Integrating CMMI®, TSP℠ and Change Management Principles to Accelerate Process Improvement

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P-3C Maritime Surveillance Aircraft

Software Support Activity

NOVEMBER 2004

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 and transitioning from SW-CMM to CMMI

Background

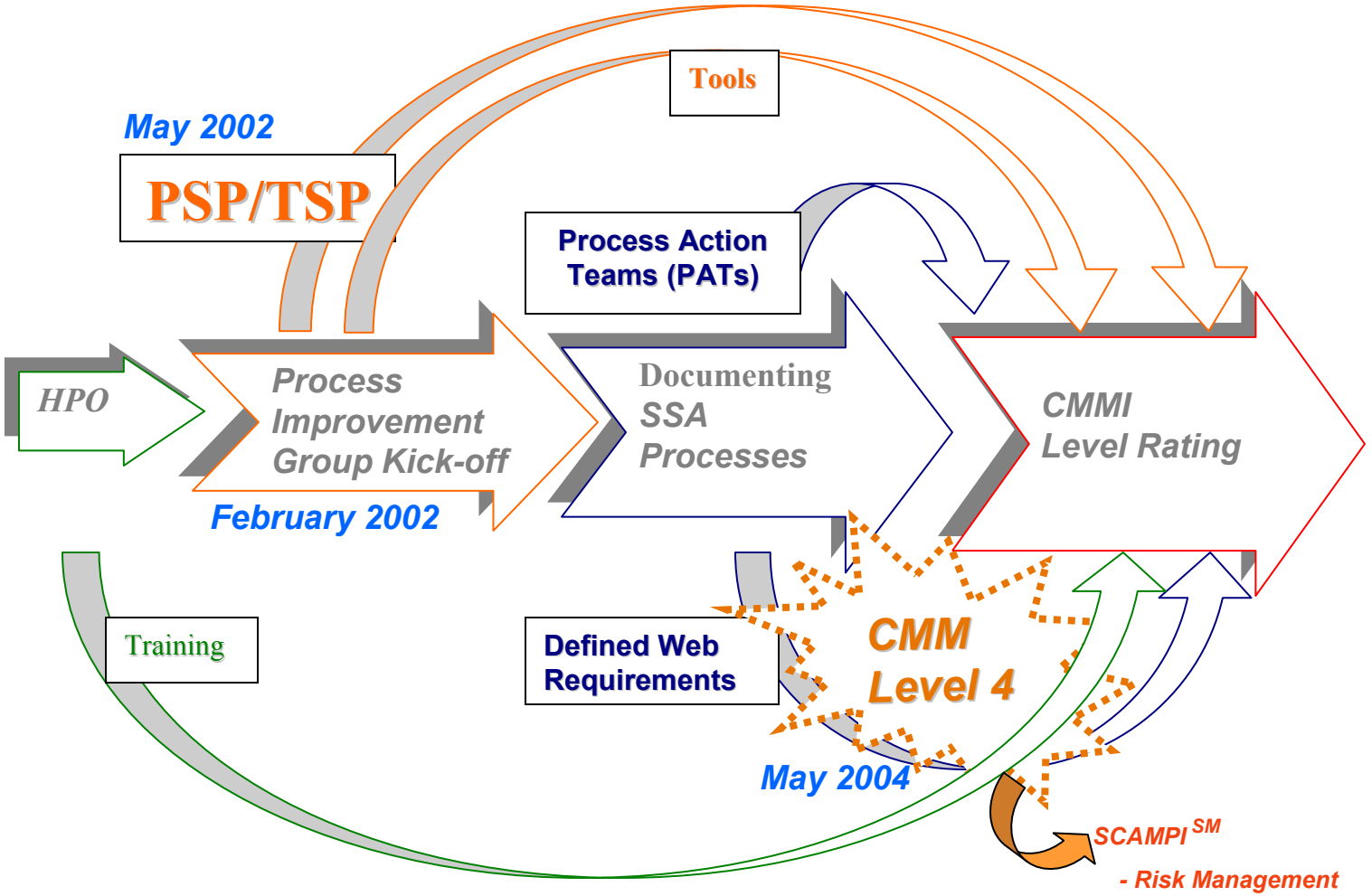
P-3C Maritime Surveillance Aircraft Software Support Activity

- 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 MSA SSA's leadership philosophy, culture and business processes
- Satisfy NAVAIRINST 5234.2 - Requires software intensive programs to initiate process improvement

