

Personal Software ProcessSM & Team Software ProcessSM

An Overview

Dan Van Duine

SEI-Authorized PSPSM Instructor & TSPSM Coach

Advanced Information Services Inc.

Seattle Eastside Area SPIN

November 20, 2006

SM Personal Software Process, PSP, Team Software Process, and TSP are service marks of Carnegie Mellon University

© CMMI and CMM are registered in the U.S. Patent and Trademark Office by Carnegie Mellon University

Copyright 2006 Advanced Information Services Inc.

Agenda

- CMM[®], PSP, and TSP
- PSP Overview and Results
- TSP Overview and Results
- Implementation Strategy & Challenges
- Summary
- Questions

The Capability Maturity Model (CMM) for Software*

- Provides guidance for companies desiring to improve and assess their software development processes
 - Guidance is “What,” not “How”
- CMM primarily directed toward management practices
 - CMMI has added more team-level practices
- Does not give specific guidance for individual behavior

PSP and TSP

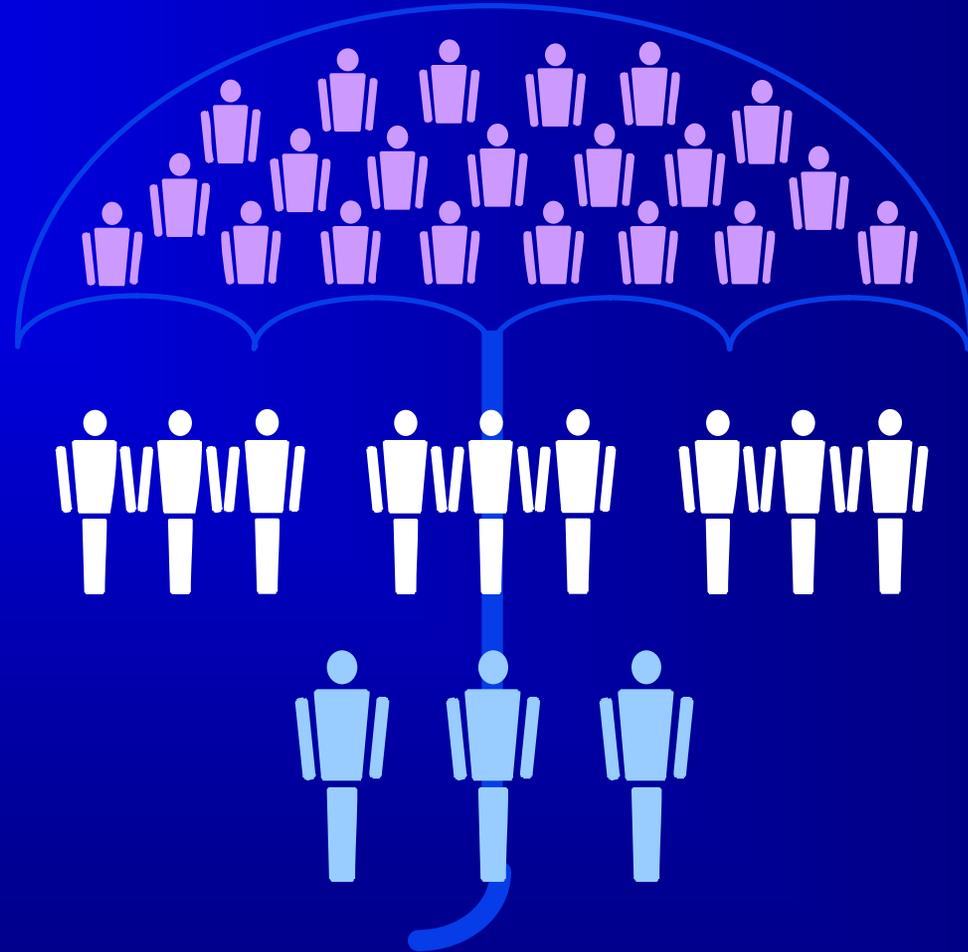
- PSP is a high-maturity process framework for individuals
- TSP addresses high-maturity practices for teams of PSP-trained engineers
- PSP & TSP provide a set of “Hows” to the CMM’s “Whats”
- PSP & TSP get individuals and teams more involved in process improvement
- PSP & TSP are sometimes referred to as Level 5 processes for individuals and teams

CMM + PSP + TSP

CMM - Improves organization's capability, management focus.

TSP - Improves team performance, team and product focus.

PSP - Improves individual skills and discipline, personal focus.



The PSP Philosophy

- Use effective methods
- Recognize strengths and weaknesses
- Practice, practice, practice
- Learn from history
- Find and learn new methods
- Practice software development as an engineering discipline rather than craft

What is the PSP?

- The PSP is a set of practices that engineers can apply to most structured personal tasks to improve predictability, quality, & productivity
- The PSP as taught contains *one* set of methods that can be effective for many
 - An excellent starting point, but not expected to be a “one size fits all” process
- Currently, few engineers practice the best available methods, negatively impacting chances of project success—PSP addresses this

What Does a “PSP” Developer Do? - 1

- Tracks basic development process data
 - Size, time, defects, and task completion
 - Time & defects are tracked by phase, e.g., planning, design, code, personal reviews, test, postmortem
- *Uses* data derived from the basic data for process management and improvement
- Plans using historical data and tracks progress
 - “PROBE” (PROxy Based Estimating) estimating
 - “Earned Value” scheduling & tracking
 - Quality planning

What Does a “PSP” Developer Do? - 2

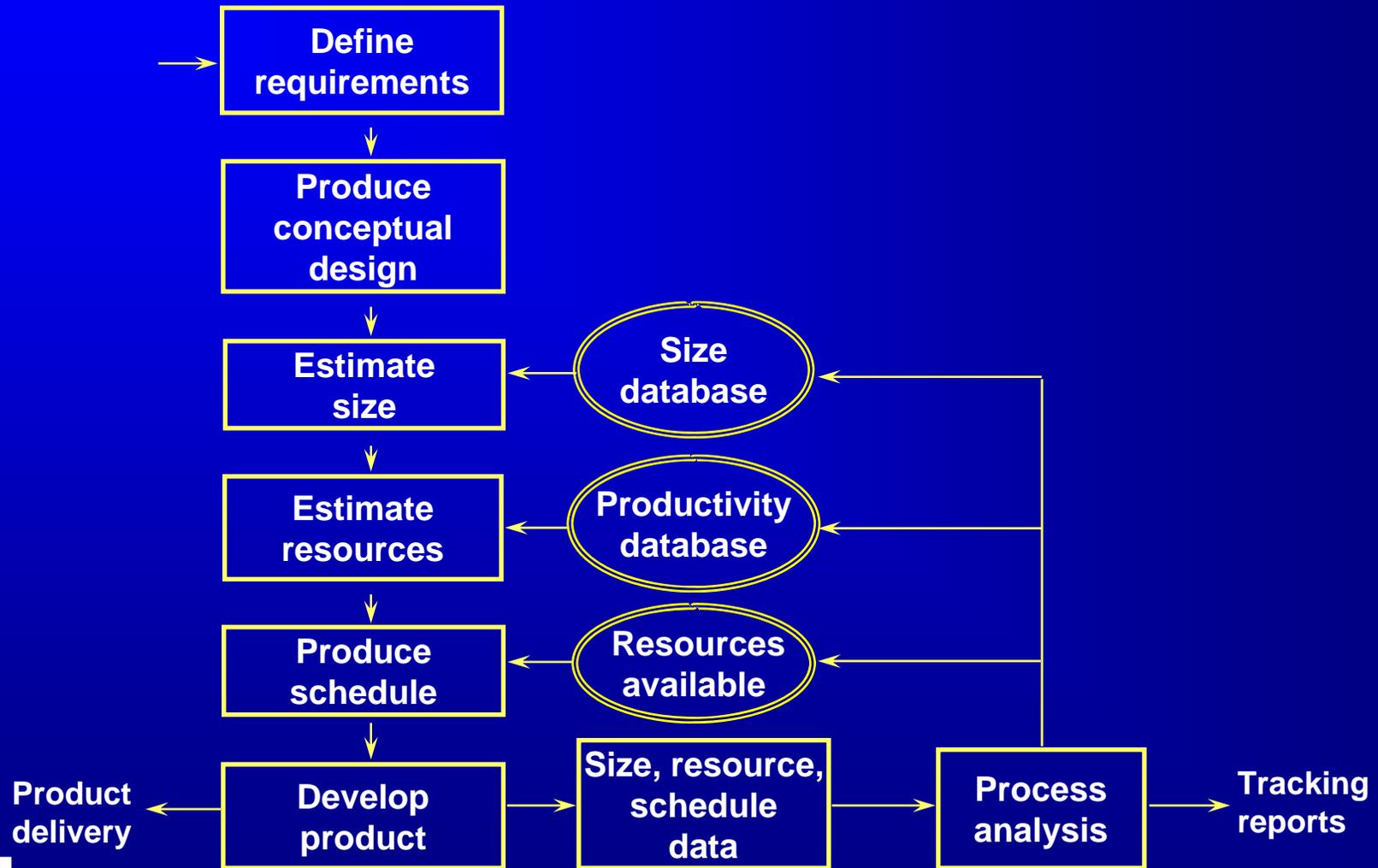
- “Builds in” Quality
 - Produces verifiable designs
 - Conducts structured personal design and code reviews
- Improves development process using data

