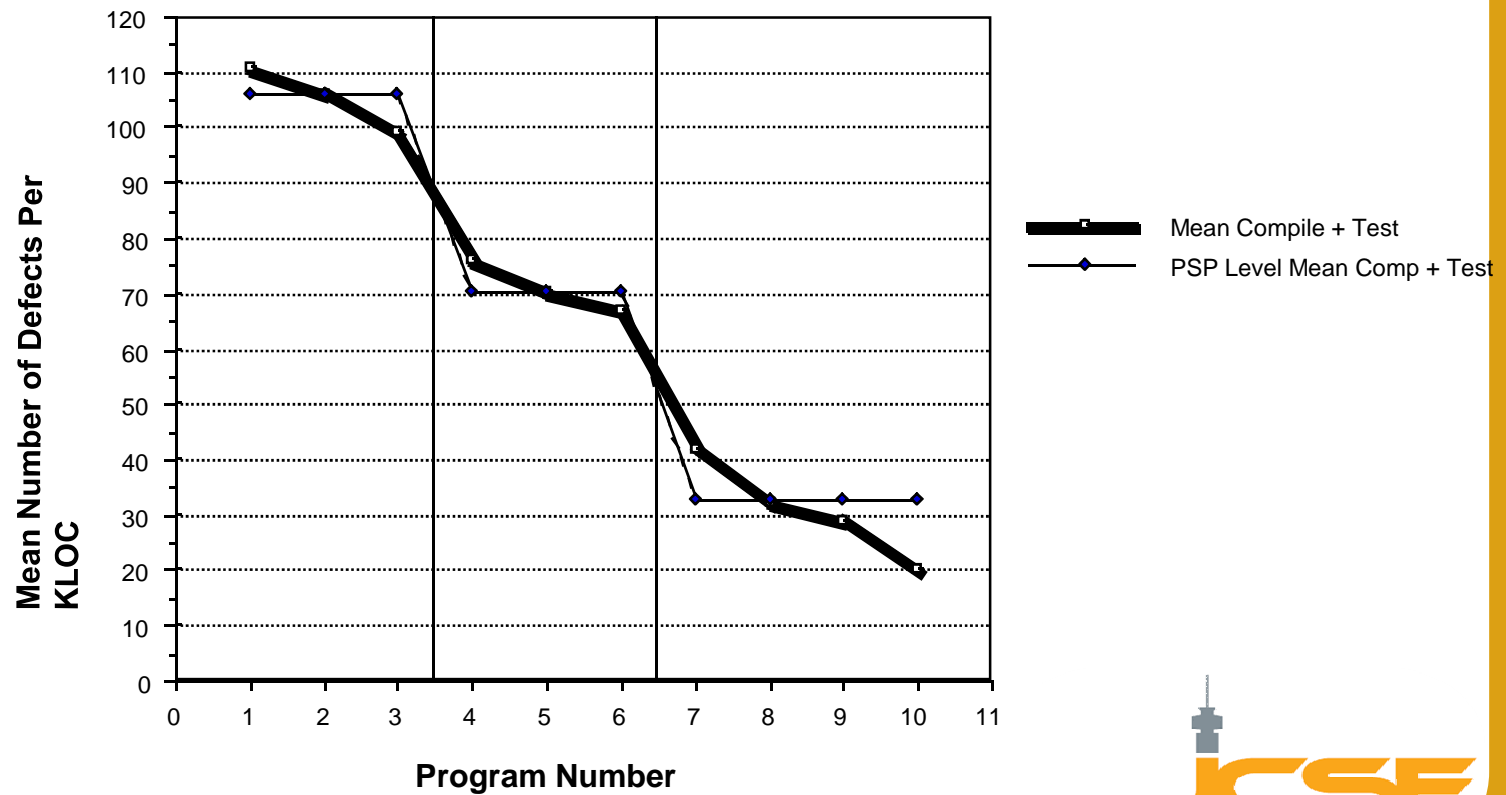
PSP Estimating Accuracy

- For the first 1/3 of the PSP training, the majority of students are under-estimating.
- By the midway point students begin to achieve a balance of over- and underestimates.
- By the end of the PSP training students achieve a much tighter balance around zero.



