



**Software Engineering Institute**

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# Toward Quantified Reflection

## Reflections on TSP reflective practice

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<sup>SM</sup> The following are service marks of Carnegie Mellon University: Team Software Process, TSP, Personal Software Process, PSP

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# Overview

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What motivated this reflection

What is the “Ladder of inference”

Some typical data from experience

Some suggestions for moving forward?

# Motivation

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Performance And Capability Evaluation (PACE)

Evaluated projects form, all data plus some

- Training summaries,
- Project characteristics, Launch data, Project data,
- Post mortem reports



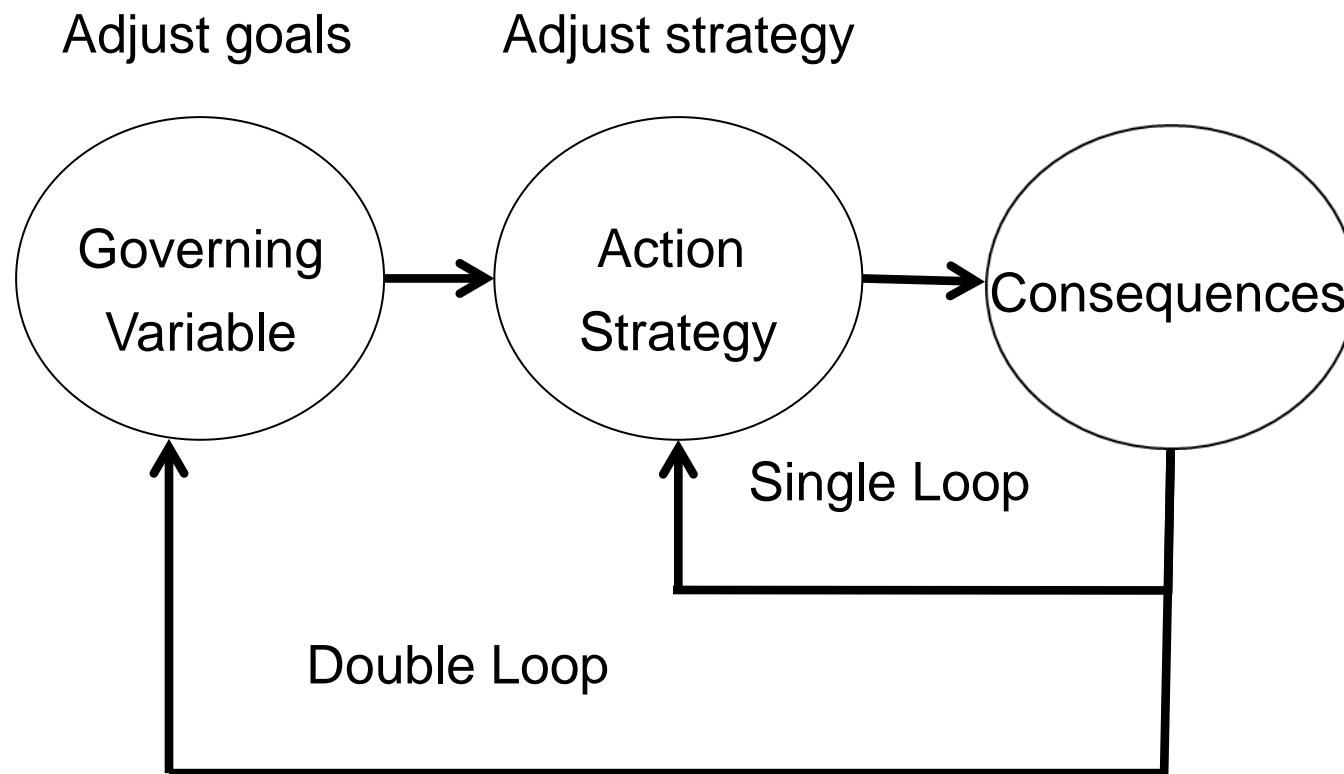
What were the challenges and what I have learned about how post mortems are actually being performed?

Improvement beyond scope of evaluation, but Watts felt it was critical.

What can we do to help improve the quality of post mortems?

What can we do to help the PM drive improvement?

