



Integrating CMMI,[®] TSPSM and Change Management Principles to Accelerate Process Improvement

Julie Switzer, P-3 Process Improvement Lead, NAVAIR

Orville Starnes, TSP Launch Coach, NAVAIR

September 2008

[®] CMM, CMMI and Capability Maturity Model are registered in the U.S. Patent and Trademark Office.

SM Personal Software Process (PSP); Team Software Process (TSP); and SCAMPI are service marks of Carnegie Mellon University



Objectives



- Background and current status of the Process Improvement effort
- Applying change management principles to successfully change an engineering culture
- Lessons learned in integrating improvement initiatives

Background



P-3C Maritime, Patrol & Reconnaissance Aircraft (MPRA) Software Support Activity (SSA)

- Integrate new capabilities into the Navy's land-based, long range P-3C anti-submarine warfare patrol aircraft
- Primarily perform software maintenance and enhancements

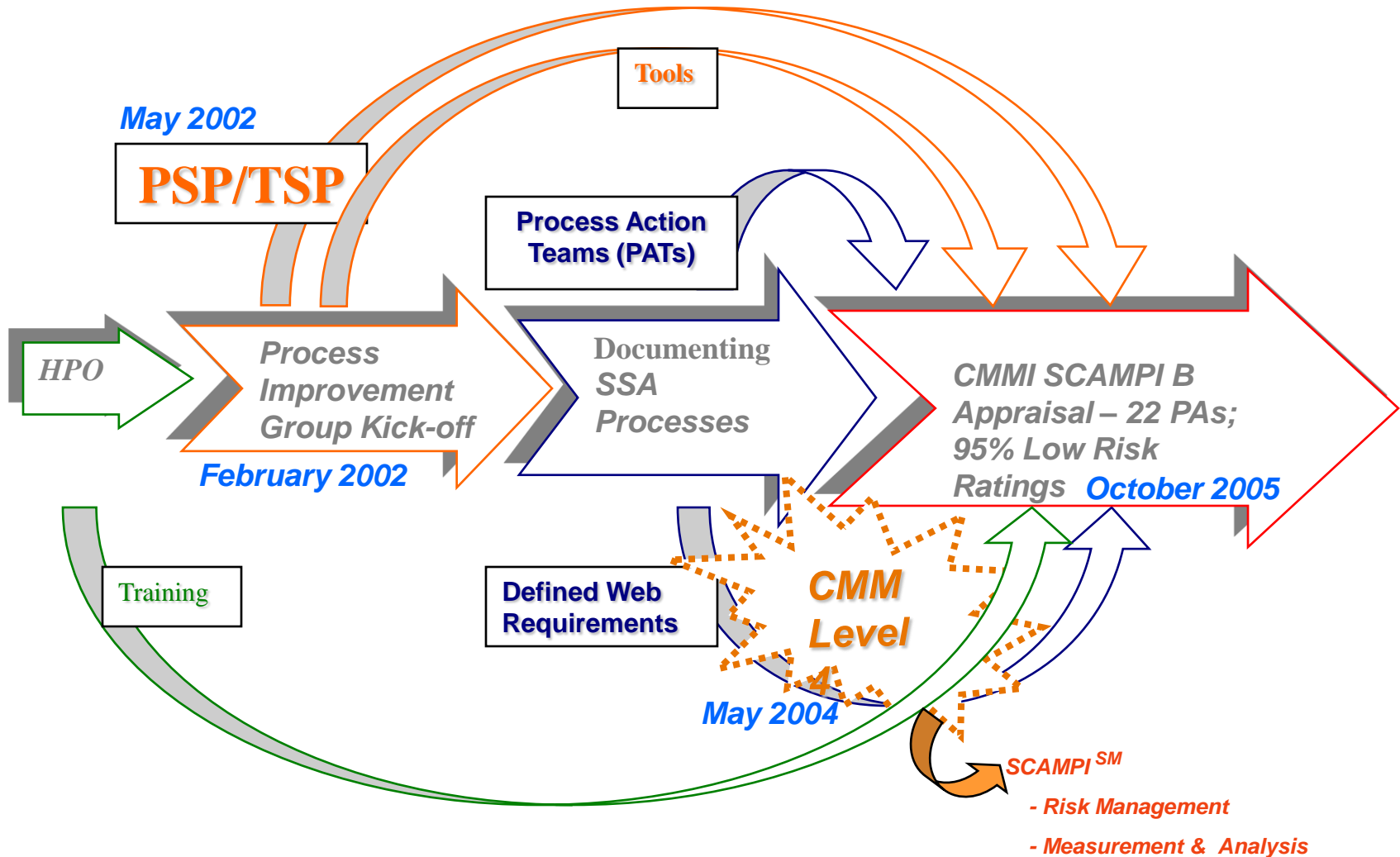


Process Improvement Goals



- Positively impact cost, schedule, quality
- Pursue credential as evidence of strong business practices
- Improve the work environment
- Apply High Performance Organization principles to improve SSA's leadership philosophy, culture and business processes
- Satisfy policy that requires software intensive programs to implement process improvement