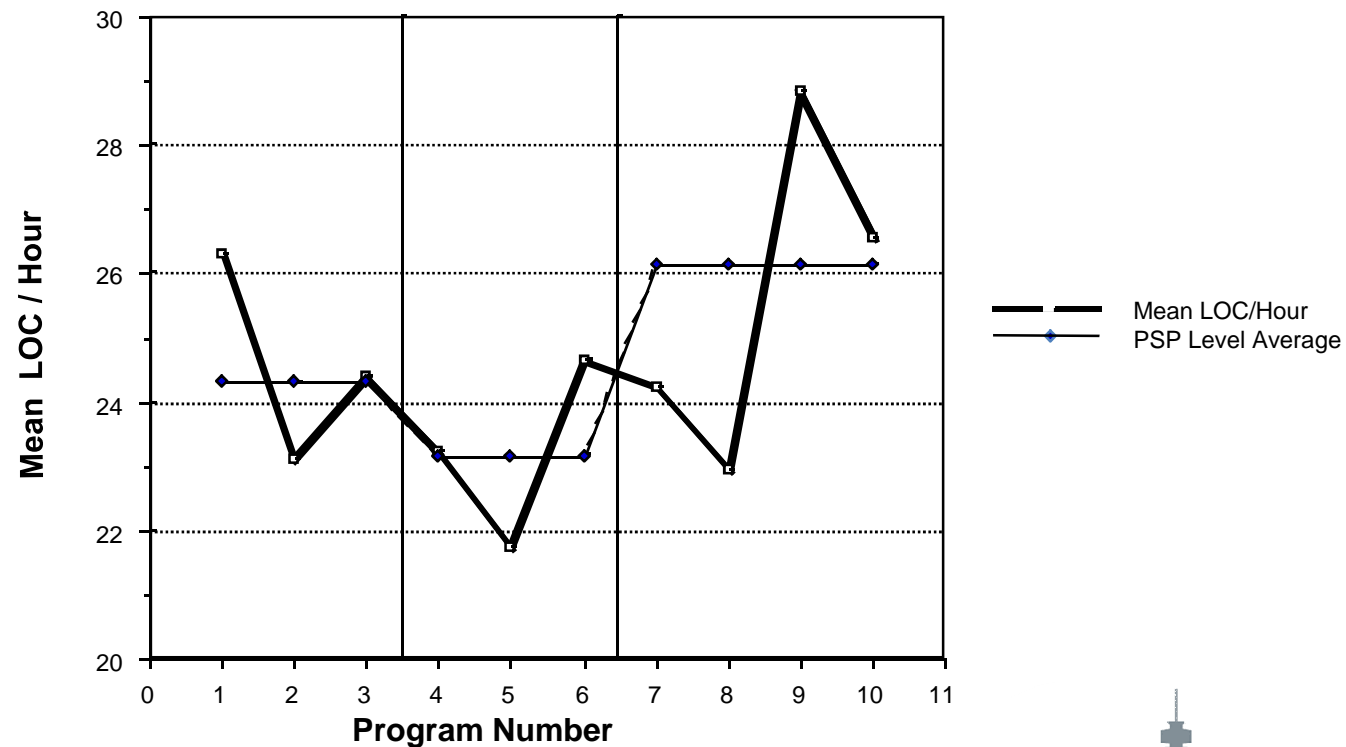
PSP Quality Results

Defects Per KLOC Removed in Compile and Test



PSP Productivity Results

Lines of (New and Changed) Code
Produced Per Hour of Total Development Time



PSP Conclusion

- PSP training changes behavior.
- Developers convince themselves that process discipline, measurement, estimating & planning, and quality management will improve their performance.
- They are then prepared and ready to apply these skills to their work.



TSP Principles

- Software is developed by individuals and teams. To improve overall performance, improve individual and team performance.
- Empowered, team coaching, and rational management are the most effective way to manage engineering teams.
- Process is a performance determinant...an ad-hoc chaotic process cannot produce predictable, high-quality results.
- Measurement is necessary for high-performance.
- To get a quality product out of test, you must put a quality product into test.
- Quality must be measured and managed at every step.