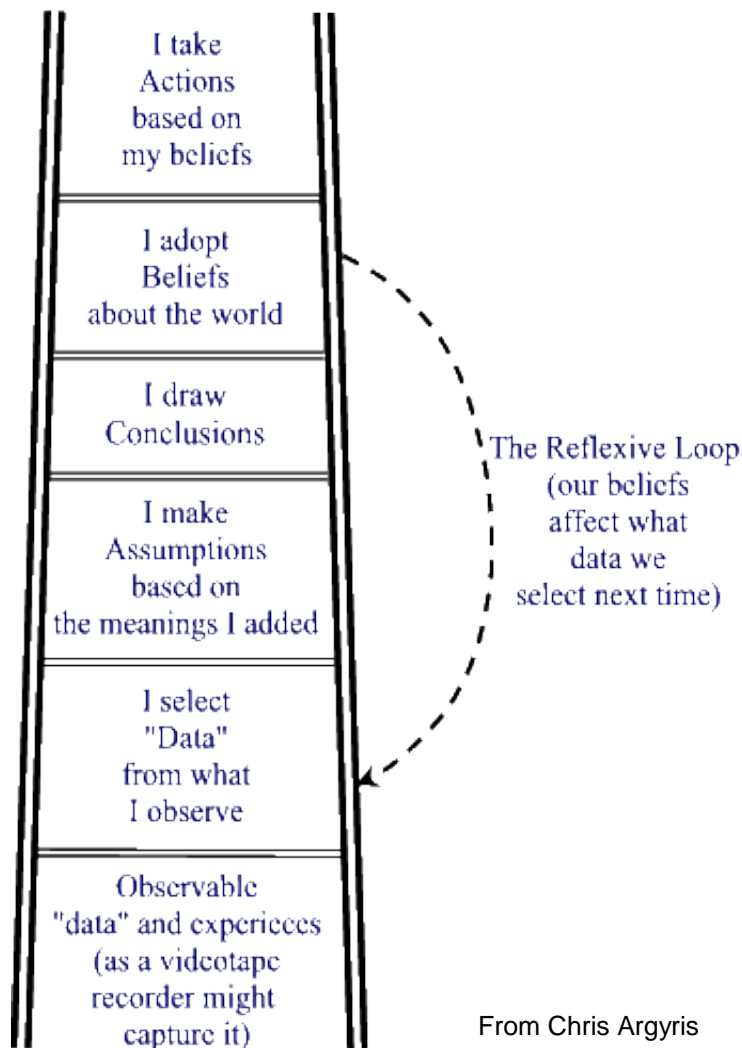
# Single Loop and Double Loop Learning



Single Loop: learning the game, try harder

Double Loop: change the game, try smarter

# Ladder of Inference: Reflection-on-Action



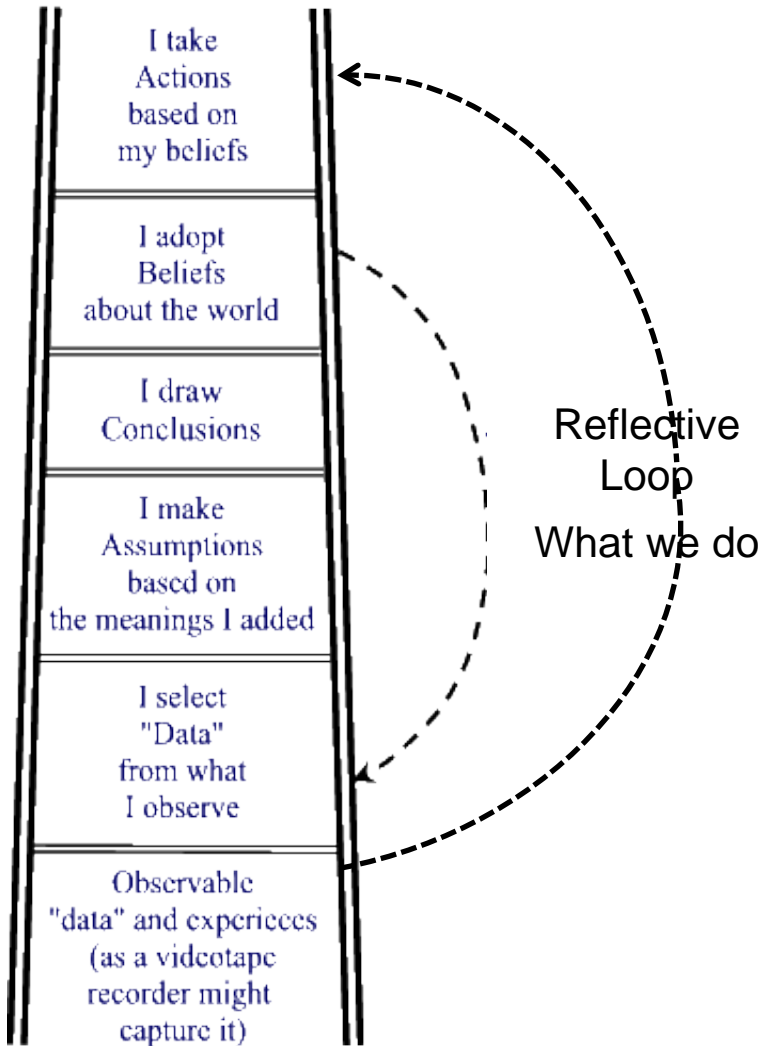
Reflection-On-Action is the cognitive post mortem reviews actions to explore the understandings brought to them.