SSA Process Improvement Effort

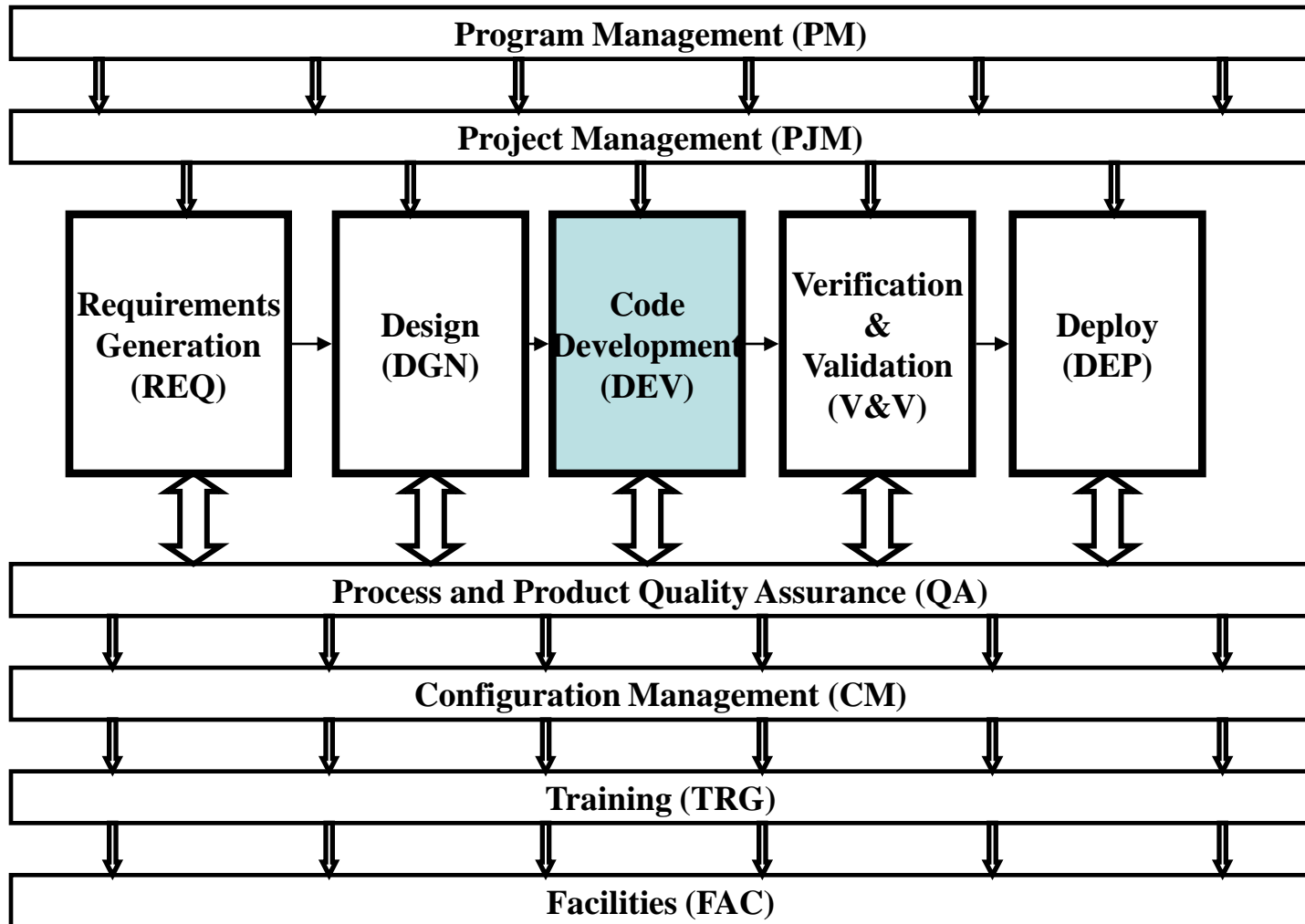


Reasons for Successful Improvement

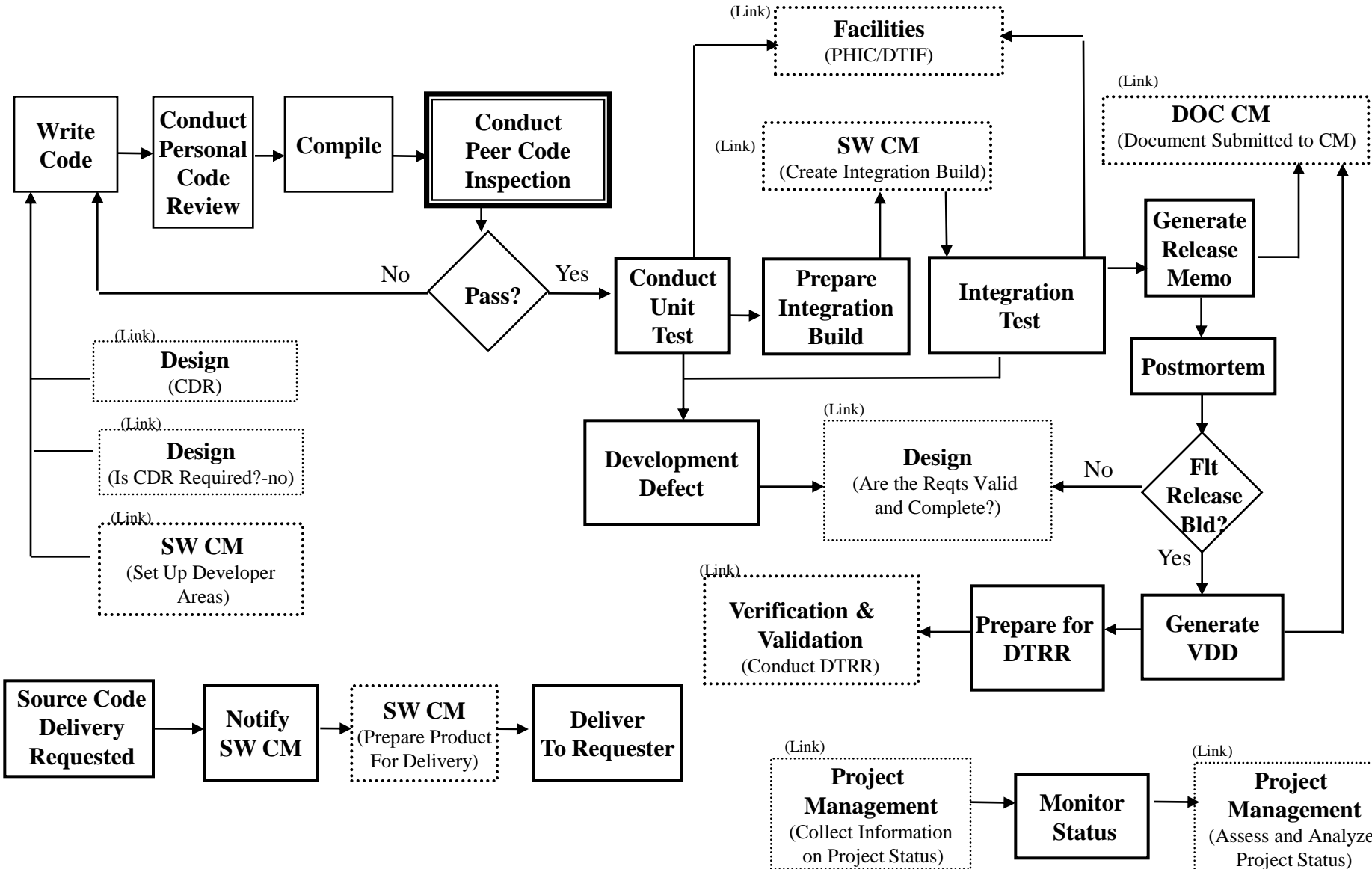


- Strong Sr. Management commitment and support
- Developed a Process Improvement culture
 - Applied change management principles to gain and maintain buy-in from the team
- Used the Team Software Process (TSP) as a framework and tailored it as needed
- Assigned Process Action Teams (PATs) to form the organization's standard process architecture (the Golden Process) and document processes for each phase of the product life-cycle based on the organization's best practices

Golden Process



Code Development Phase



Applied Change Management Principles



- Used High Performance Organization (HPO) Methodologies to motivate the team and gear up for change
 - Mission Statement
 - Values Statement
 - Organizational Goals
 - Strategic Customer Value Analysis
- Built a coalition and shared decision-making
- Created an environment that encouraged individual and collective learning
- Maintained momentum
- Managed resistance patiently, but firmly
 - resistance to change occurs because people don't understand it, they perceive it as a threat, or it's forced on them