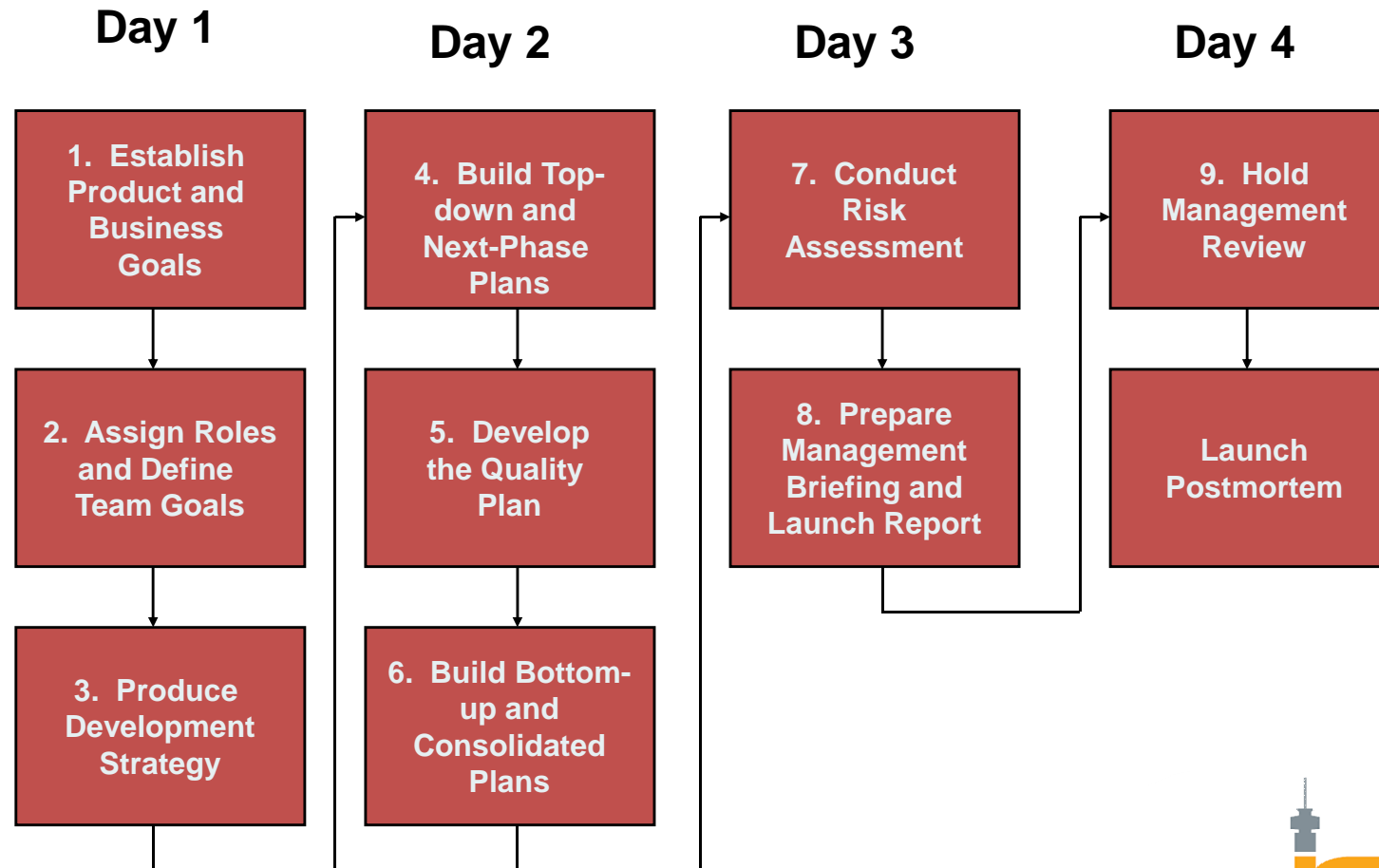


Team Software Process

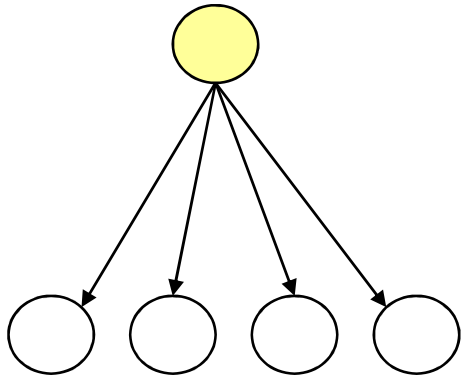
- The Team Software Process (TSP) is a development process for engineering teams.
- TSP is a process-based solution to common business issues.
 - cost and schedule predictability
 - productivity and cycle time improvement
 - product quality improvement
- Unlike other methods, TSP
 - improves the performance of both teams and individuals
 - is disciplined and agile
 - provides immediate and measurable performance benefits
 - accelerates CMMI-based improvement