PSP Data

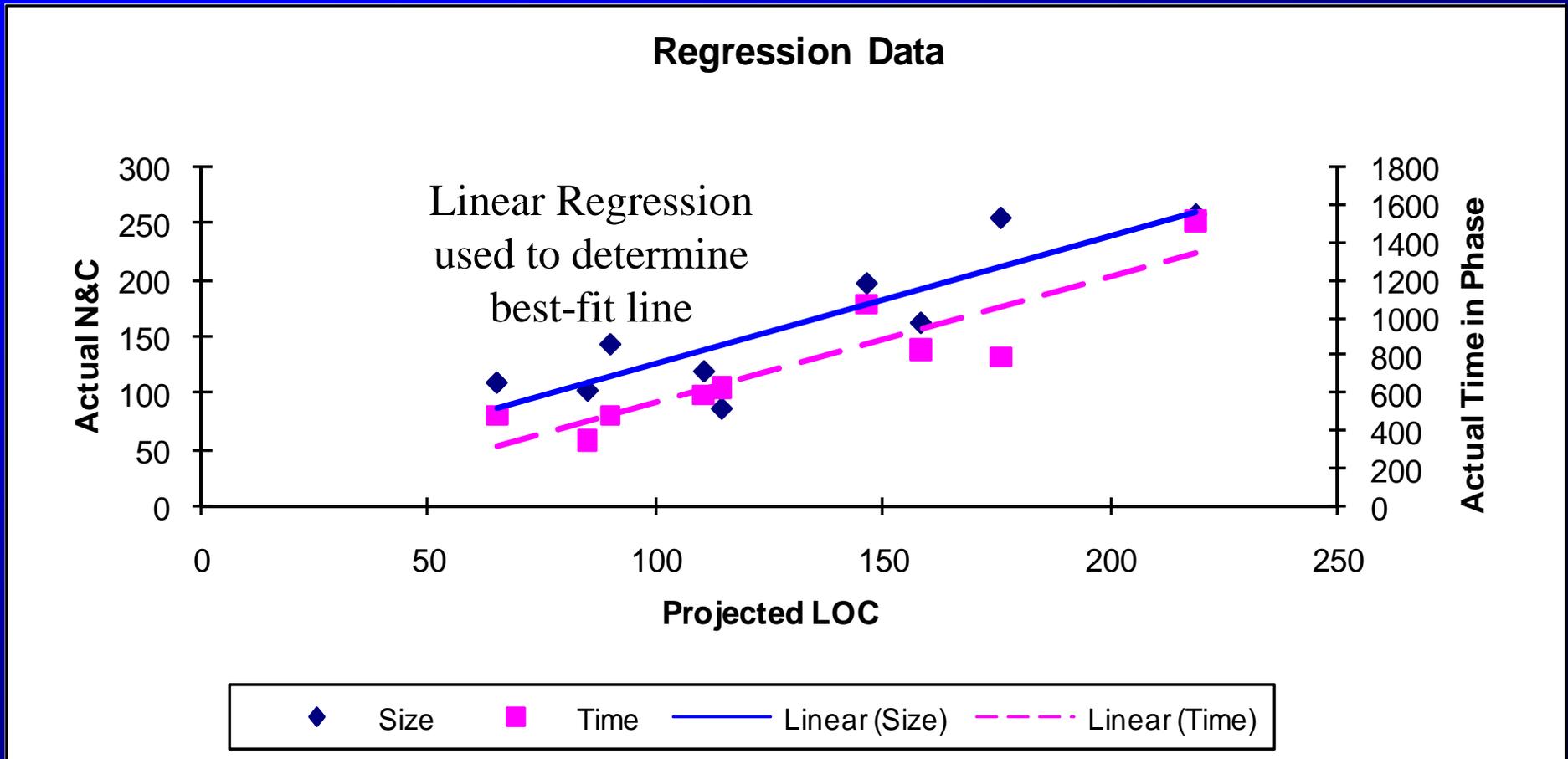
- What a developer measures
 - Estimated & actual size by object
 - Estimated & actual direct effort (“Time On Task”) by phase
 - Estimated & actual defects, injected and removed by phase
- Metrics derived from the measurements (for starters!)
 - Productivity (LOC/Hour), % Time on Task
 - Defect density (Defects/LOC), Cost Of Quality (COQ)
 - Yield (Defects found/Defects present), Review Rates
 - Process Quality Index (PQI), Defect Removal Leverage (DRL)

Did I mention that the ‘P’ in PSP stands for “Personal?!”

The Project Planning Framework

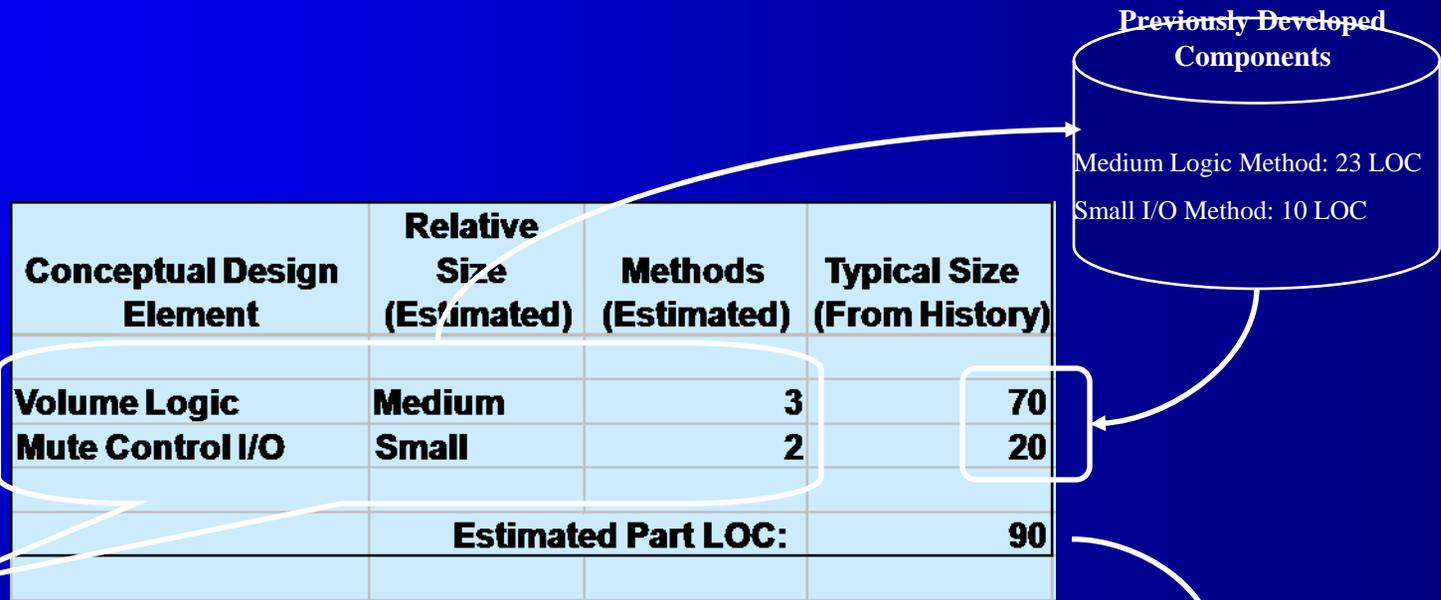


Personal History



Personal history of size and effort forms the basis for future estimates

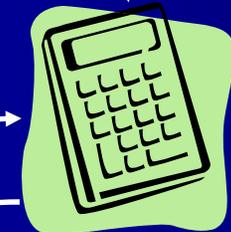
Proxy-Based Estimating (PROBE)