## Example questions

- What was positive or negative?
- What do I find difficult?
- What data did I select?
- What were my assumptions when interpreting?

From Chris Argyris

# Ladder of Inference, Reflection-on-Practice



Reflection-On-Practice is the cognitive post mortem reviews actions to explore the understandings brought to them.

Example questions:

- What conclusions can I draw?
- With hindsight, what should I do differently? Why?
- What results should I expect?
- How does this affect the data available?

# How are our Post Mortems working?

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Post mortems evaluate process and outcomes both quantitatively and qualitatively

Goals: More than what happened?

What was I supposed to accomplish?

What did I actually accomplish?

Process: How did this come to be?

What am I supposed to do?

What did I actually do?

Improvement:

What do I need to do better?

What should I do differently?

# Begin At the Beginning

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What are your goals?

- Cost?
- Performance?
- Quality?
- Schedule?
- Responsiveness to change?

Many, maybe most post mortems did not include an explicit statement of the project goals, how they had changed, or how the project performed against the goals.

Most did not include context information about the project, environment, tools used, stakeholders, and so forth.



# What about the process?

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What is your process?

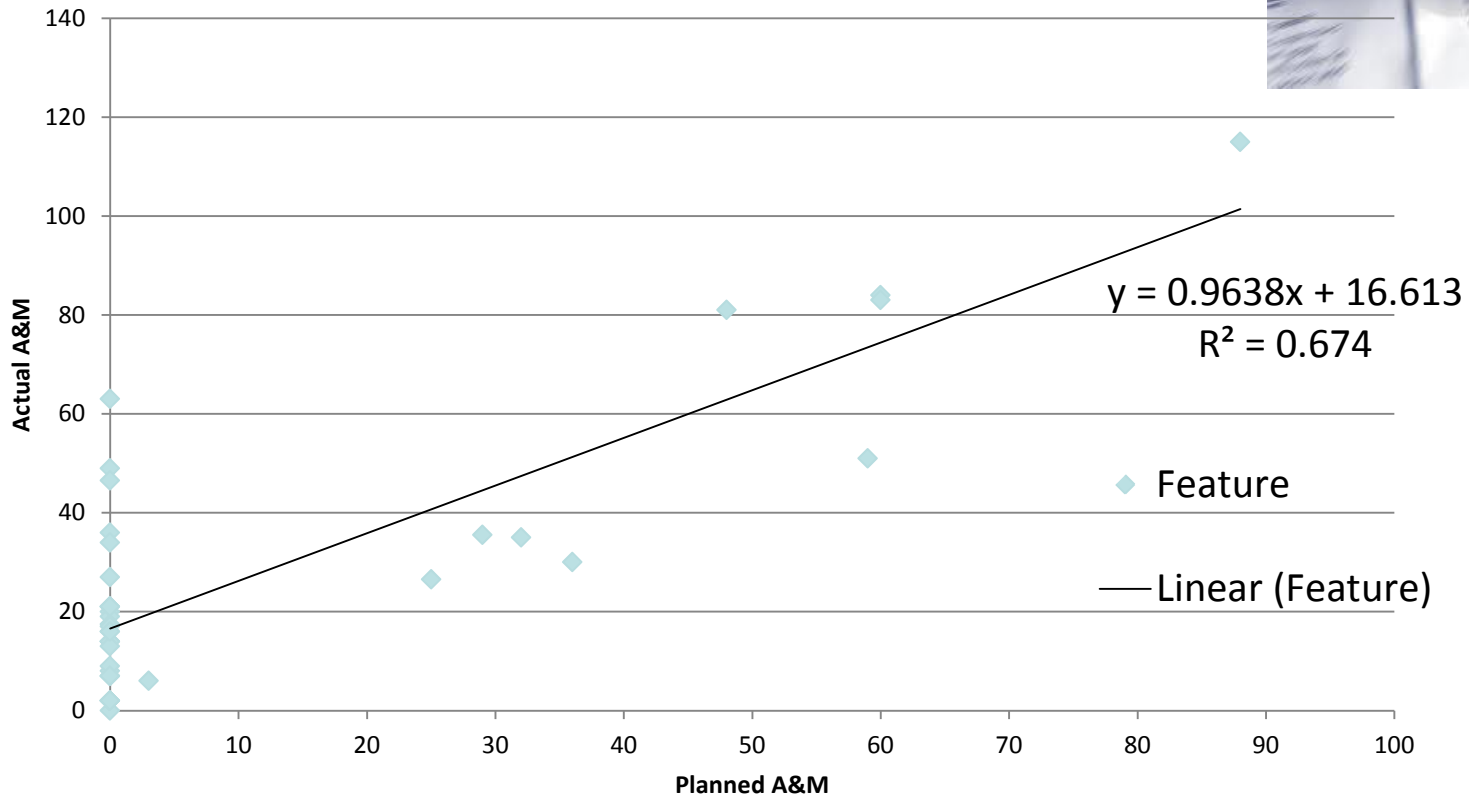
What are the steps?

