

Lecture Topics

Defining a Process

Analyzing Process Performance

Bringing Process Discipline to a Team



Why Define and Use a Personal Process?



Why Define and Use a Personal Process?



Benefits of a personal process include

- consistency
 - results are more likely to be similar.
 - work becomes more predictable.
- efficiency
 - structures and guides your work (orders the steps, avoids rework)
 - keeps you focused on what needs to be done now
- basis for improvement
 - gathering data on your work helps determine which steps
 - take the most time
 - cause you the most trouble
 - are least effective
 - this information helps identify improvement opportunities

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Elements of a Good Process Definition



Scripts Document the process entry criteria, phases/steps, and exit criteria. The purpose is to provide expert-level guidance as you use the process.



Measures Measure the process and the product. They provide insight into how the process is working and the status of the work.



Forms Provide a convenient and consistent framework for gathering and retaining data



Standards Provide consistent definitions that guide the work and gathering of data.

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Example Process Script – Software Development

PSP0 Process Script		
Purpose		To guide the development of module-level programs
Entry Criteria		<ul style="list-style-type: none"> - Problem description - PSP0 Project Plan Summary form - Time and Defect Recording logs - Defect Type standard - Stopwatch (optional)
Step	Activities	Description
1	Planning	<ul style="list-style-type: none"> - Produce or obtain a requirements statement. - Estimate the required development time. - Enter the plan data in the Project Plan Summary form. - Complete the Time Recording log.
2	Development	<ul style="list-style-type: none"> - Design the program. - Implement the design. - Compile the program, and fix and log all defects found. - Test the program, and fix and log all defects found. - Complete the Time Recording log.
3	Postmortem	Complete the Project Plan Summary form with actual time, defect, and size data.
Exit Criteria		<ul style="list-style-type: none"> - A thoroughly tested program - Completed Project Plan Summary form with estimated and actual data - Completed Time and Defect Recording logs

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Example Process Script - Requirements

Purpose	To produce requirements.
Entry criteria	Product need statements, market drivers, or request for proposal
Elicit Requirements	<ul style="list-style-type: none"> • Hold requirements elicitation meetings • Consolidate requirements • Develop prototypes if needed
Document Requirements	<ul style="list-style-type: none"> • Write outline • Write use cases • Write functional requirements • Write non-functional requirement • Write test cases to verify functional and non-functional requirements
Sub-team Review	<ul style="list-style-type: none"> • Distribute first draft to own sub-team members • Get email/verbal feedback from own sub-team members • Incorporate feedback from own sub-team
Formal Inspection	<ul style="list-style-type: none"> • Formal inspection • Incorporate feedback from formal inspection
Exit criteria	Inspected and approved requirements specification.

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Example of a script that is not part of PSP. Students need to begin thinking about what scripts they will need to perform on the job. This is a good lead into the Process Definition Exercise.



Basic Process Measures -1



The reason to measure a process is to understand it.

- how much time is spent in various activities
- what is produced at various times
- how many defects are injected and removed, and when

With these data, individuals can better

- plan and estimate the work to be done
- evaluate the results
- improve the process for the next project



Basic Process Measures -2



To measure the process, the work is divided into a defined set of tasks or activities called *phases*.

The measures for each phase are

- time spent in that phase
- defects injected in that phase
- defects removed in that phase

The product size is also measured, but only when the work package is complete. The size measure may vary depending on product or sub-products.

These measures provide the foundation for all PSP and TSP measurements, analyses, and planning.



Core Measures



Size



Effort



Quality



Schedule

Source: CMU/SEI-92-TR-019

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Example Size Measures

A good size measure must be:

- useful for planning (correlate to effort)
- precise (when two people measure the same thing, they get the same result)
- directly countable/measurable

For example:

- pages
- paragraphs
- diagrams
- graphs
- lines of code
- requirement statements



This is an example of size measures.