Typical Productivity



20 LOC/hr



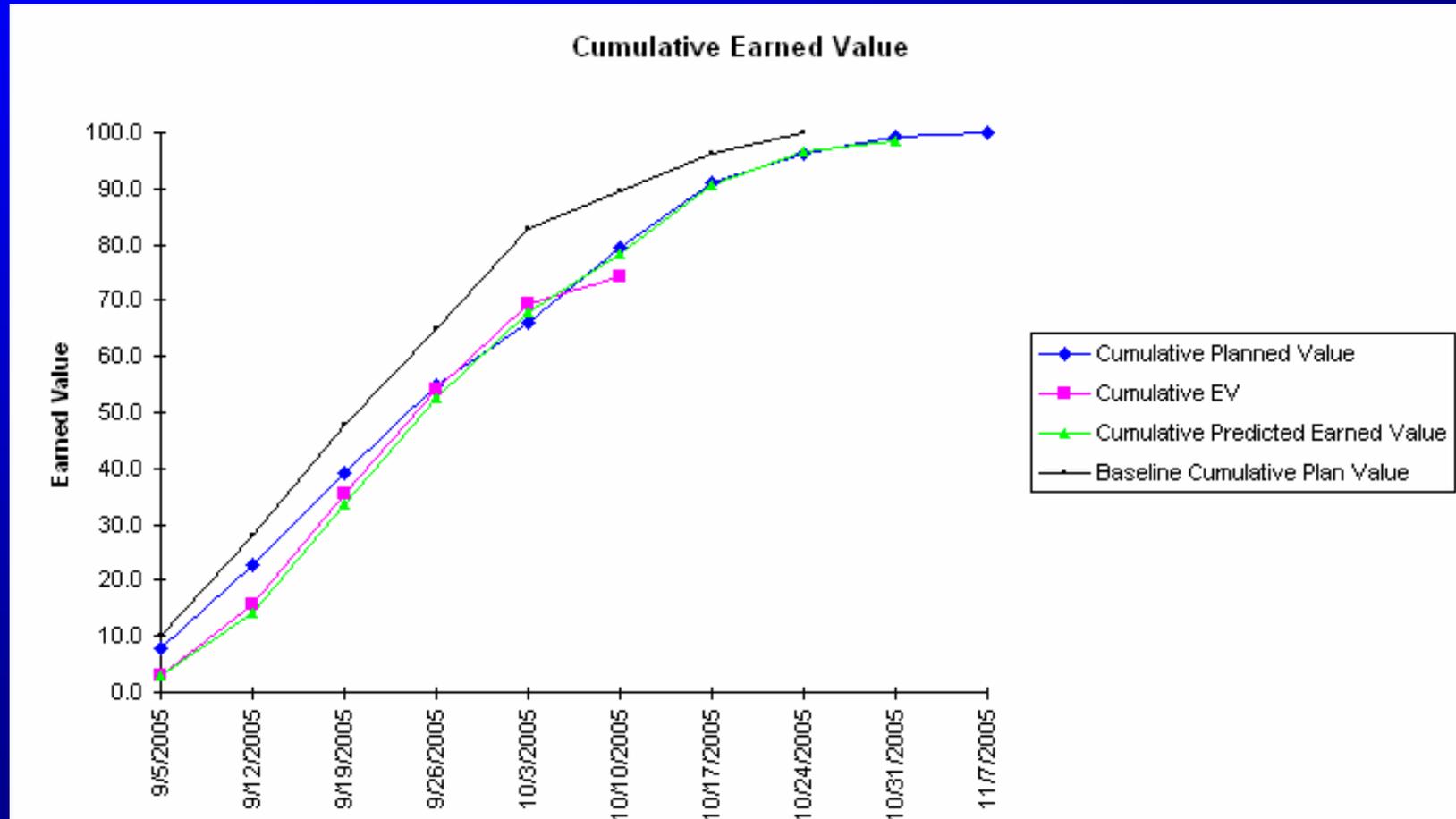
Estimated Direct Effort = 4.5 hrs

ais

Scheduling using Earned Value

- Once planned task hours, task order, and % time on task are estimated, a schedule plan can be produced
- Earned Value (EV) is a project management technique that measures progress against the plan by counting the completion of planned tasks
- The Planned Value (PV) for a task is the percentage of the total project estimate that the task entails
 - E.g., if a task is estimated to take 15 hours and the entire project is estimated to take 60 hours, the task's PV is $15 / 60 = 25\%$
- When tracking work, each estimated task is evaluated as either being complete or not; the sum of the PVs for the completed tasks is used as the project's completion percentage

Earned Value Example

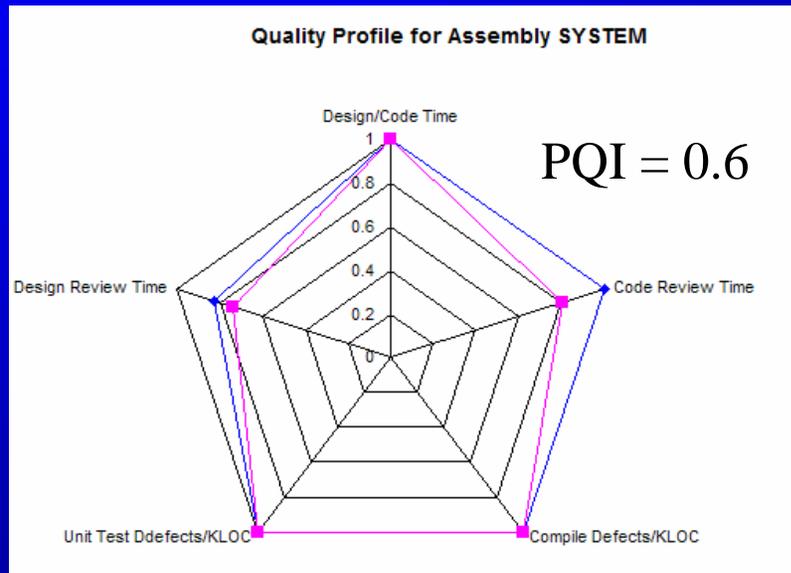


Quality Planning & Tracking - 1

- Defect history provides answers
 - “How many defects will I likely inject?”
 - “Where am I likely to find those defects?”
- By estimating defects, individuals can recognize poor quality and take corrective action—*before* integration and system test
 - E.g., if I expect to find 15 defects in a code review and I find only 2, either
 - ◆ I did an unusually great job of coding, or
 - ◆ I didn’t do a great job of reviewing my code

Quality Planning & Tracking - 2

Quality Profile & Process Quality Index (PQI)



PSP/TSP Quality Profile Guidelines

Design Time should be greater than or equal to Coding Time

Design Review Time should be at least half of Design Time

Code Review Time should be at least half of Coding Time

Compile Defects should be less than 10 defects per KLOC

Unit Test Defects should be less than 5 defects per KLOC

- PQI values ≥ 0.4 are indicative of modules likely to be defect free during system and acceptance testing
- PQI is available at completion of *Unit Test*