Team Building

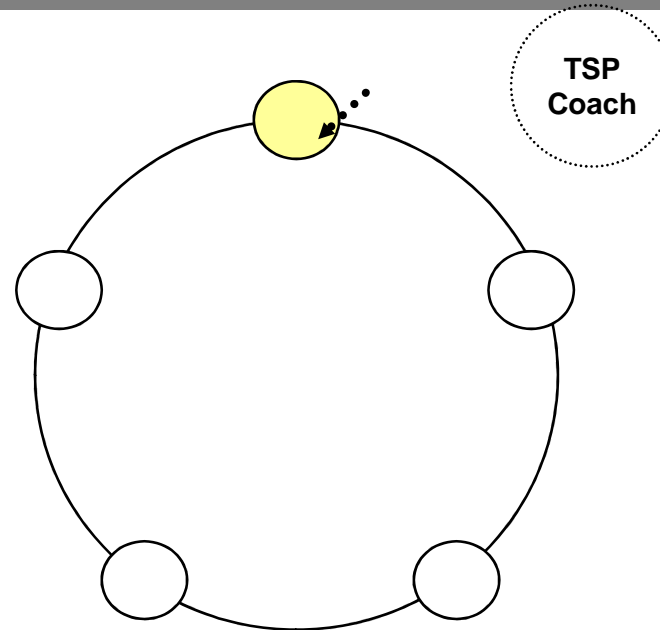


TSP Teams are Self-directed



Traditional team

The leader plans, directs, and tracks the team's work.



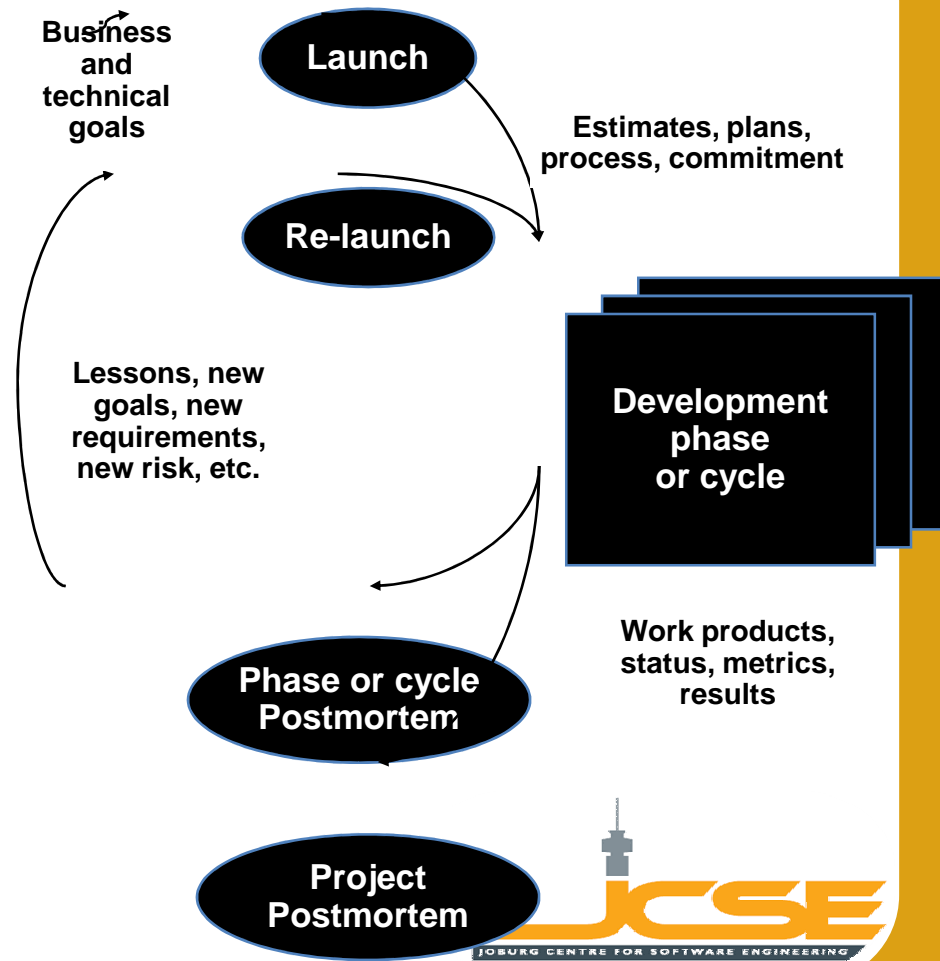
Self-directed team

The team members participate in planning, managing, and tracking their own work.