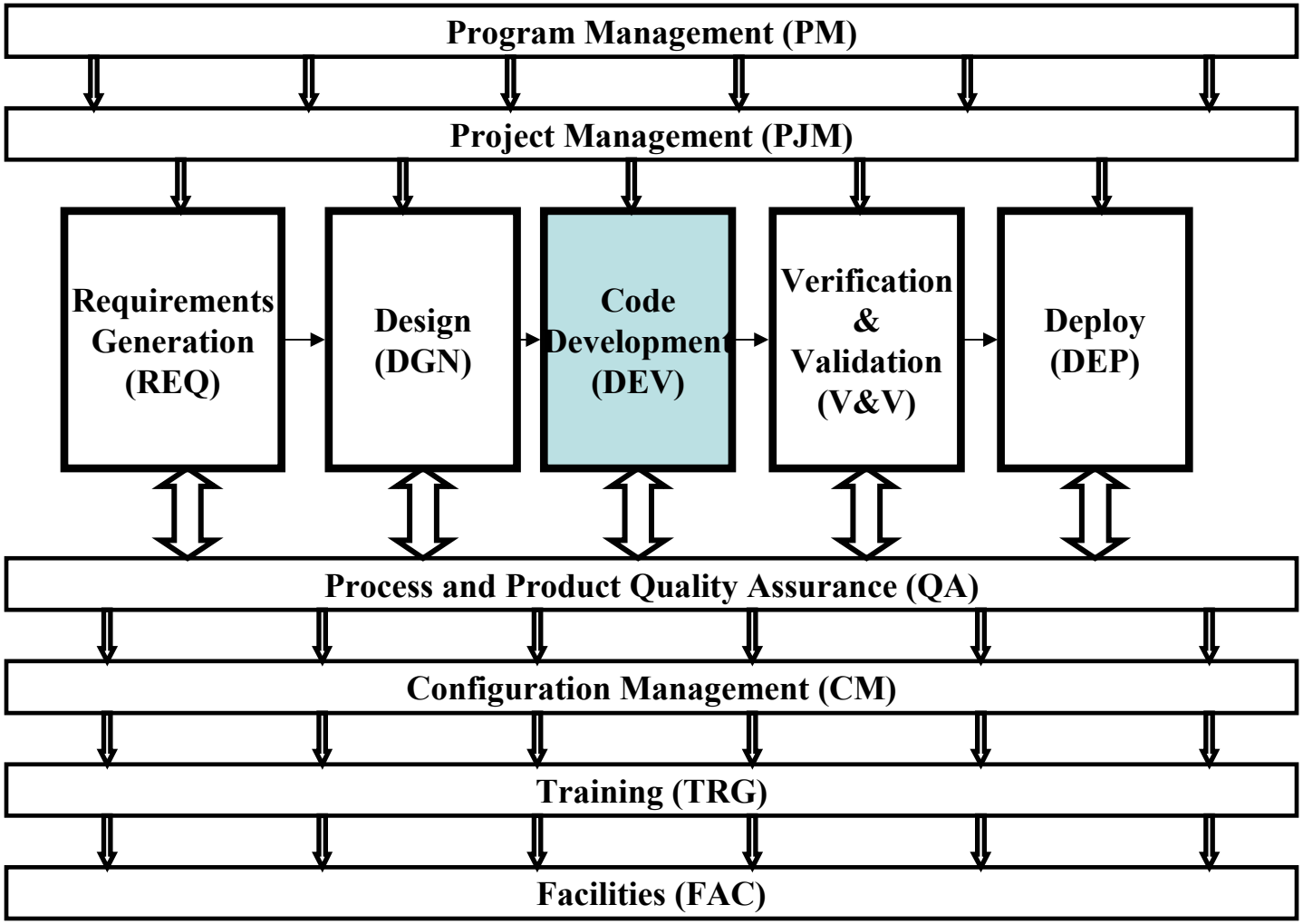
MSA SSA Process Improvement Effort



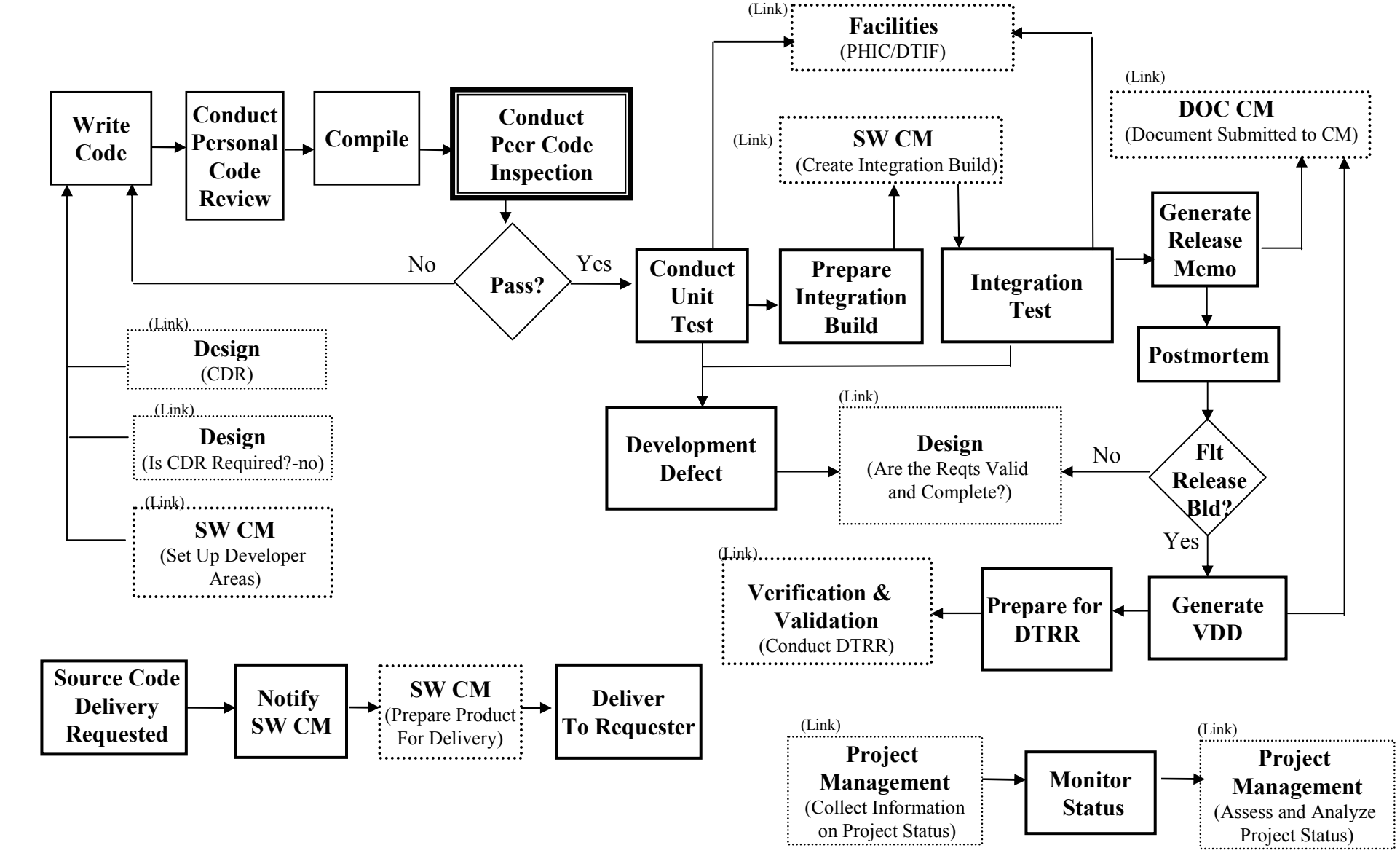
Reasons for Successful Improvement

- 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
- Used SEI Report TR-008 to determine how TSP completely or partially addressed the SW-CMM
- 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

P-3 Maritime Surveillance Aircraft Software Support Activity 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