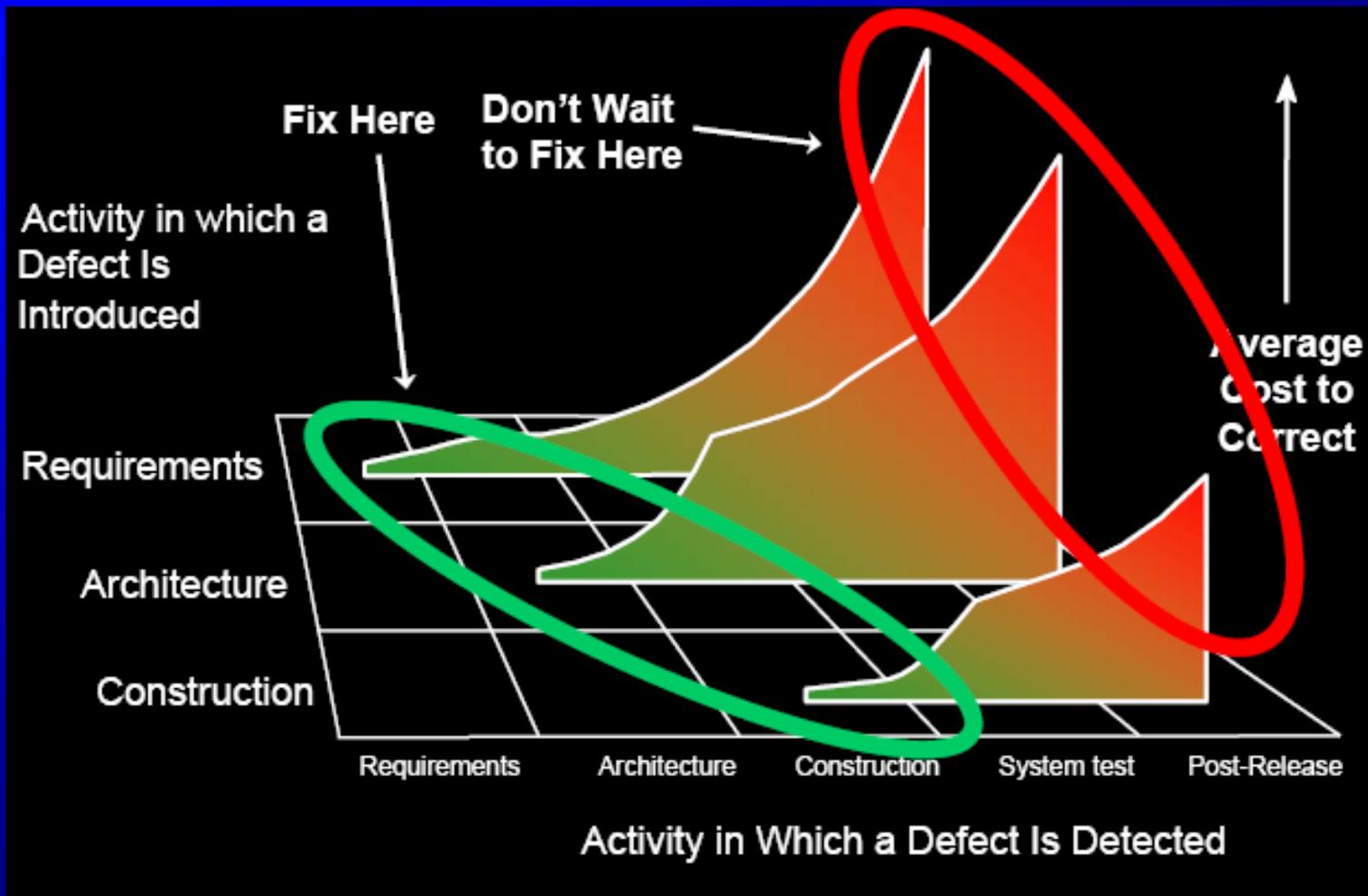
ais

Quality Philosophy

- Fixing defects late in the process is *expensive*
- For the overall project, doing the job the best way will result in the shortest possible schedule
- Strive to achieve high quality for each component
- Avoid downstream consequences of poor quality
 - Delays in product availability
 - Excessive development resources and costs
 - Reduced customer satisfaction
 - Increased service costs

“Pay a little more now, instead of a lot more later”

Cost to Fix Defects



Achieving High Quality at the Personal Level

- Produce verifiable designs using design templates covering the four design “quadrants”
 - External vs. Internal
 - Static vs. Dynamic
- Conduct *structured, personal* design and code reviews using checklists
 - Used to remove and prevent defects
 - Based upon an *individual’s* defect data

Continuous Improvement

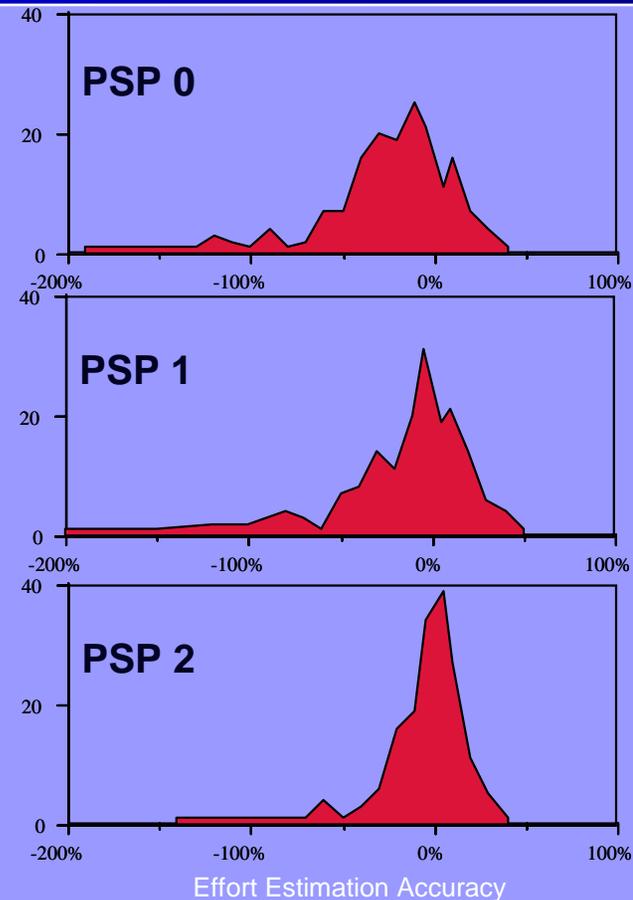
- Data is captured and analyzed after each development cycle
- Estimated and actual size and effort builds personal history
- Regression continuously improves estimation
- Analysis of defects results in actions to prevent similar defects in the future