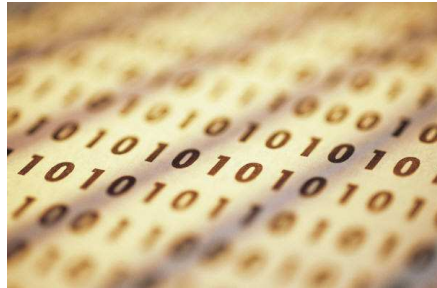


TSP Process Structure

- The TSP process elements can be organized into whatever process structure makes the most business and technical sense.
- The phases can be implemented iteratively in small cycles, in a spiral with increasing cycle content, or sequentially as in a waterfall,
- TSP projects can start on any phase or any cycle.
- Each cycle starts with a launch or re-launch and ends with a postmortem.



TSP Base Measures



Size



Effort



Quality



Schedule



What the Base Measures Provide

Derived Measures

- Estimation accuracy (size/time)
- Prediction intervals (size/time)
- Time in phase distribution
- Defect injection phase distribution
- Defect removal phase distribution
- Productivity
- %Reuse
- %New Reusable
- Cost performance index
- Planned value
- Earned value
- Predicted earned value
- Defect density
- Defect density by phase

Derived Measures (continued)

- Defect removal rate by phase
- Defect removal leverage
- Review rates
- Process yield
- Phase yield
- Failure cost of quality
- Appraisal cost of quality
- Appraisal/Failure COQ ratio
- Percent defect free
- Defect removal profiles
- Quality profile
- Quality profile index

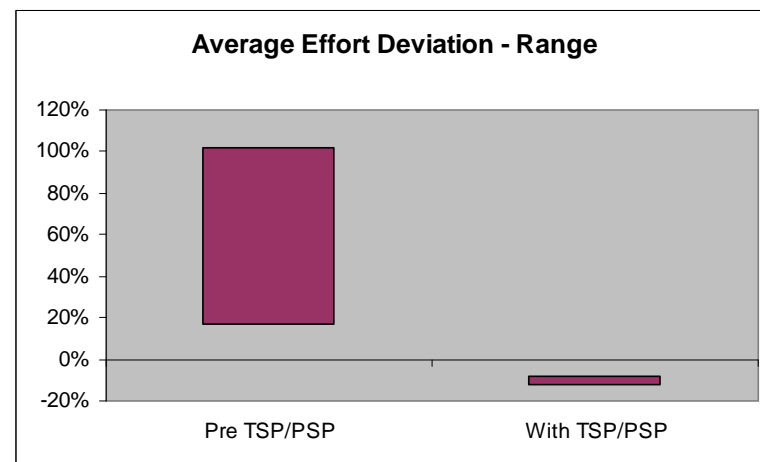
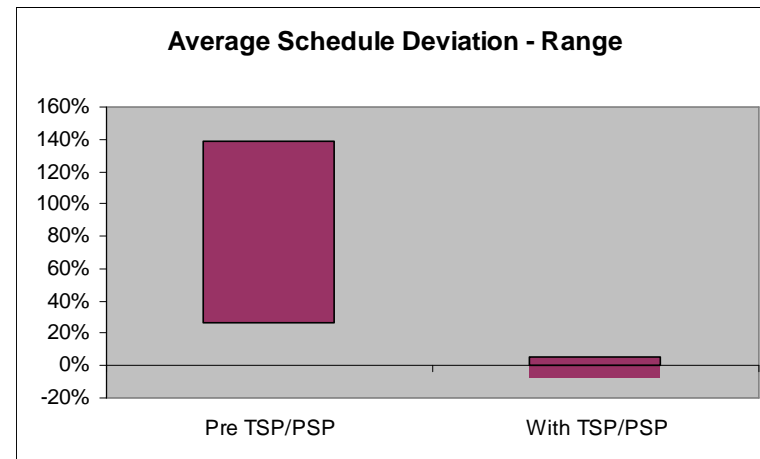


Actual results: TSP Improves Predictability

- Effort and schedule deviation are dramatically improved.

Schedule Performance	
Typical Industry	100%+ overrun
Study baseline	27% to 112%
TSP	< 10%

Effort/Cost Performance	
Typical Industry	100%+ overrun
Study baseline	17% to 85%
TSP	< 5%