- Do I use the steps? How do I know?
- How well do I execute them?
- How effective are they steps? What should I measure?
- Do they lead to a desirable results?

# Process Analysis: size estimation



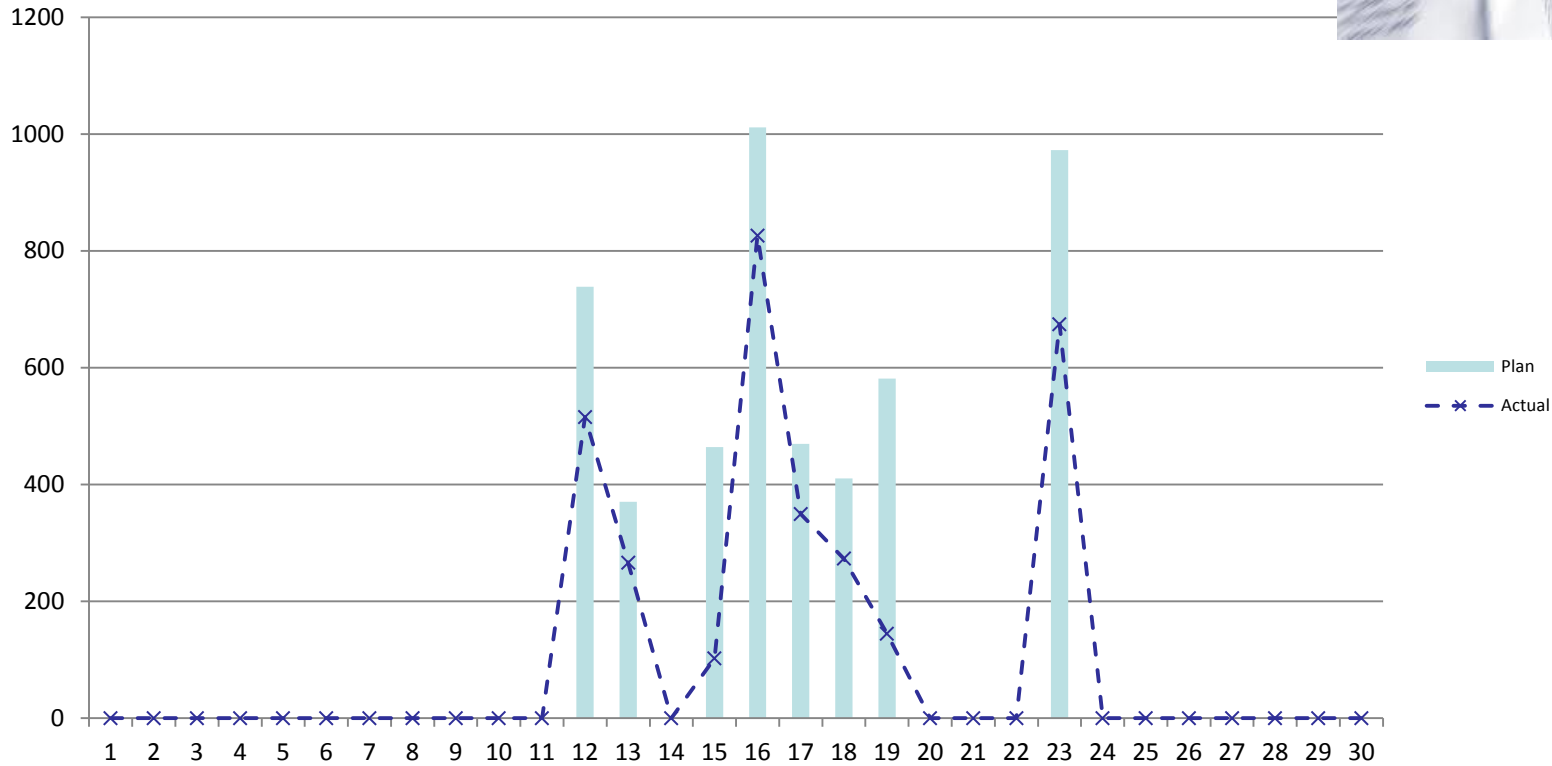