PSP Estimating Results

Majority are under-estimating

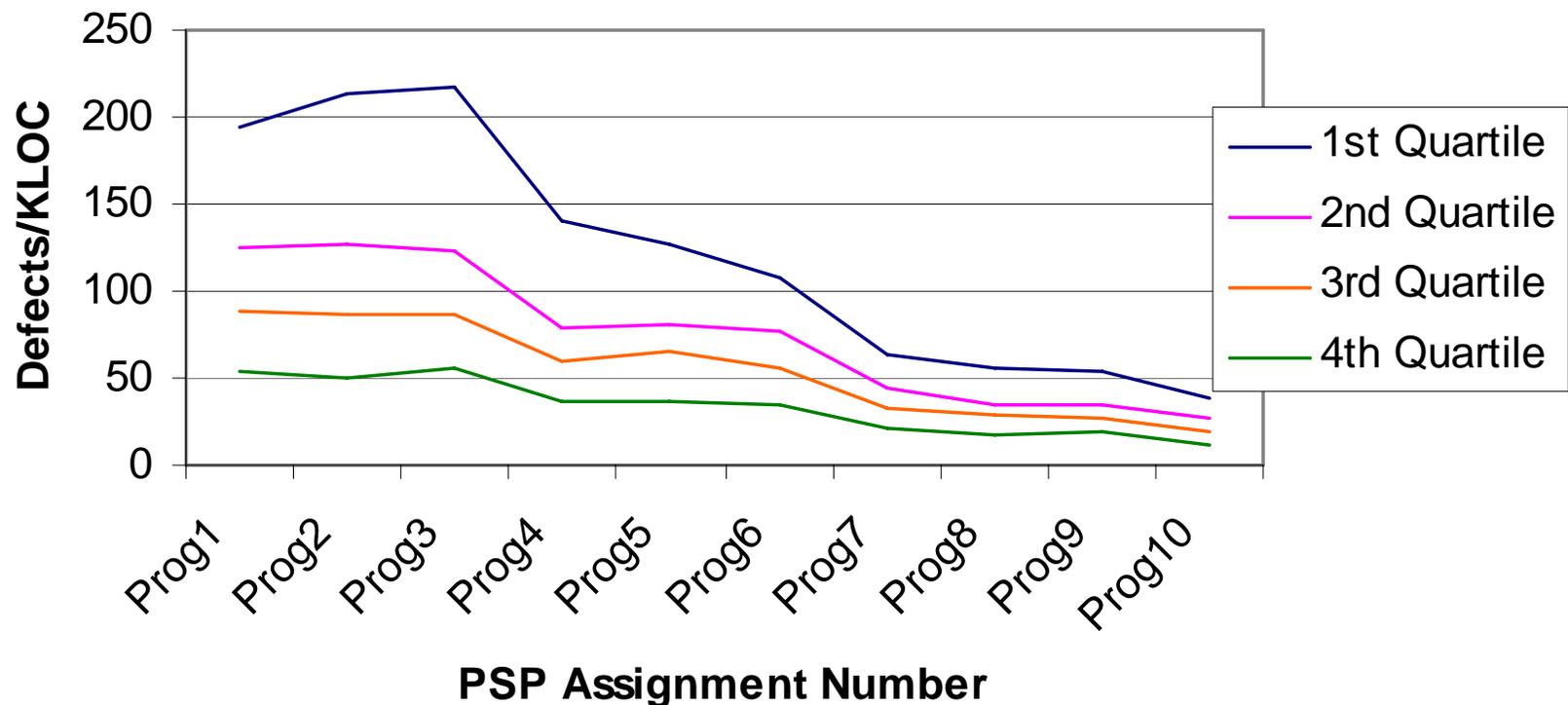
Balance of over- and underestimates

Much tighter balance around zero

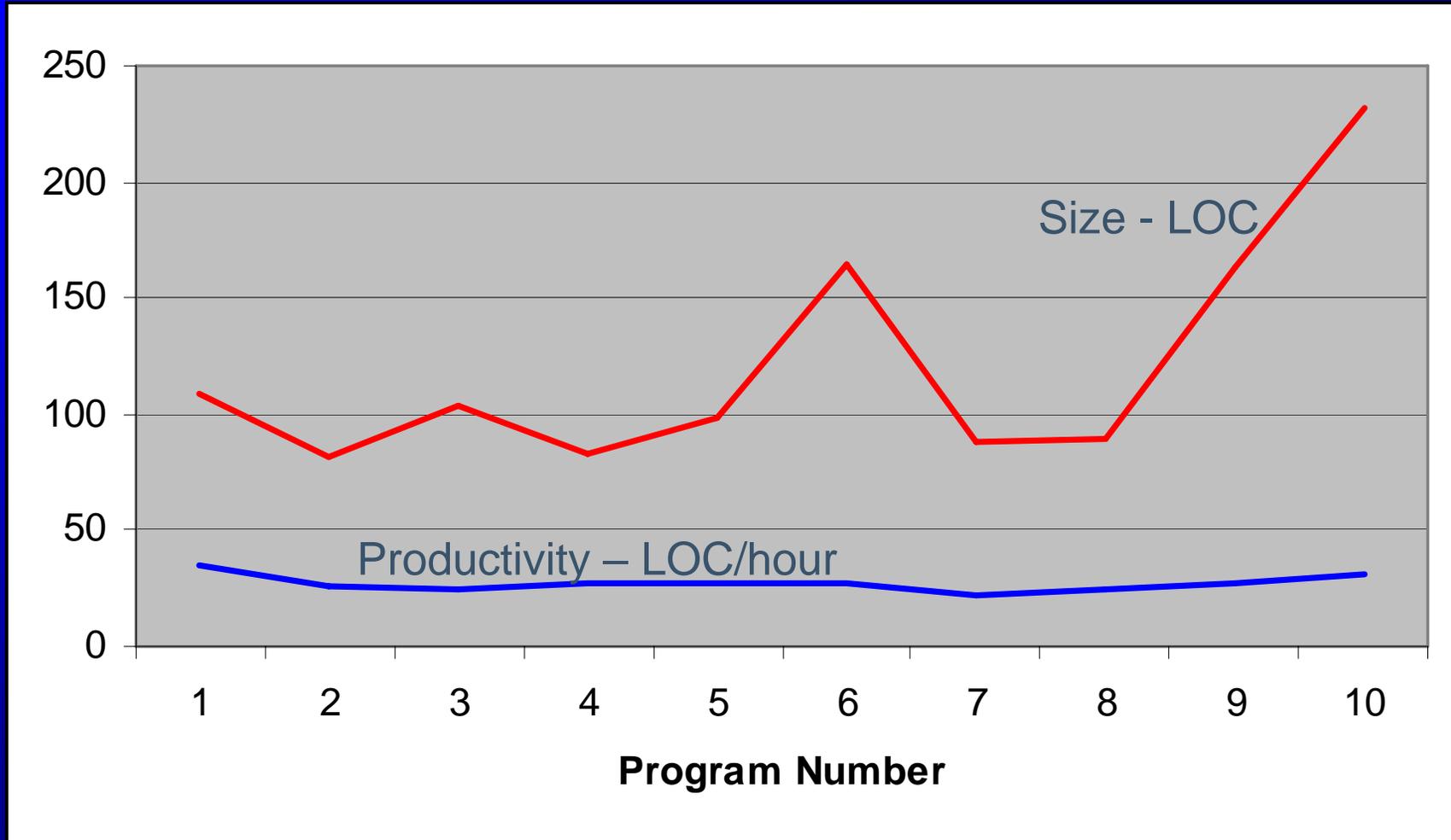


PSP Quality Results

Compile and Test Defects - from PSP Training

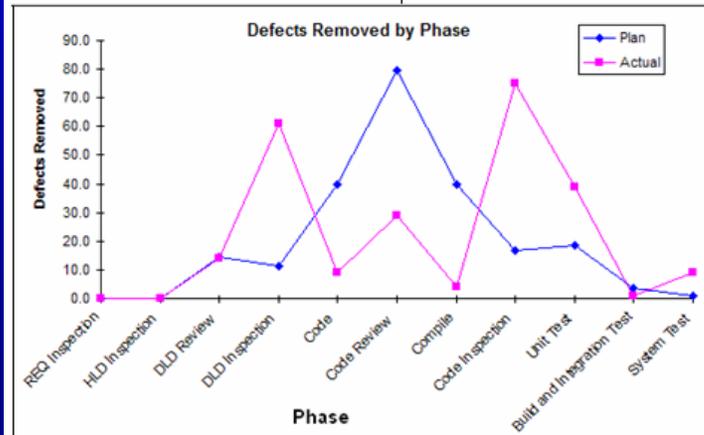
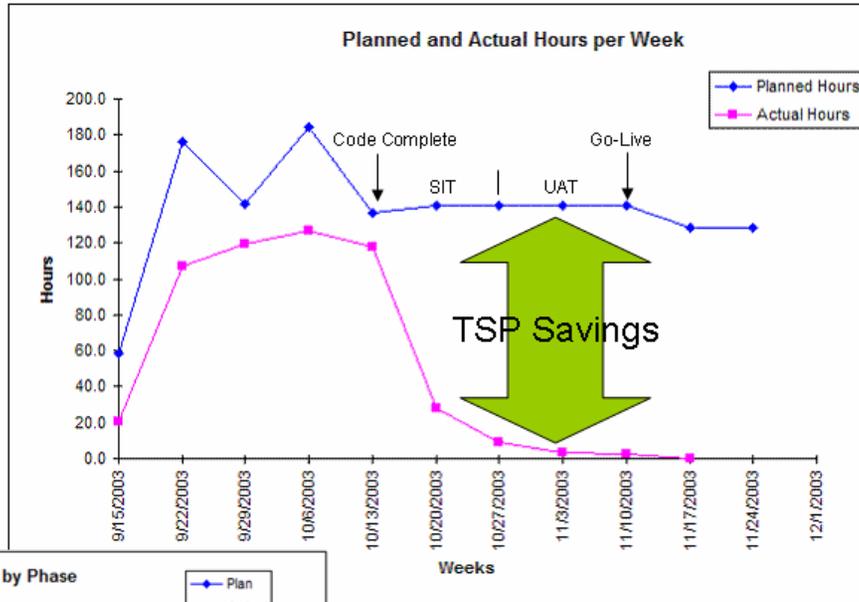


PSP Productivity Results



Where do the Savings Come From?

TSP Productivity Gains:



4,255 New & Change LOC

Defect Density

4 bugs in SIT	0.94 defects/KLOC
1 bug in UAT	0.23 defects/KLOC
0 bugs RTC	0

Source: Microsoft Corporation

ais

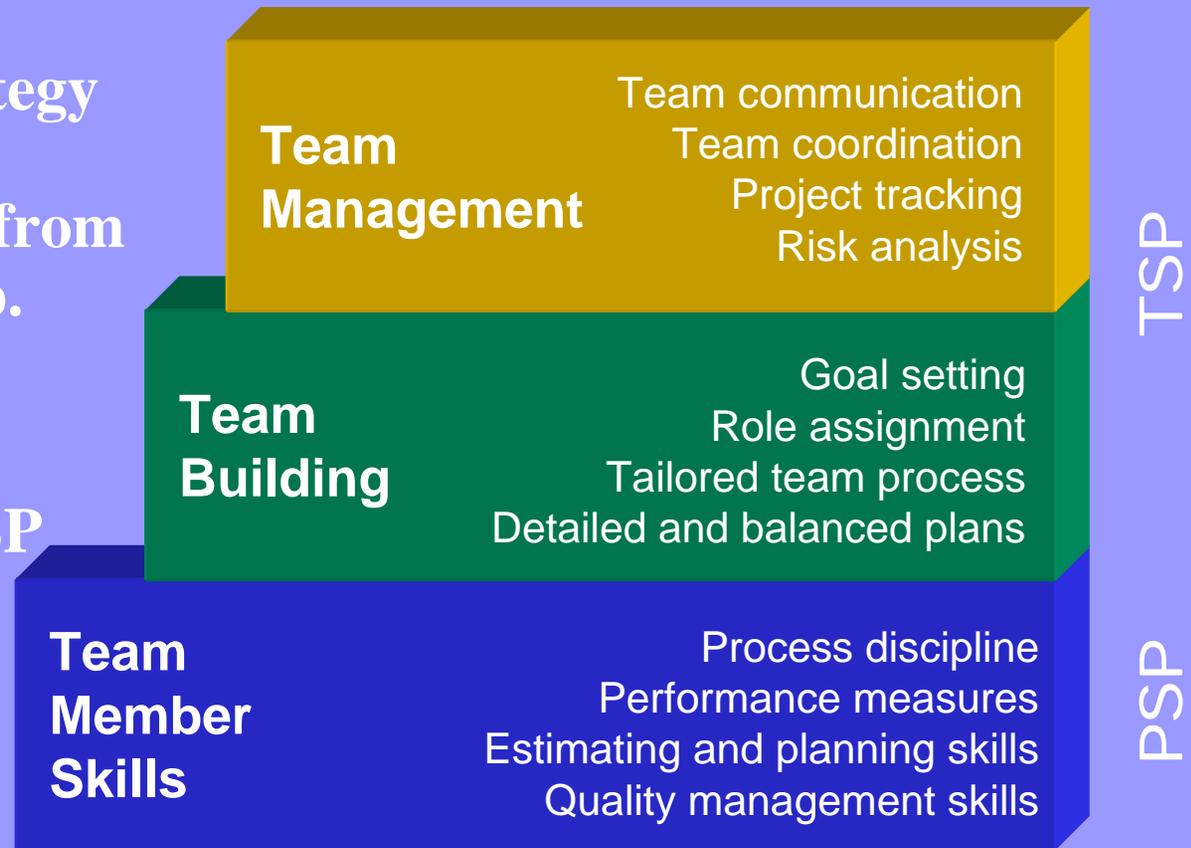
Advanced Information Services Inc.