Source: CMU/SEI-2000-TR-015

Joburg Centre for Software Engineering

TSP Improves Quality -1

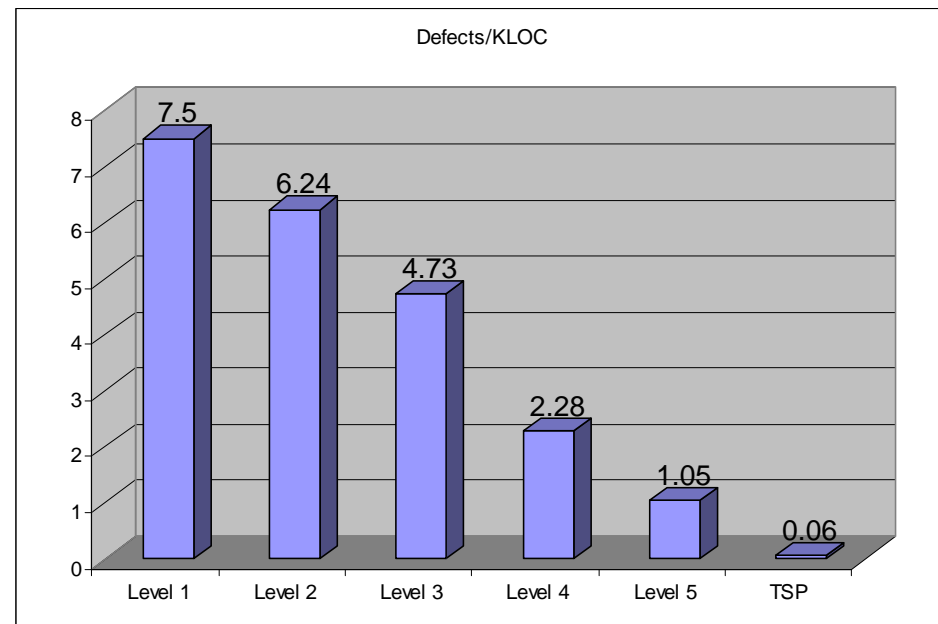
Performance Category	TSP Impact Study (2003)*	Typical Industry Performance
System test defects per thousand instructions	0.4 avg. 0.0 to 0.9	2 to 14
Released defects per thousand instructions	0.06 avg. 0.0 to 0.2	1 to 7
System test effort (% of total effort)	4% avg. 2% to 7%	40%

* From a study of 20 projects in 13 organizations conducted in 2003



TSP Improves Product and Process Quality

- An analysis of 20 projects in 13 organizations showed TSP teams averaged 0.06 defects per thousand lines of new or modified code.
- Approximately 1/3 of these projects were defect-free.
- These results are substantially better than those achieved in high maturity organizations.

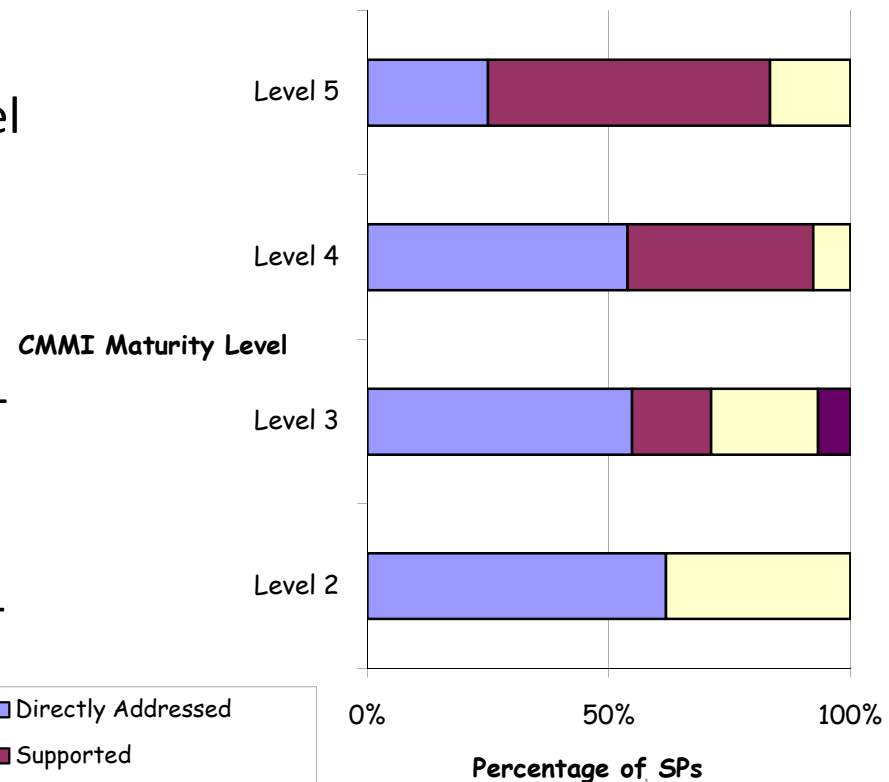


Source: CMU/SEI-2003-TR-014



Accelerated Process Improvement

- TSP addresses or supports most of the capabilities expected of a project team through CMMI Level 5.
- It provides a “starting point” for low-maturity organizations.
- It provides a “next step” for high-maturity organizations.
- Three organizations have used TSP to advance from ML1 to ML4 in only 2.5 years.