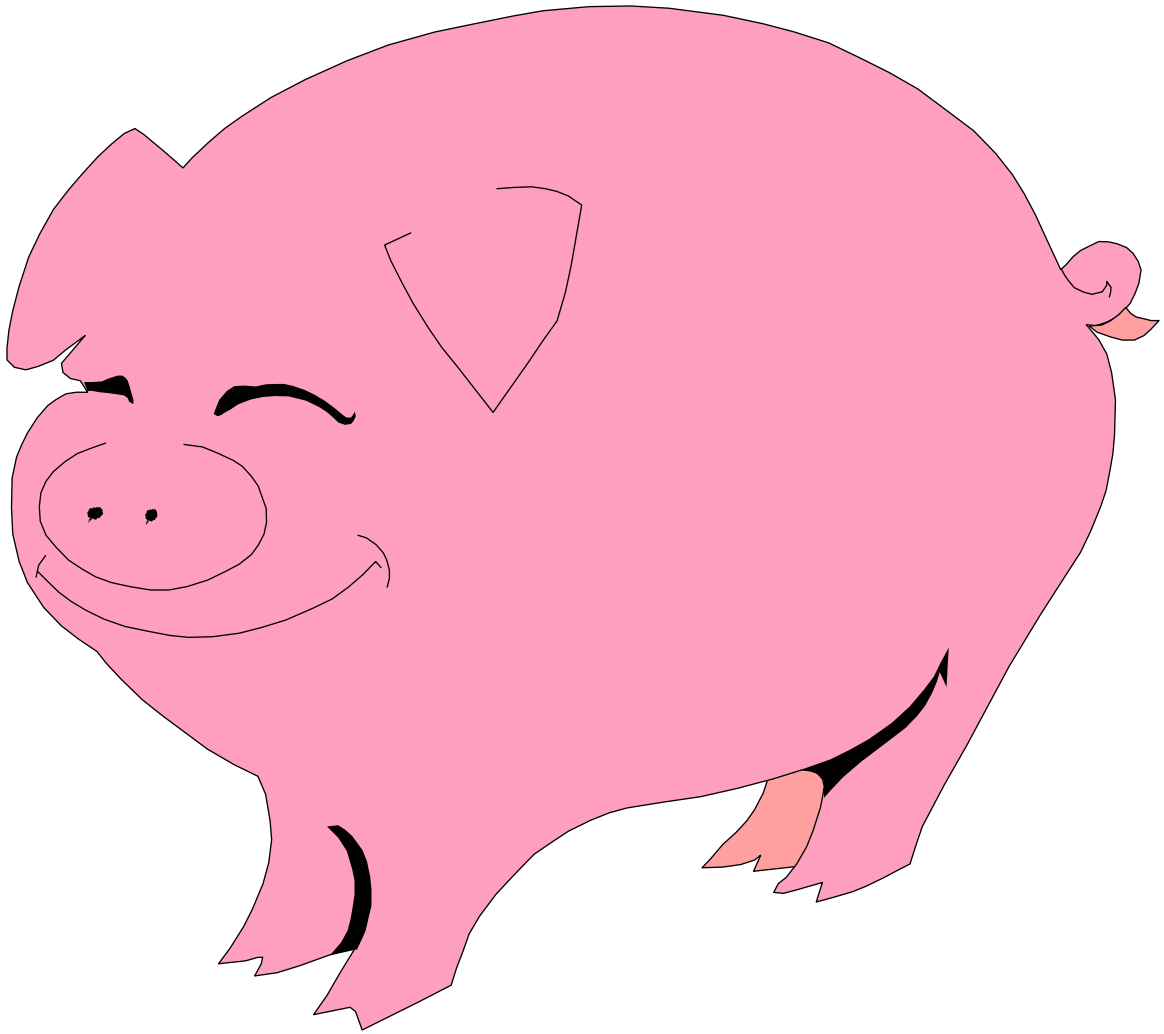
- Kept the team informed – Continued to remind them that Process Improvement is an integral part of their job
  - Pep talks from Sr. Management
  - Training
  - Posters
  - Newsletters
  - Team-building picnics
  - Logos
  - Contests
  - Process Improvement Group (PIG) Mascot

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

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

	A4.7.3 (Baseline)	ASQ-222 3.1	ASQ-227 3.1 **	Percent Change (Baseline)
SLOCS	**27,880**	**32,780**	**36,690**	**n/a**
Productivity (SLOCs/Hr)	**2.7**	**2.7**	**4.9**	**+81%**
Development Defects	**n/a**	**n/a**	**105**	**n/a**
Test Defects (SPRs)	**128**	**69**	**12 *****	**n/a**
Defects per KSLOCs	**4.6**	**2.1**	**1*** **	**-78%**
Plan DT Release	****	**12/4/2000**	**1/26/2004**	
Actual DT Release		**5/29/2001**	**2/5/2004**	

** Formal initation of PSP/TSP process along with MSA specific processes.					
*** Final build testing is incomplete, project number of test defects estimated to be 37 (1 per 1 KSLOCS)					
**** Many requirements changes throughout program caused excessive replanning, dates meaningless					