Proprietary

What is the TSP?

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

This strategy starts with PSP training.



Source: Software Engineering Institute

What Does a TSP Team Do?

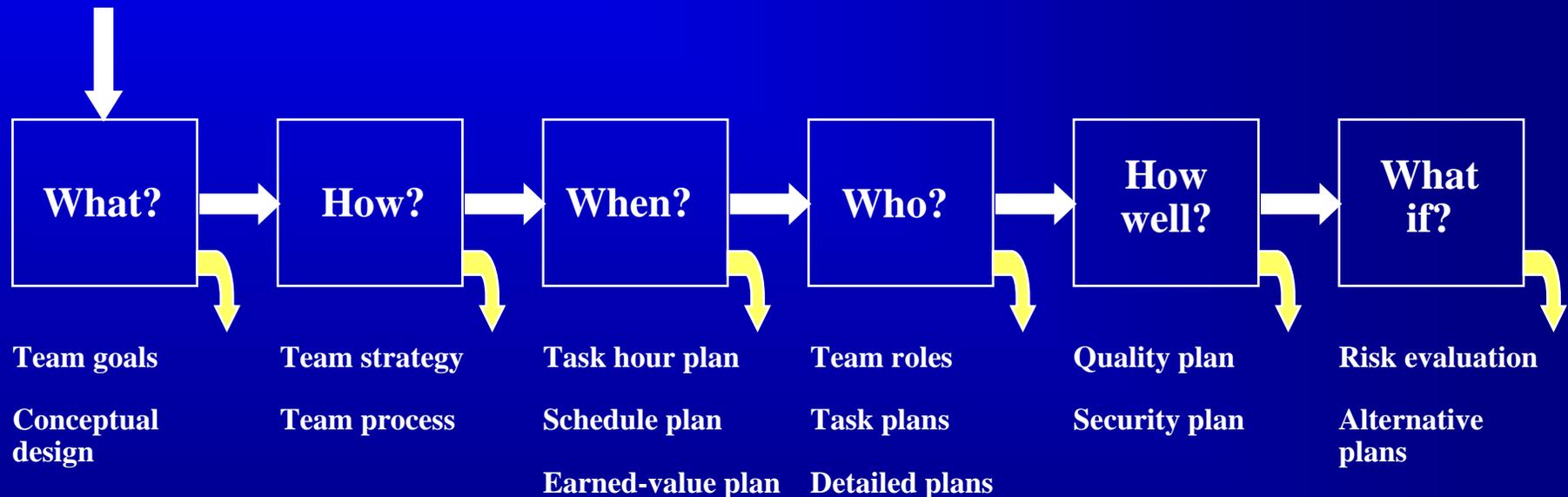
- Developers use PSP practices for their personal work
- For each development phase (2-4 months), the team
 - Conducts a team “launch” to come to a common understanding of the project & to develop detailed plans
 - Tracks progress against schedule and quality weekly, adjusts plans, and takes immediate action if necessary to ensure commitments will be met
 - Uses team-level data the same way as developers use their individual data to assess schedule and quality
 - ◆ Quality data, Software inspections, Time on Task, Earned value, PQIs, etc.
 - Conducts Postmortems to improve development process

TSP Launch Products

Business goals

Marketing needs

Product requirements



Planned products

Size estimates

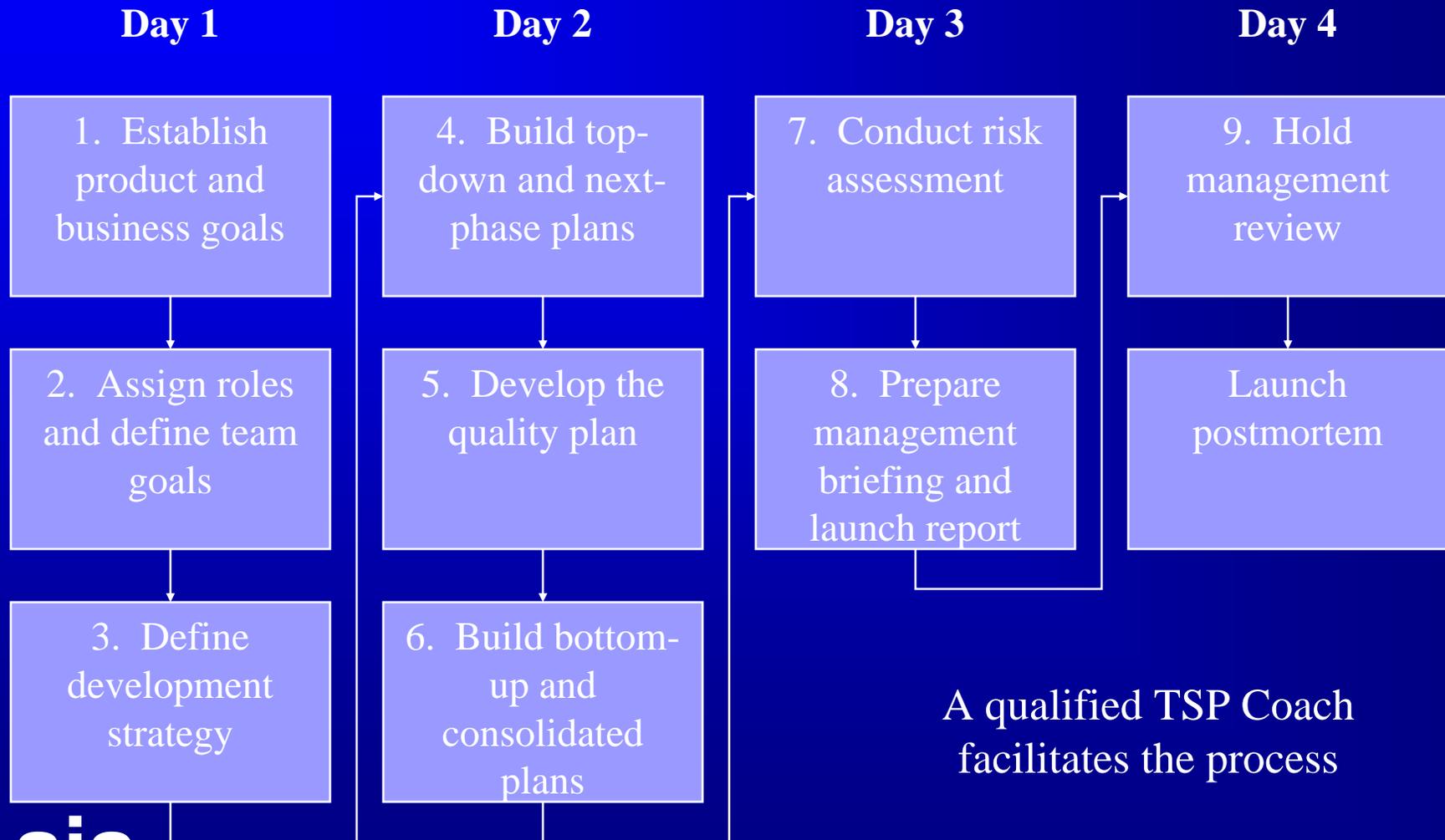
Establishes a common understanding of
and commitment to the project

ais

Advanced Information Services Inc.