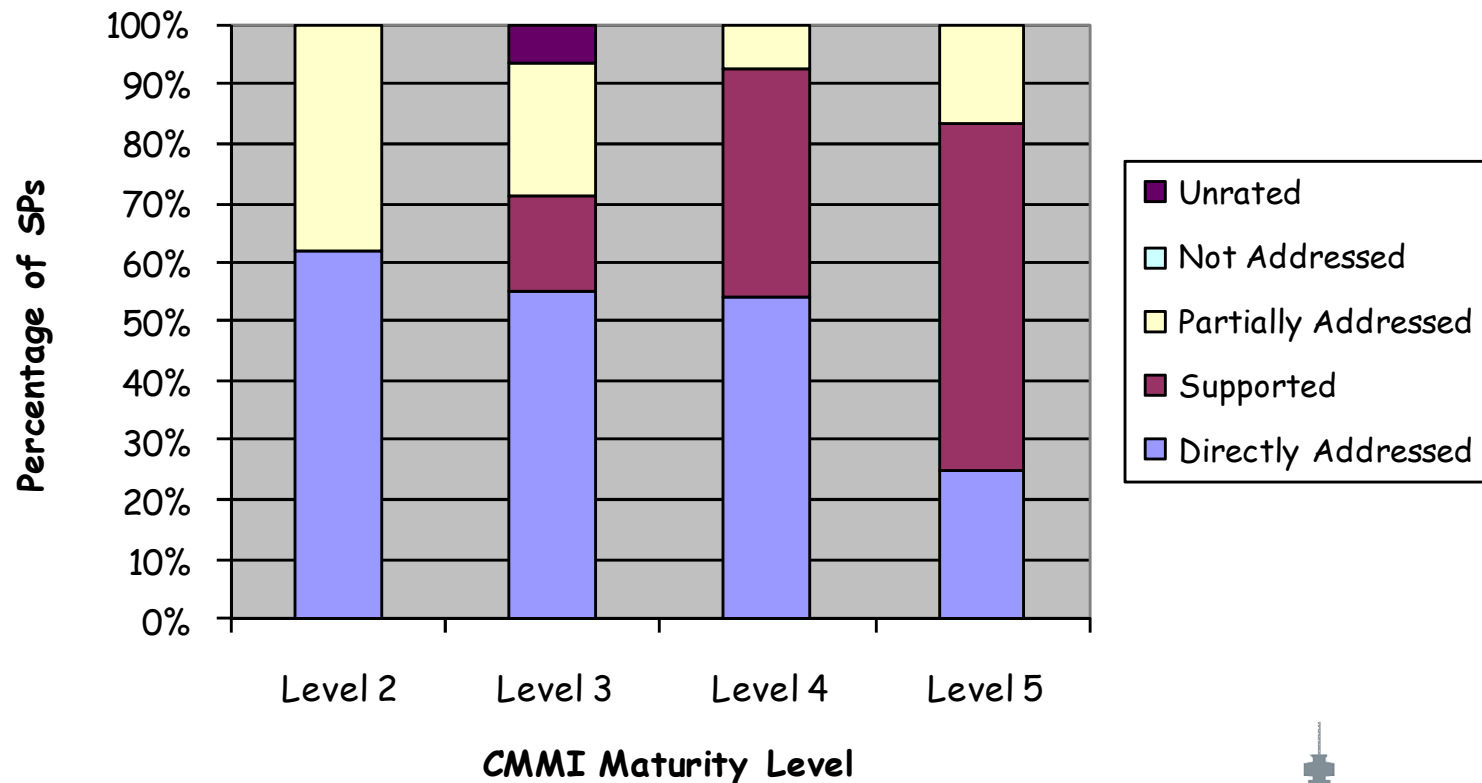


TSP Improves Quality of Work Life

- *“A more disciplined process allowed me to do a better job, and allowed me to balance my job with other aspects of my life.”*
- *“This project ended up a lot less stressful than other projects.”*
- *“Promotes a less stressful environment. Can track that the project is on schedule. Fewer defects are seen positively in the organization.”*
- *“It is nice to be associated with a project that had few defects.”*
- *“I liked the level of detail that went into initial plan, and the constant awareness of the schedule. Allowed us to make adjustments as the project went on, instead of waiting for a major milestone.”*
- *“It was nice that management finally allowed the team to create the schedule.”*



TSP Overall Coverage of CMMI



Adoption

- Organizations using, piloting, or preparing to pilot the TSP.