"People don't resist change. They resist being changed!"
~ Peter Senge



Developed a Process Improvement Culture



Launched a communications campaign

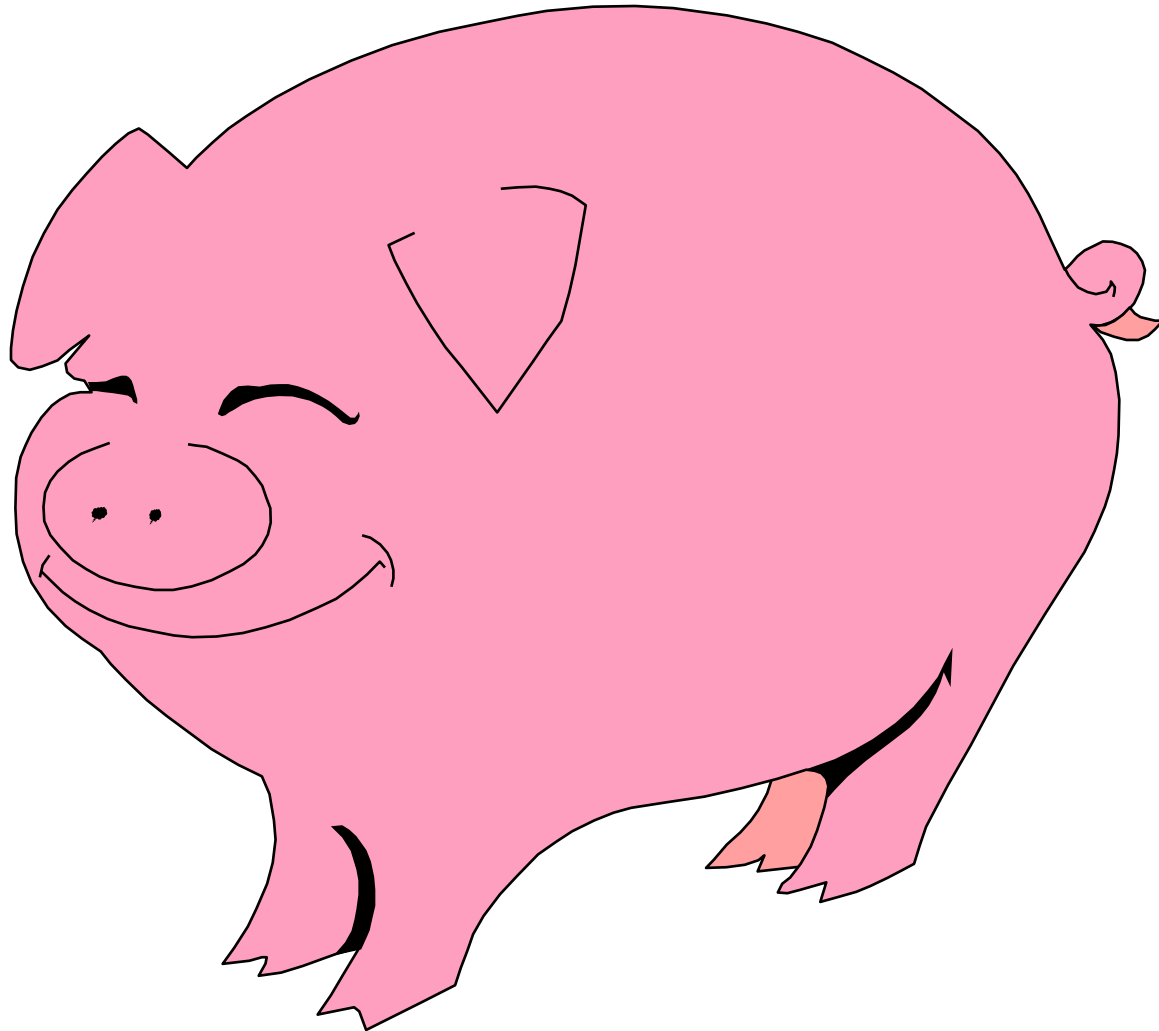
- Kept the team informed – Continued to remind them that Process Improvement is an integral part of their job
 - Pep talks from Sr. Management
 - Training
 - Posters
 - Newsletters
 - Team-building picnics
 - Logos
 - Contests
 - Process Improvement Group (PIG) Mascot

Process Improvement is hard work – do what you can to make it fun!

“We are what we repeatedly do. Excellence, then, is not an act, but a habit.”

~ Aristotle

Process Improvement Group MASCOT



Used TSP as a Framework



Benefits of Using TSP

- Team communication has increased exponentially
 - Weekly TSP project meetings; monthly TSP project lead reports and meetings with Sr. Management create a collaborative work environment
- Team planning includes all stakeholders
- Outputs of the TSP launch constitute the project plans. No need to generate additional “shelf paper”
- By using historical data, teams estimate more accurately
 - TSP enables accurate scheduling

Used TSP to Increase Performance



- ★ Increased software engineering productivity
- ★ Decreased defect density
- ★ Improved schedule variance
(6 months delay to 1 week delay to on time delivery)
- ★ Increased ability to estimate costs

	<u>A4.7.3</u> (Baseline)	<u>ASQ-227 3.1</u> **	<u>ASQ-227 4.3</u>	<u>ASQ-227 5.0</u>	<u>Percent Change</u> (Baseline)
SLOCS	27,880	36,690	42,723	37250	n/a
Productivity (SLOCs/Hr)	2.7	4.9	7.5	5.3	+118%
Development Defects	n/a	105	37	47	n/a
Test Defects (SPRs)	128	12 ***	5	2	n/a
Defects per KSLOCs	4.6	1***	1	.17	-78%
Plan DT Release	****	1/26/2004	9/20/2005	10/20/2006	
Actual DT Release		2/5/2004	1/20/2006	4/25/2007	

* PSP and TSP training received by developer, no formal project initiation.