Example Form – Time Log



TSP Time Recording Log - Form LOGT									
Name D				Date 9/27/2004					
Team Wizards				Cycle Hours 130.7					
Assembly	Phase	Task	Date	Start	Int	Stop	Delta		
SYSTEM	DOC	Draft a Design Standard for the team	09/23/04				338.0		
"A" RequirementsREQ		"A" SECTION A - write requirements	9/24/04				661.4		
SYSTEM	DOC	Improve standard based on comments	9/30/04				240.6		
SYSTEM	DOC	Issue the standard to the team	8/31/04				120.2		
SYSTEM	DOC	Team Review and comment on standard	9/30/04				119.2		
"A" RequirementsREQ		"A" SECTION A - write requirements	9/1/04				478.7		
Core RequirementsREQ/NSP		Core Requirements REQ/NSP - inspect	9/6/04				478.0		
Core RequirementsREQ/NSP		Core Requirements REQ/NSP - inspect	9/6/04				147.1		
"A" RequirementsREQ		"A" SECTION B - write requirements	9/13/04				832.8		
"A" RequirementsREQ		"A" SECTION C - write requirements	9/14/04				352.4		
"A" RequirementsREQ		"A" SECTION B - write requirements	9/20/04				412.6		
"A" RequirementsREQ		"A" SECTION C - write requirements	9/21/04				300.0		
SYSTEM	DOC	Team Review and comment on standard	9/10/04				190.9		
Core RequirementsREQ		Core Requirements REQ - write require	9/12/04				690.0		
Core RequirementsREQ		Core Requirements REQ - write require	9/13/05				450.2		
SYSTEM	DOC	Team Review and comment on standard	9/10/04				190.1		
Core RequirementsREQ/NSP		Core Requirements REQ/NSP - inspect	9/20/04				660.1		
Core RequirementsREQ/NSP		Core Requirements REQ/NSP - inspect	9/20/04				300.0		
SYSTEM	DOC	Team Review and comment on standard	9/10/04				190.1		
"A" RequirementsREQ/NSP		"A" Requirements REQ/NSP - inspect	9/20/04				720.1		

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Example of time being measured.



Example Form – Defect Log

Date	Item	Type	Assembly	Entered	Reviewed	Fix Time	Pre-Prod	Description
1/25/2011	1		60 TSP-6 8.5-4mm-CLD		SLD/DRP	4.5		
1/26/2011	2		60 TSP-6 8.5-4mm-CLD		SLD/DRP	12.0		
1/26/2011	3		60 TSP-6 8.5-4mm-CLD		SLD/DRP	20.0		



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Example of defects being collected.



Example Standard - Requirement Defect Types

Defect Type Standard

Type Number	Type Name	Description
10	Omission	Missing requirement
20	Ambiguous	There could be multiple interpretations of the requirement
30	Duplicate	A similar requirement exists elsewhere
40	Unclear	The requirement was unclear
50	Incorrect	The requirement is incorrect
60	Inconsistent	The requirement is not consistent with another requirement
70	Extraneous Information	The requirement describes not just "what" but "how"

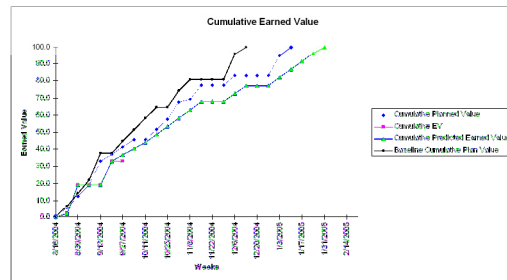


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Example of a defect standard. Note that students will have to create many standards in order to collect relevant measures in the work environment. This is an example of a Requirement Defect Type Standard.



Example Schedule – Earned Value



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Earned Value one way to measure schedule performance.



TSP Week Summary - Form WEEK									
Name		Account		Date					
Team		Weeks		Status for Week		Selected Assembly		Cycle	
Week Date		9/20/04		SYSTEM					
Task Hours %Change		Weekly Data		Plan / Actual		Plan / Actual		Project End Date	
Baseline	205.0	Schedule hours for this week		10.0	11.9	8.64	-1.9	Baseline	12/26/04
Current	252.2	Earned value this cycle to date		80.0	74.7	1.21	15.3	Plan	12/26/04
%Change	14.7%	To-date hours for tasks completed		4.3	13.0	5.31	-3.4	Predicted	
		Earned value this cycle to date		37.2	33.0	1.13	4.3		
		To-date hours for tasks completed		17.5	74.7	1.06			
		To-date average hours per week		15.0	12.4	1.21			
		EV per completed task to date		0.480	0.441				

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Process Development Steps



1. Determine your needs and priorities
2. Define the process objectives, goals, and quality criteria
3. Characterize your current process
4. Characterize your target process
5. Establish a process development strategy
6. Define your initial process
7. Validate your initial process
8. Enhance your process

Note: Order the steps in the most appropriate order for your situation.