ABB
Accenture
Advanced Information Services
Advanced Maturity Services, Inc.
Alan S. Koch Consultants
Alliant
AMRDEC
Ascent
Bechtel-Bettis*
Boeing
Centre De Investigacion En Matamaticas
Census Bureau
Cluster File Systems
Computing Technology, Inc.
CQG, Inc.
CRSIP / STSC / DRAPER
Davis Systems
DEK
Delivery Excellence
DOE / Los Alamos
DOE / Naval Reactors
DPC Cirrus
Dynamics Research Corp.
Evince Media

Halex Associates
Heath Solutions, Inc.
Helsana
IBM Japan
IBM Mexico*
Idea Entity Corporation
Institute for Information Industry
Intuit*
Kaitatsu, Ltd.
KPMG
LogiCare
Los Alamos National Laboratory
M/A-Com Private Radio Systems, Inc.
Magellen*
Microsoft*
Misys
Motiva
MP SPI Solutions
NASA Langley
NAVAIR*
Naval Reactors*
NAVOCEANO*
NCS Pearson
Northern Horizons

Oakwood College
Oracle*
Prodigia S.A. de C.V.
PS&J Consulting - Software Six Sigma
QuarkSoft
Sage Software
SAIC
Samsung Electronics
Samsung SDS
Sandia National Laboratories
Satyam Computing Services
Scientific Atlanta
Softtek*
SECC
STPP, Inc.
STSC
Tec de Monterrey
Trend Micro
TYBRIN Corporation - Air Logistics
Unisinos
University of Alabama / Huntsville
University of Queensland
Vicarious Visions

*Organizations SEI is currently working with



TSP and Agile -1

Agile Value Statement	How TSP Relates
<i>Individuals and interactions over processes and tools</i>	<p>TSP holds that the individual is key to product quality and effective member interactions are necessary to the team's success.</p> <ul style="list-style-type: none">•Project launches strive to create gelled teams.•Weekly meetings and communication are essential to sustain them.•Teams define their own processes in the launch.



TSP and Agile -2

Agile Value Statement	How TSP Relates
<i>Working software</i> over comprehensive documentation	<p>TSP teams can choose evolutionary or iterative lifecycle models to deliver early functionality—the focus is on high quality working software from the start. TSP does not require heavy documentation.</p> <ul style="list-style-type: none">• Documentation should merely be sufficient to facilitate effective reviews and information sharing.• TSP teams can determine the level of documentation produced based on organizational standards, customer needs, and system attributes.



TSP and Agile -3

Agile Value Statement	How TSP Relates
<i>Customer collaboration over contract negotiation</i>	<p>Learning what the customer wants is a key focus of the TSP.</p> <ul style="list-style-type: none">•The customer or a customer representative is required to be present when TSP teams start plan the project and the first cycle.•The customer or customer representative can also attend each re-launch to guide plans for the next cycle.•The TSP has a team member role, the Customer Interface Manager, for the purpose of collaboration with the customer.



TSP and Agile -4

Agile Value Statement	How TSP Relates
<i>Responding to change over following a plan</i>	<p>TSP teams expect and plan for change.</p> <ul style="list-style-type: none">•TSP teams re-plan whenever the plan is no longer a useful guide.•New tasks are added as they are discovered.•They dynamically rebalance the team workload as required to finish faster.•The team's process is adjusted as needed to improve performance.•The team continuously manages risk and uses early-warning indicators to identify and avoid technical and planning issues.



TSP in South Africa

- JCSE planning to lead a TSP Pilot in partnership with SEI
- Pilot will be modeled on successful pilot running in Mexico
- JCSE, Dept of Trade & Industry and potential pilots will visit Mexico and the USA at the end of May 2008.



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Discussion and questions

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Topics for future events:

- How can local companies take advantage of Agile methodologies to get involved in international software development projects
- Changes in XP and Agile since 2001
- Agile and outsourcing
- Agile and SOA
- Software frameworks best suited to XP
- Software testing/analysis tools
- Software metrics and personal improvement processes
- Continuous integration
- Test driven development
- Continuous Integration
- Expert XP practitioner debate with expert from oa different methodology
- The role of a Business Analyst in an XP Project