## Component Size Estimation



# Process Analysis: time in phase



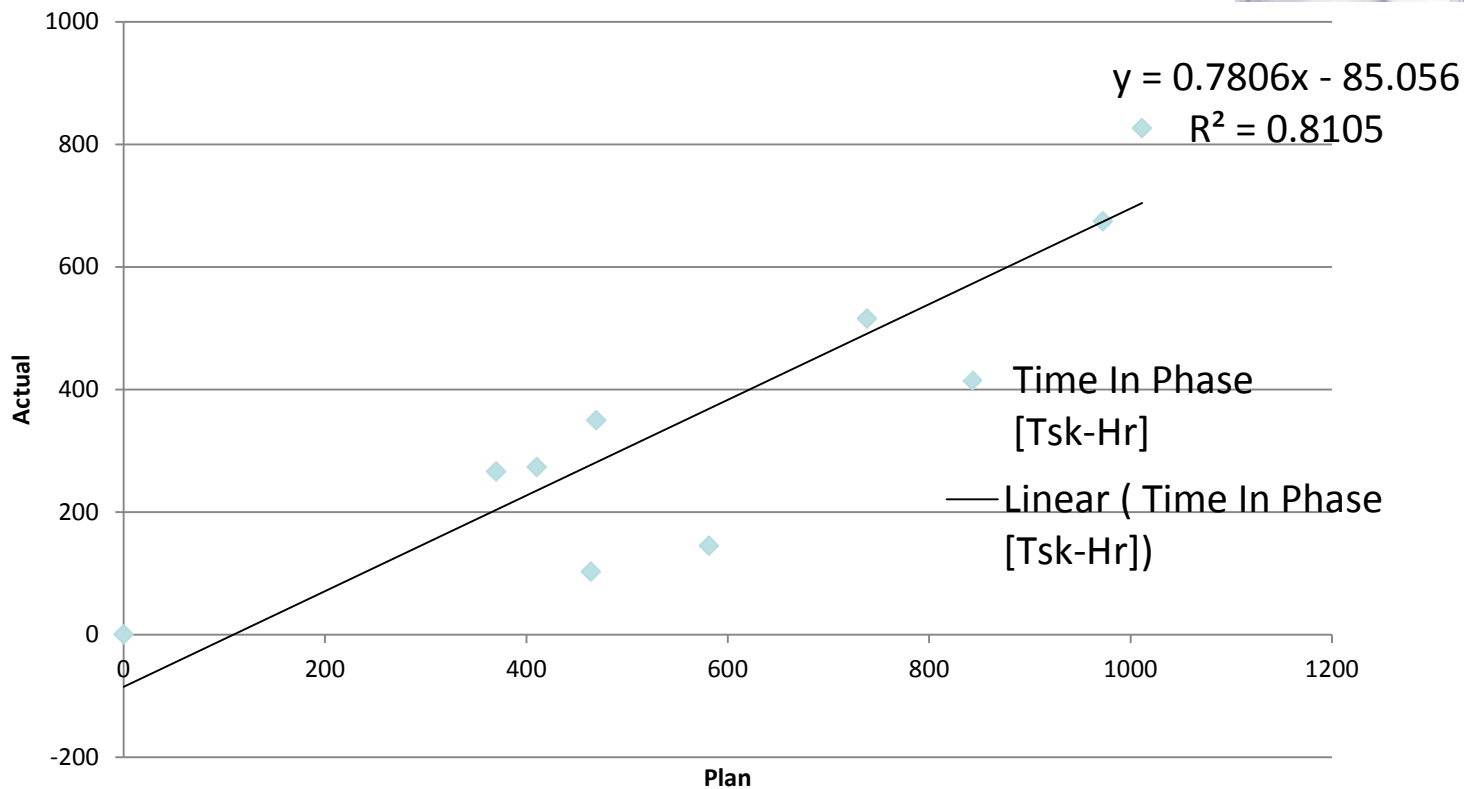
## Phase Effort Plan



# Process Analysis: time in phase



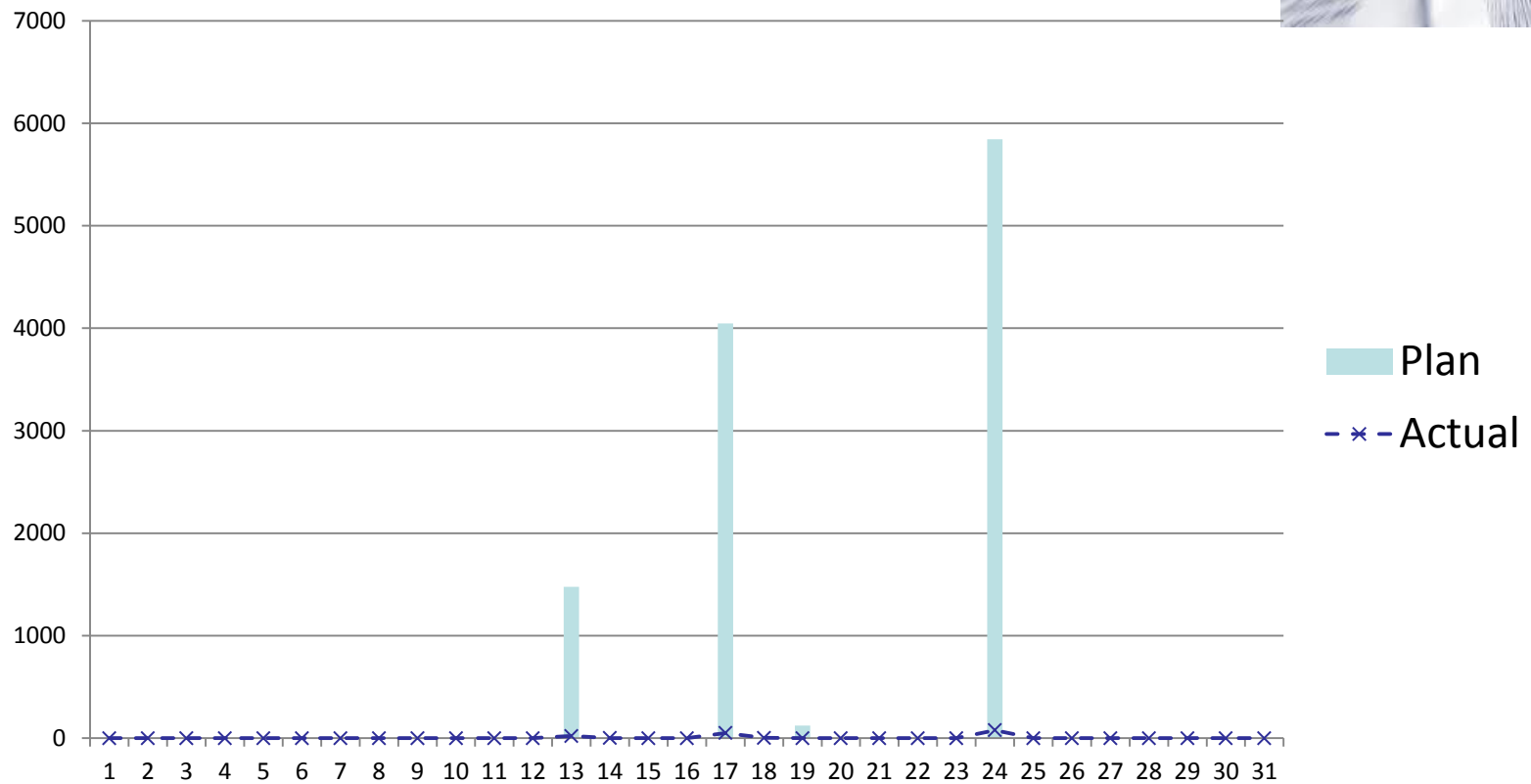
Time In Phase  
[Tsk-Hr]