Based on chapter 13 of Watts Humphrey's [PSP: A Self-Improvement Process for Software Engineers](#).

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Determine Process Needs and Goals

- Purpose of the process
- General guidelines, usage considerations, or constraints
- Entry criteria
- Exit criteria
- Quality goals
- Measures



Characterize Your Current Process

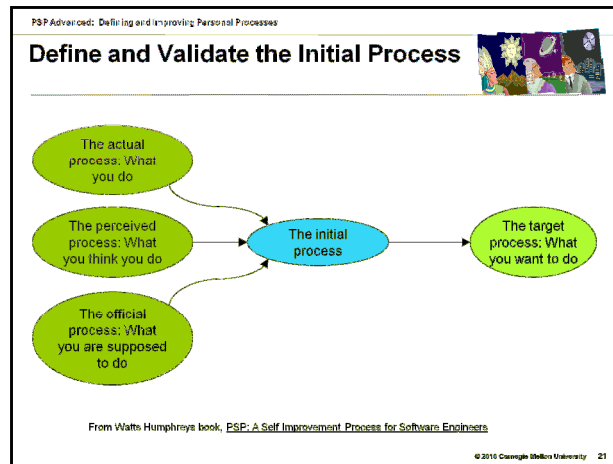
- How well do you understand the current process?
- What problems do you have with the current process?
- Does the current process have explicit entry and exit criteria for each step?
- Is the current process planned and tracked?
- Do you have a current process baseline?
- What are the goals for the target process?



Characterize Your Target Process

- What are the general criteria for the target process?
- Should it predictably produce quality products?
- Should it minimize cycle time?
- Should it be fully defined?
- Should it have explicit entry and exit criteria?
- Should every phase be characterized and measured?
- Should it be planned and tracked?





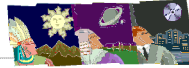
When you define the initial process, the objective should be that it represents your current processes and moves you in the direction of your target process.

Your first attempt will likely be close to your perceived process, what you think you do. When you try to use this process, you'll discover your actual process differs; the omissions, mistakes and oversights will stand out.

You should adjust your process definition so that it more closely matches what you actually do and try it again. After a few iterations, what you actually do and the defined process will converge to a realistic initial process. With this more disciplined and stable starting point, your process improvement efforts will be most successful.



Enhance the Process



1. Use the process and learn what is working and what needs to be improved
2. As you use the process, record your PIPs
3. Evaluate Ideas and determine potential performance gains
4. Select PIPs, plan, and implement them—add more detail as needed to your process
5. Do work and while doing the work collect
 - detailed data
 - generate PIPS
 - learn about new methods (and record those as PIPS)
6. Periodically do Big Picture Analysis
7. Record PIPS and problems—determine if it is time for another round of process improvements



Hints and Tips



Design the process at just the level you need to guide the work. Consider it an expert level checklist.

Your first pass will rarely be complete no matter how much time you put in it.

Start with a simple process and enhance it as you learn.



Process Evolution and Performance Improvement

As you do work, many things can lead you to want to evolve your process with goal of improving your performance:

- Aspiration (I want to do Better!)
- Inspiration (I had this great idea! Or I want to try this new thing I read about!)
- Annoyance (This problem happens all the time and it is a real irritant!)
- Performance Problems (I am not meeting my commitments 80% of the time!)



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Analyzing Process Performance - 1



Discussion:

- Why do you need to periodically review your process data?
- How often should you review your process data?
- What happens if you review your process data too often? too seldom?

If you have already set goals, you start by understanding your performance against those goals.



Analyzing Process Performance - 2



Analyze your performance with respect to size estimation, effort estimation, and quality management to:

- understand your current performance
- identify your highest-priority areas for improvement
- establish challenging but achievable goals, and
- define corresponding improvement actions to meet those goals
- define actions to address challenges you will face in making those changes



Some Cautions



Don't over analyze only one piece of information. Please remember to look for trends.