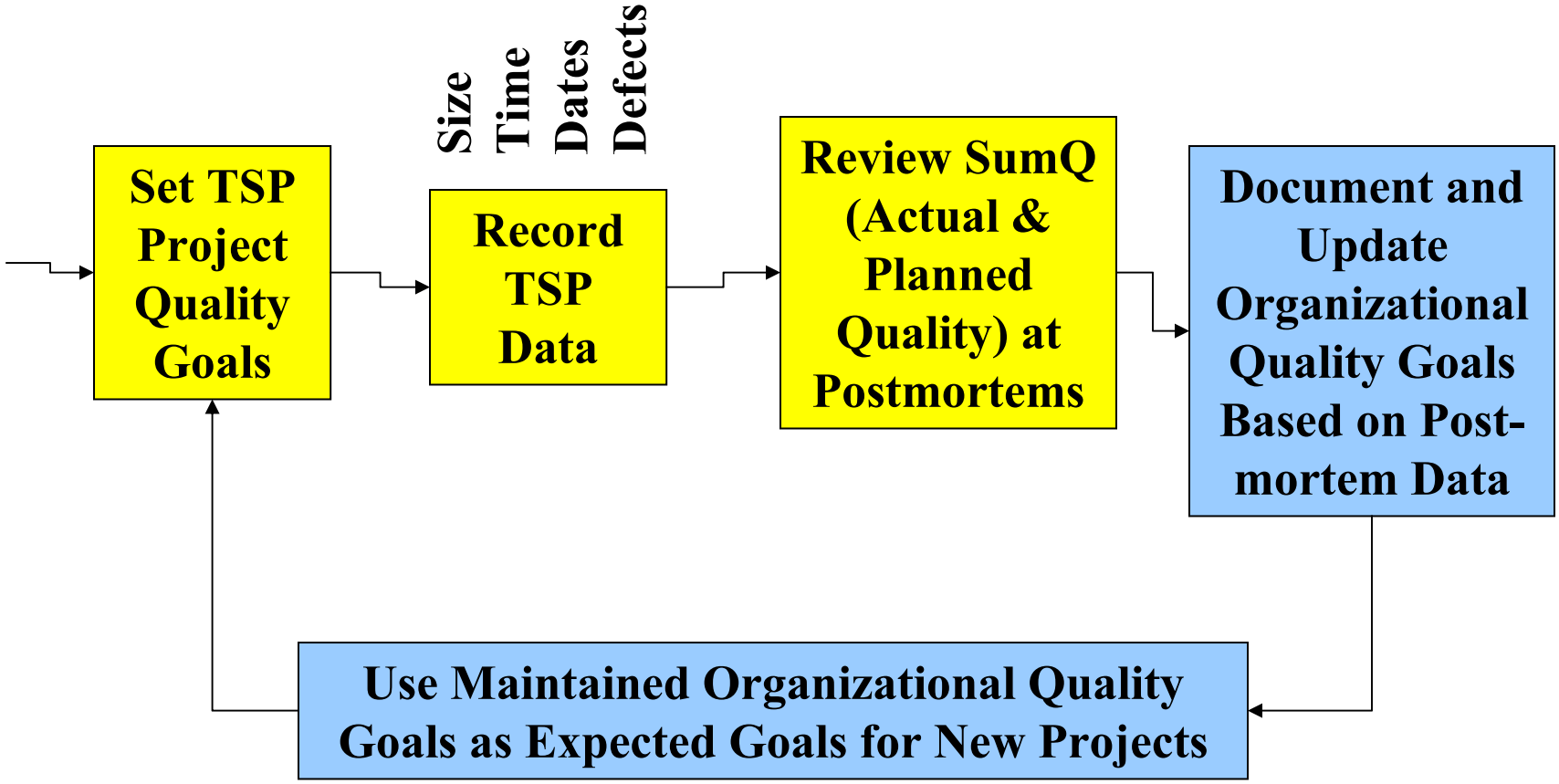
Used TSP to Accelerate to Level 4

- TSP satisfied approximately 90% of all Level 4 Key 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

How it All Comes Together



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

Transitioning to CMMI

- Review/revise
  - Mission
  - Values
  - Customer Needs
  - Goals
- Use SEI report to map TSP to CMMI (pending formal release)
- Perform a gap analysis and develop action plans for each PAT
  - Focusing first on areas not addressed in the CMM
- Address improvement opportunities noted in the CBA IPI

Contact Information

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QUESTIONS?