# Process Analysis: defect injection/removal



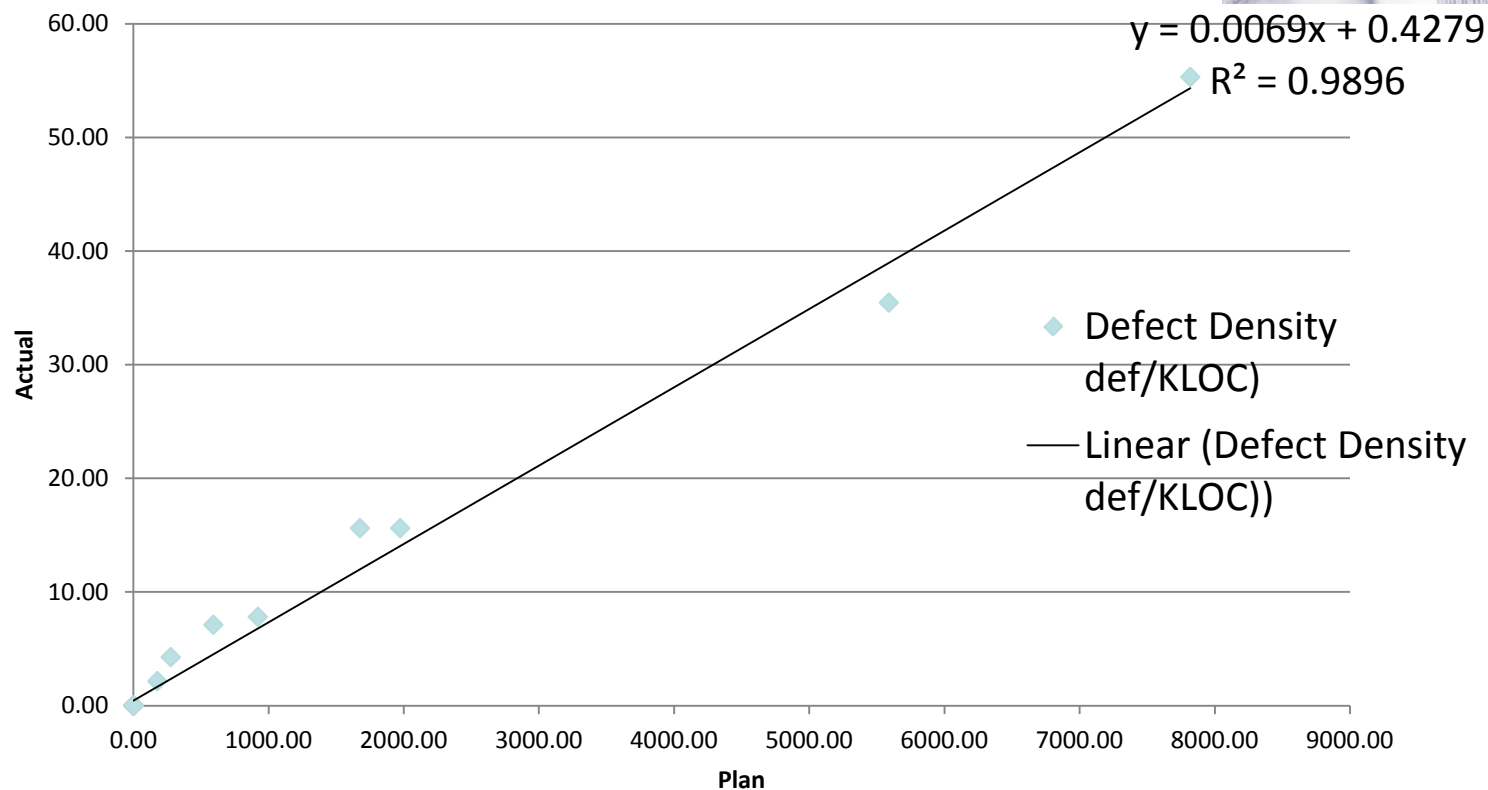
## Defect Injection Plan



# Process