** Formal initiation of PSP/TSP process along with MSA specific processes.

*** Final build testing incomplete, projected number of test defects estimated to be 37(1 per KSLOC)

**** Many requirements changes throughout program caused excessive replanning, dates meaningless



Setting and Meeting Quality Goals



Deliver a high-quality product to ST with Defect Density < 1.0 SPR's/KSLOC in ST assigned to be fixed

Product	Actual SLOC	#SPRs	Achieved Goal?
ASQ 222 5.1	6,176	0	Yes
ASQ 227 5.1	16,277	0	Yes
USQ 78B 2.2	14,311	1	Yes

Setting and Meeting Schedule Goals



Meet schedule commitments - 98% confident that we will deliver within 2 standard deviations (sigma) of expected delivery (planned delivery + average error of 7%)

Product	Build	Date/Week Planned	1 Sigma (68% Confidence)	2 Sigma (98% Confidence)	Week Actual	Achieved Goal?
ASQ 222 5.1						
	1	4/2/2007 – 10	4/30/2007 – 14	5/21/2007 – 17	3/19/2007 – 8	Yes
	2	11/5/2007 – 41	12/31/2007 – 49	2/18/2008 – 56	10/29/2007 – 40	Yes
	3	2/18/2008 – 56	4/14/2008 – 64	6/2/2008 – 71	2/25/2008 – 57	Yes
	4	5/19/2008 – 69	7/14/2008 – 77	9/1/2008 – 84	6/18/2008 – 73	Yes
	5	5/19/2008 – 69	7/14/2008 – 77	9/1/2008 – 84	TBD 7/21/2008 78	



Used TSP to Accelerate Level 4 Performance



- TSP satisfied many Level 4 practices
- Projects using TSP were performing Level 4 activities
- TSP measures were used for both process and product quality (size, time, defects, completion dates)

TSP “Planned Quality” Comes from the TSP “Quality Guide”



Measure	Goal	Comments
Percent Defect Free (PDF)		
Compile	> 10%	
Unit Test	> 50%	
Integration Test	> 70%	
System Test	> 90%	
Defects/KLOC:		
Total defects injected	75 - 150	If not PSP trained, use 100 to 200.
Compile	< 10	All defects
Unit Test	< 5	All major defects (in source LOC)
Integration Test	< 0.5	All major defects (in source LOC)
System Test	< 0.2	All major defects (in source LOC)
Defect Ratios		
Detailed design review defects /unit test defects	> 2.0	All major defects (in source LOC)
Code review defects/compile defects	> 2.0	All major defects (in source LOC)
Development Time Ratios		
Requirements inspection/requirements time	> 0.25	Elicitation in requirements time
High-level design inspection/high-level design time	> 0.5	Design work only, not studies
Detailed design/coding time	> 1.00	
Detailed design review/detailed design time	> 0.5	
Code review/code time	> 0.5	
Review and Inspection Rates		
Requirements pages/hour	< 2	Single-spaced text pages
High-level design pages/hour	< 5	Formatted design logic
Detailed design text lines/hour	< 100	Pseudocode ~ equal to 3 LOC
Code LOC/hour	< 200	Logical LOC