Don't do a superficial analysis (e.g. don't describe a chart, *analyze* it).



Analysis of Size Estimating Accuracy



Review your performance on size estimating accuracy. For example:

- How much did your size estimating accuracy change? Why?
- Do I have a tendency to add/miss entire parts?
- Do I have a tendency to misjudge the relative size of parts?
- Do I need to calculate relative size range data using my historical data?
- Based on my historical size-estimating accuracy data, what is a realistic size-estimating goal for me?
- How can I change my process to meet that goal?

The answer to many of these questions would make excellent PIPs



Analysis of Time Estimating Accuracy



Review your performance on effort estimating accuracy. For example:

- How much did your effort estimating accuracy change? Why?
- Is my productivity stable? Why or why not?
- How can I stabilize my productivity?
- How much are my time estimates affected by the accuracy of my size estimates? (Would multiple regression help me?)
- Based on my historical time-estimating accuracy data, what is a realistic time-estimating goal for me?
- How can I change my process to meet that goal?

The answer to many of these questions would make excellent PIPs



Analysis of Schedule Accuracy



Review your performance on schedule accuracy. For example:

- How many committed dates am I missing versus making?
- For the dates that I am missing, what are the root causes?
 - Am I getting the expected number of task hours per week as I have planned? If I am not:
 - What is the variance?
 - What are the root causes?
 - Are there actions I can take to improve task hours per week?
 - Are the tasks I estimated under or over estimated?

The answer to many of these questions would make excellent PIPs

NOTE: These questions are not very useful for analyzing PSP class data, but are needed for analysis in the real world.



Defect and Yield Analysis



For example:

- What type of defects do I inject during design and coding?
- What trends are apparent in defects per size unit (e.g., KLOC) found in reviews, compile, and test?
- What trends are apparent in total defects per size unit?
- How do my defect removal rates (defects removed/hour) compare for design review, code review, compile, and test?
- What are my review rates for design review and code review?
- What are my defect-removal leverages for design review, code review, and compile versus unit test?
- Is there any relationship between yield and review rate for design and code reviews?

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The answer to many of these questions would make excellent PIPs



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Process Manager Team Role



- Ensures that the team has defined processes available for all key activities
- Assists team members in defining and using processes
- Ensures that team process data are promptly reported and analyzed
- Assists the team in identifying and resolving process problems
- Manages the team's process improvement proposals (PIPs)



Process Support Activities



Ensures that defined processes are available for major development, management, and team activities

Leads the team in developing the processes that the team needs

Ensures that team members are familiar with each defined process and, where necessary, are trained in its use

Ensures that the team always follows a defined and documented process

Ensures that the team has defined processes available for all key activities



Process Tracking and Analysis Activities



For Tracking, ensures that:

- all team members report their process data in a timely way
- where members are late providing their process data, promptly gets their data or calls on the Team Leader for help

When analyzes the team process data

- Identifies where the team or any team member has problems following the defined process

Assists team member's improvement efforts



PIPs

The Process Manager manages:

- elicitation
 - gathering
 - recording
 - tracking
 - handling
- of the team's PIPs.



Reporting Status



The Process Manager:

- reports weekly to the team on the status of all team process development and analysis work
- alerts the team and Team Leader when process problems need their attention
- maintains the data to produce the process section of the project report during the phase and project postmortems



Questions to ask as Process Manager



Does the team have defined processes for their principal activities? If not, what processes do you recommend be defined, and by whom?

Do these processes reasonably represent the way that the work is currently being done? If not, are PIPs being submitted to correct the processes?

Are the team members following the processes that they have?

Is management providing the support needed to get the defined processes followed? If not, what remedial actions do you recommend?

Do you have a defined process for handling the team's PIPs? If not, what steps are planned to define such a process?





Messages to Remember

A personal process is a set of steps that individuals use to guide their work.

Defining and using a personal process helps individuals to plan, do, track, and improve their work.

Scripts, measures, forms, and standards are elements of a good process definition.

Start small and define a simple process; then evolve and improve it based on use.

Process discipline can be established and maintained on a team through the process manager role.



Process Definition Exercise

After completing this exercise you will:

- understand how to define the steps for a process you use at work
- be able to understand some characteristics of this process
- understand processes fellow attendees are using to do their work