Analysis: defect density



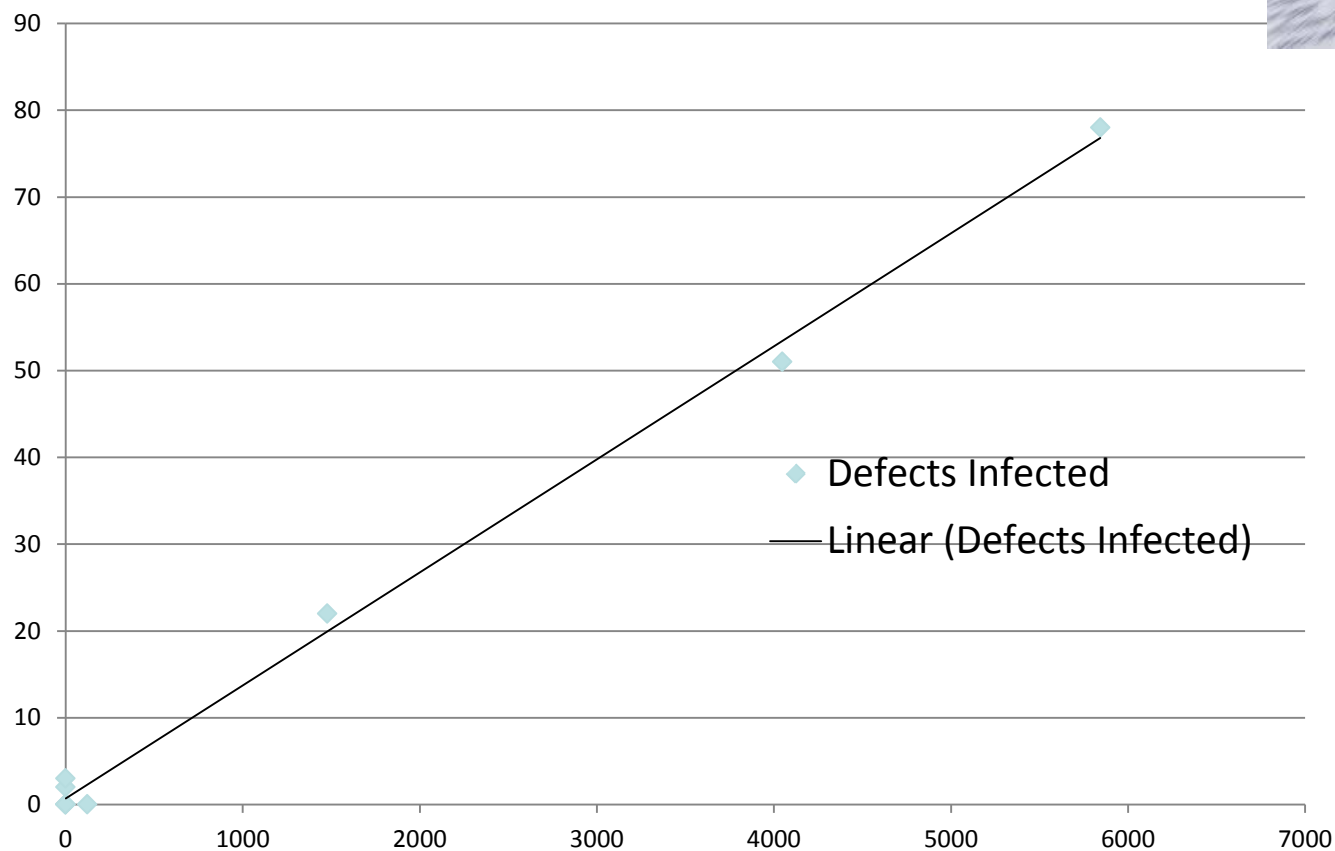
**Component Defect Density Plan  
def/KLOC)**