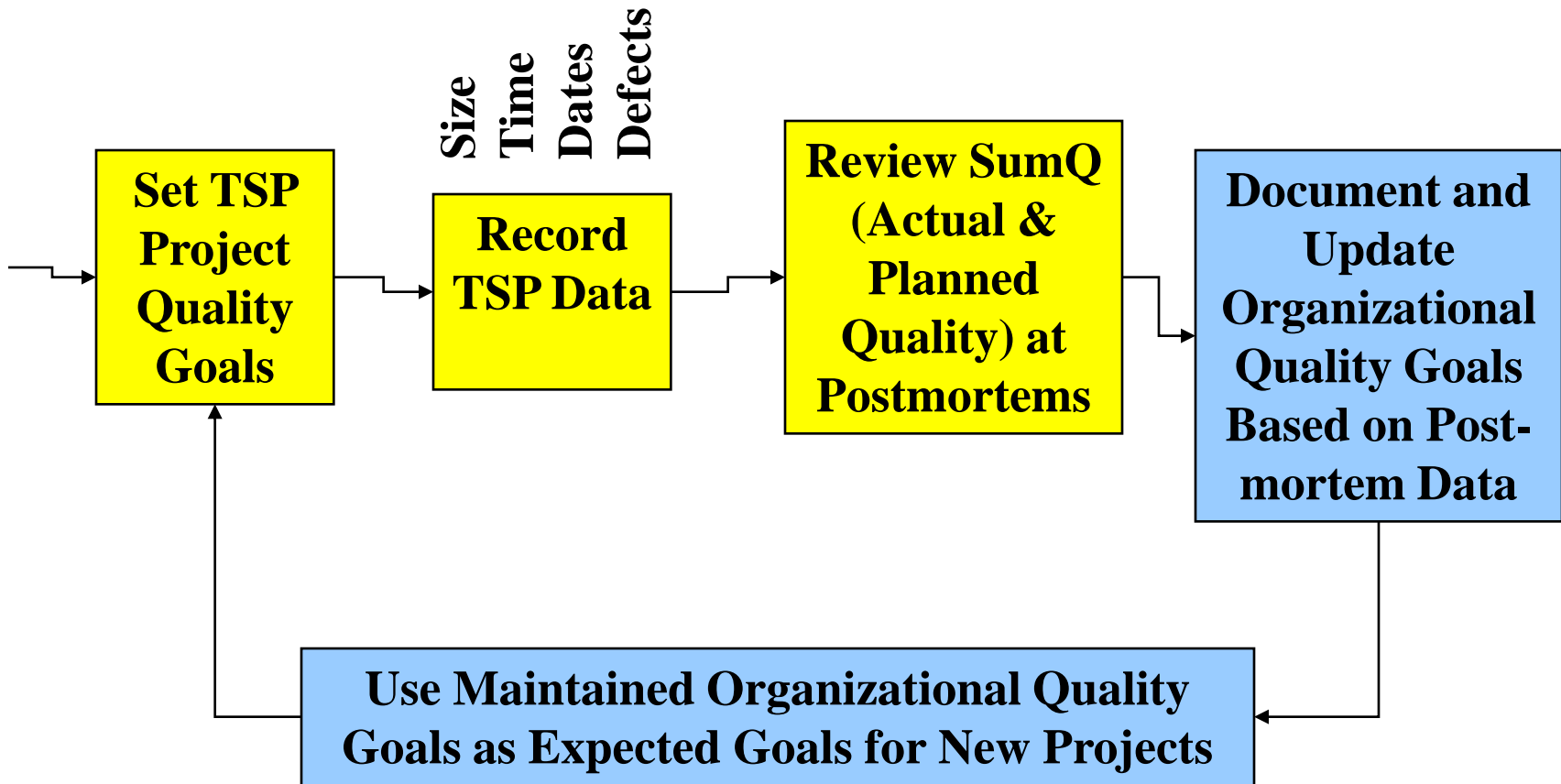


TSP Standard Operating Procedure for P-3 SSA



- Historical data used for all planning
- New members trained in PSP & TSP
- Team owns their processes
- Processes are continuously improved
 - Launch Prep
 - Launch Process
 - Development Processes

How it All Comes Together



■ What you are doing today ■ What you need for Level 4

Lessons Learned



- Develop a Process Improvement culture
- Keep the team informed and involved
- Use PSP/TSP and allow teams to tailor processes and templates based on what makes sense for them
- Recognize that not everyone needs to understand the model
 - Allow PATs to document what they do
 - Assign a process improvement lead to perform a gap analysis using the model and work with PATs to fill the gaps
- Ensure that PATs communicate early and often
- Network
- Create simple databases and spreadsheets to use for tracking training data, etc.
- Establish a central repository for process assets and institute standard nomenclatures for artifacts as early as possible



In Memory of Our Friend & Colleague

Carol Karel, P-3 SSA Lead



Contact Information



Julie Switzer, NAVAIR P-3 Program Office

Phone: 301-757-6619

Email: Julie.Switzer@navy.mil

Orville Starnes, Advanced Information Services

Phone: 309-691-5175

Email: orvilles@advinfo.net

NAV  AIR



QUESTIONS?