Proprietary

The TSP Launch Meetings



ais

The Weekly Team Meeting

- Keeps project on track by reviewing status & planned work for team & each team member
- Provides early warning of schedule / quality problems
- Focused on *data*
 - Schedule data such as EV, Time on Task, % unplanned work, etc.
 - Quality data such as defects per phase, component PQIs, review rates, defect densities, etc.

TSP Team Ongoing Activities

- Record size, time, defects, task completion
- Review plans for issues with quality, schedule, dependencies, etc., and update as necessary
- Perform team management duties
- Perform software inspections
- Look for improvement opportunities

TSP Users

The TSP is used by a growing number of organizations, such as

ABB

AIS

Bechtel

Boeing

Comnet

DFAS

EDS

Ericsson

Honeywell

Intuit

Kaiser

Lockheed

Microsoft

NASA Langley

SAIC

SDRC

Teradyne

Trilogy

United Defense

USAF: Hill AFB

USN: China Lake

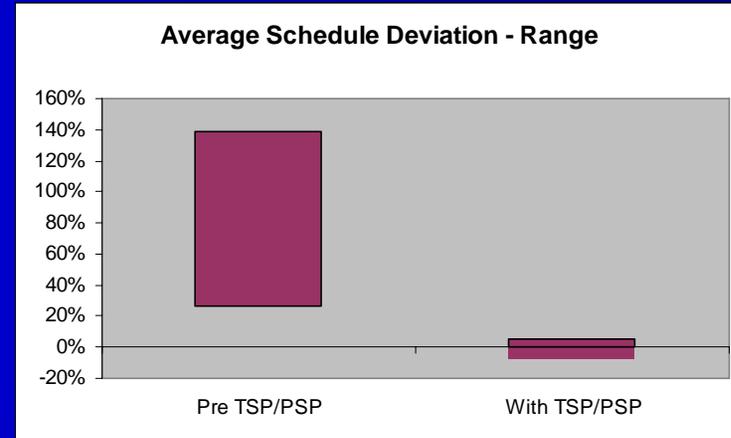
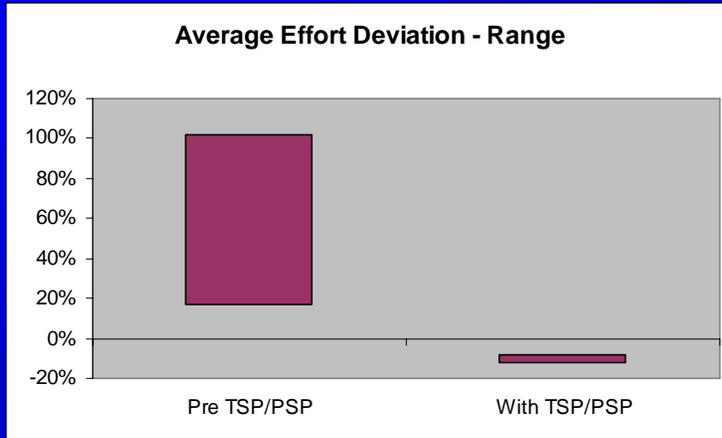
USN: NAVOCEANO

Xerox

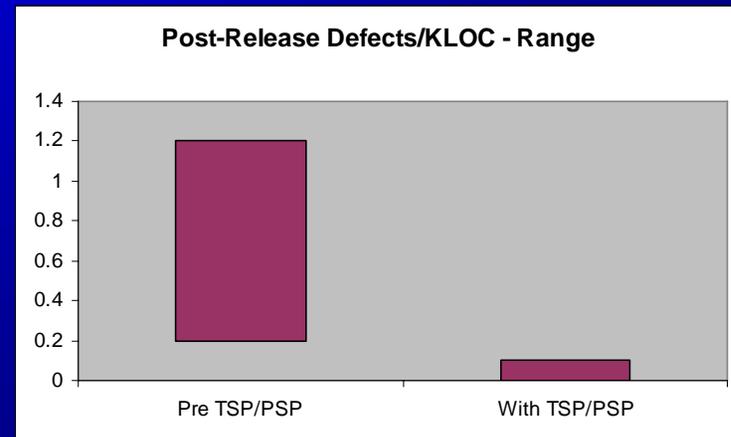
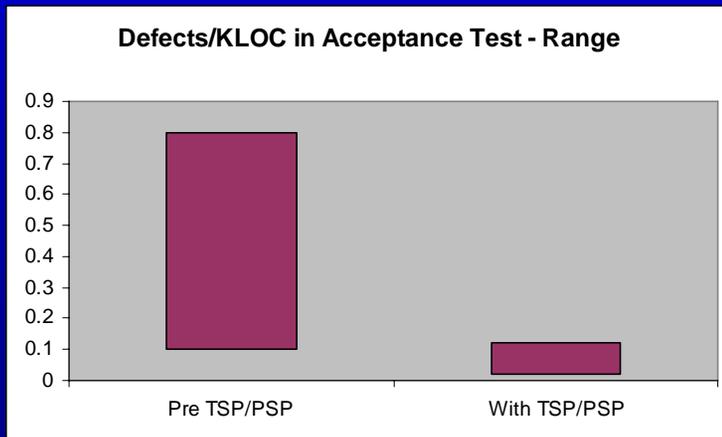
ais

TSP Performance Comparison*

Effort & Schedule



Quality



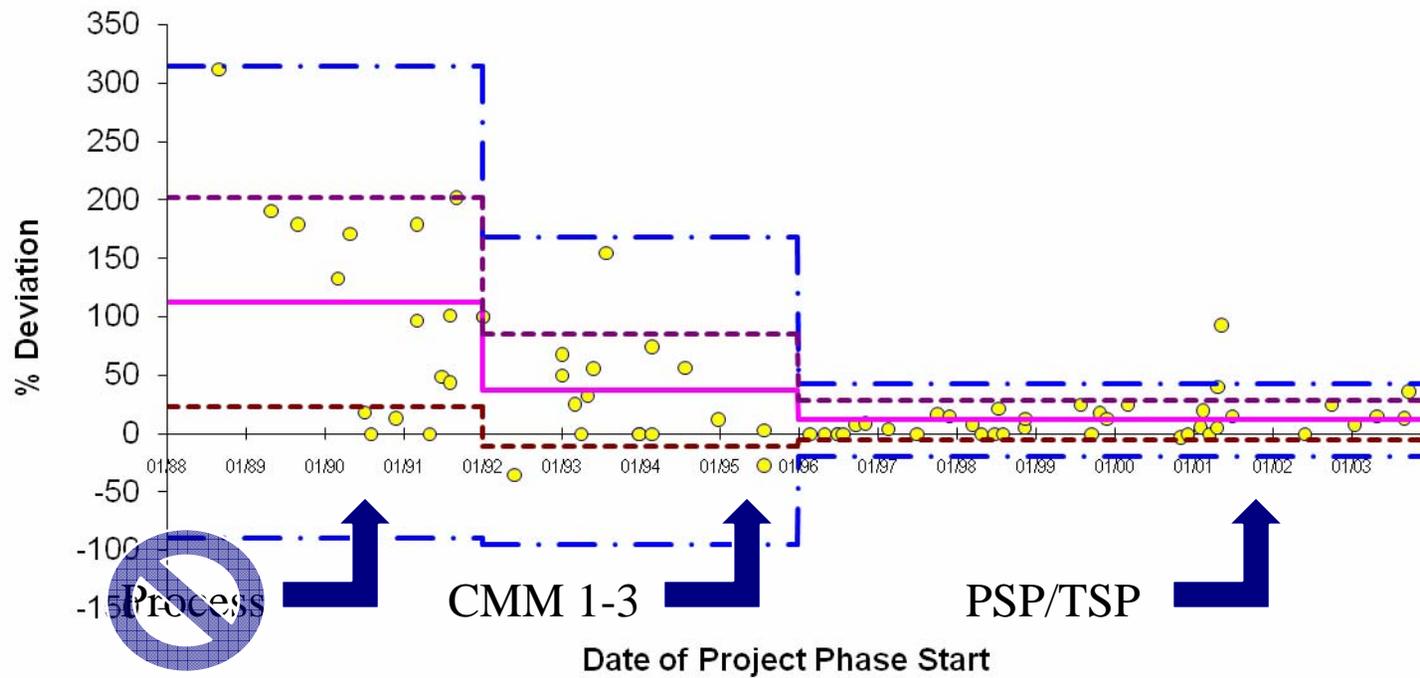
ais

*From a study of 18 TSP projects in four organizations conducted in 2000

Source: Software Engineering Institute

AIS TSP Results

Schedule Deviation Individual Value Control Chart -
Development Phases



Microsoft TSP Results

Project survey

Microsoft IT

	Non-TSP Projects	TSP Projects
Released On Time	42%	66%
Average Days Late	25	6
Mean Schedule Error	10%	1%
Production Defects/KLOC	1.8	0.5
Sample Size	80	15