# Process Analysis: defect injection/removal



### Defect Injection by Phase



$$y = 0.013x + 0.7057$$
$$R^2 = 0.9961$$

# Reflections

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## Non-problems

- Processes well defined and used
- Data is good
- Standard defect phase % look pretty good

## Problems?

- Defect level estimates are way off.
- Analysis is not showing up in PM
- Updated planning parameters are not explicit

## Bigger Problems?

- Performance to Goals not showing up in the PM report
- Plan change history is not available



# How can we improve the PM?

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What are the global similarities?

Basic data and questions about

- goals and outcomes
- process as defined and
- process as used,
- process results,
- what happened

What additional tools might be helpful?

- Data templates
- Analysis suggestions
- Some analysis tools

What else?



# Begin at the Beginning and Lowest Rungs of the Ladder

## TSP Launch Data Standard – Standard LAU-Data



### Purpose

This Launch Data Standard guides teams in

- recording complete launch data in a retrievable way
- retaining launch data in a format suitable for later use
- The launch data can be used by the team to
- compare team performance with the goals set during the launch
- improve estimating accuracy
- provide data needed for a TSP-PACE
- provide data needed for other types of appraisal or assessments

# How did we do? Against what?



## Project Goals Summary Worksheet

Quality Plan Overall Summary (Goal, Plan, and Actual)	Launch plan data			
	Management Goals	Team Goals	Plan	Actual
Yield Before System Test	70.0%	70%	70%	73%
Development Defect Density (Defects/KLOC)			75.000	1.677
System Test Defect Density (Defects/KLOC)	0.0%	0%	0.000	0.000
Customer/Acceptance Test Defect Density (Defects/KLOC)	1.0%	1%	0.000	0.150
Product Life Defect Density (Defects/KLOC)	NA	NA	NA	NA

# Form: Project Change record

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Moving target? Double Loop?

## Project Change Record

Problems addressed:

This was more or less implicit in the project record, but not explicit or standard

Record of

- How did we change the plan?
- Why did we change the plan?
- Who requested and approved the change?

# Process Analysis



## Process And Product Analysis Worksheet

Development Process Data	Time In Phase [Tsk-Hr]		Defects Infected		Defects Removed	
	Plan	Actual	Plan	Actual	Plan	Actual
Default TSP Life Cycle Phase						
Detailed Design	738.5	515.6	1478.0	22.0	0.0	0
Detailed Design Review	370.2	266.1	0.0	2.0	1034.0	14
Unit Test Development	0.0	0.0	0.0	0.0	0.0	0
Detailed Design Inspections	464.2	102.6	0.0	0.0	310.0	7
Code	1011.5	826.0	4047.0	51.0	0.0	4
Code Review	469.6	349.5	0.0	3.0	2926.0	31
Compile	410.4	273.1	123.0	0.0	689.0	11
Code Inspections	581.4	144.6	0.0	0.0	482.0	5
Unit Test	972.5	674.4	5843.0	78.0	201.0	6
Total	5018.2	3151.8	11491	156	5642	78

# Standard: Post Mortem data



## TSP Post Mortem Data Standard

What data should be prepared to support the Post Mortem?

Problems addressed:

- Data supporting the analysis not available
- Not sure what information should be stored long term

# Standard: Post Mortem Report



## TSP Post Mortem Report Standard

What information should the report contain?

## The Post Mortem Performance Summary Standard

What should the performance should a PM contain?

Problems addressed

- Missing Context
- Goals Performance
- Improved guidance on standard analysis

# What are your reflections?

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- How useful are your post mortems?
- How do you create your post mortem reports?
- What data do you have?
- What data do you use?
- How do you use your post mortems?
- Are you improving?
- Why or why not?
- What do you need in tools?
- What would you like to see in training?
- Are there training issues?







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