Implementation Strategy

- SEI's recommended strategy for introducing TSP involves these steps:
 - Identify key areas for initial introduction
 - Hold executive seminar and transition planning session
 - Identify projects that could serve as pilots for TSP
 - Train the affected managers and engineers
 - Conduct a few (2-4) trial-use projects
 - Evaluate pilot project results
 - Train and authorize an internal TSP/PSP transition team
 - Plan for and initiate broad rollout

PSP/TSP Requirements

➤ Individual

- Discipline and commitment
- Objectivity regarding performance data

➤ Organization

- Strong management support
- Commitment to Quality first, Schedule second
- Investment in training and process support
- Respect for data confidentiality

PSP/TSP Training

- Executive seminar and planning session – 2 days
- Management training – 3 days
- Engineer training – 10 days
 - teaches personal project management
 - engineers learn to measure and manage quality
 - required for effective team participation
- Internal transition agent training:
 - PSP Instructor – 5 days
 - TSP Coach – 5 days

Training costs can typically be recovered on the first project

Typical Implementation Challenges

- Lack of Management involvement & interest
- Unwillingness to invest in training
- Lack of basic project management capabilities
- Projects undergoing constant change
 - E.g., scope, schedule, personnel
- Focus on schedule over quality
- Perception of data misuse
 - E.g., using personal data for performance appraisals

Did I mention that the 'P' in PSP stands for "Personal?!"

Management understanding and commitment is key

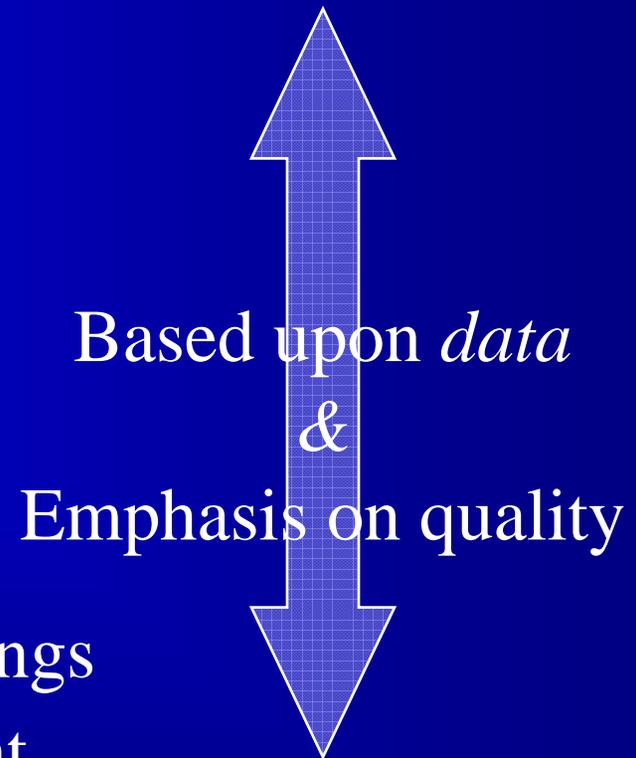
Summary - Basics

➤ PSP

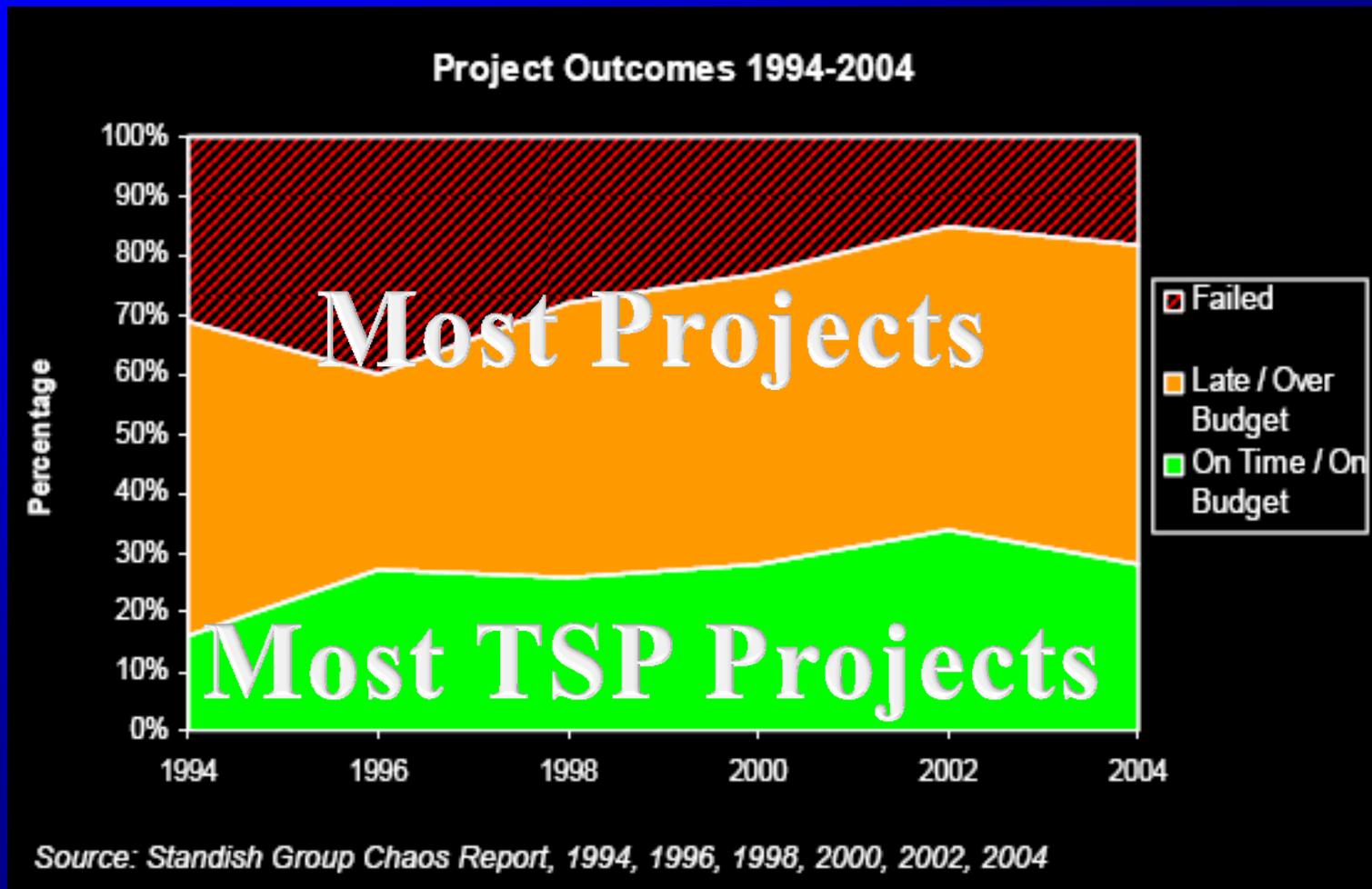
- Personal planning
- Personal quality
- Continuous improvement

➤ TSP

- Launch/relaunch
- Structured weekly team meetings
- Quantitative Plan Management



Summary - Success



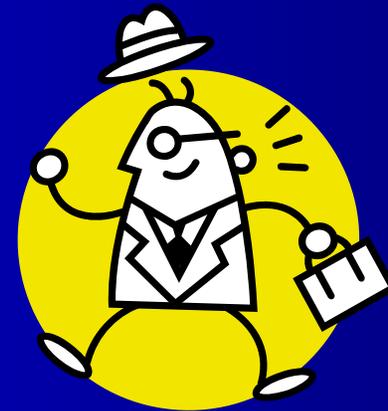
ais

Summary – Satisfaction

Typical

Preferred

Customers



Employees
(at 6:00 PM)



ais

Advanced Information Services Inc.

Proprietary

A Word from the “Shameless Commerce Department” at AIS*

- AIS is a “CMM/PSP/TSP shop”
 - Maturity Level 5 CMM (plans for ML 5 CMMI)
 - All development projects use PSP/TSP
 - Projects routinely meet schedule commitments with “world-class” quality
- AIS offers PSP/TSP training and consulting
- Visit www.advinfo.net for more information

ais

*Thanks to Construx’s Paul Donovan!

Contact Information

Dan Van Duine

SEI Authorized PSP Instructor & TSP Coach

Advanced Information Services Inc.
1605 Candletree Drive, Suite 114
Peoria, IL 61614

E-mail: danv@advinfo.net

Phone: (425) 705-1010

Web: www.advinfo.net

SEI TSP Web Site: <http://www.sei.cmu.edu/tsp/>

ais