

# PSP<sup>SM</sup>: A Building Block for Self-Directed and High-Performance Teams

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# What make use better?

**Why are you a better programmer than a first year student?**

**Why are some organizations better than others?**

**Do some of the same things for a personal level scale up to organizations?**

(deliver software on time; deliver with high quality and few defects)

# Elements for Superior Performance

- Challenging and worthy goal
- Talented, motivated, and capable people
- Enabling Training and Support
- A manager with the drive and vision
- A leader who understands and cares

# Current Practices

- Typically, most software engineers
  - do not involve in planning their work
  - are rushed through requirements and design
  - design while code
  - not look back for lesson learned

# Problems

- These practices cause a lot of problems
  - Experienced engineers inject a defect every 7 to 10 lines of code.
  - For even moderate-sized systems, this is thousands of defects.
  - Most of these defects must be found in test.
  - About 50% of development time spends on fixing defects

# What do we need – 1

Ability to

- Better estimate the work
- Better manage the cost and schedule
- Effective manage quality
- Reduce cycle time or time to market

***Ability to improve oneself***

# What do we need – 2

Ability to

- Bond together as jell
- Work as one
- Synergize all members
- Direct themselves

***Ability to build and work as a team***

# What do we need – 3

- Ability to
  - Guide the team without interfering
  - Create the enabling environment
  - Standardize the good practices
  - Support the culture of continuous improvement

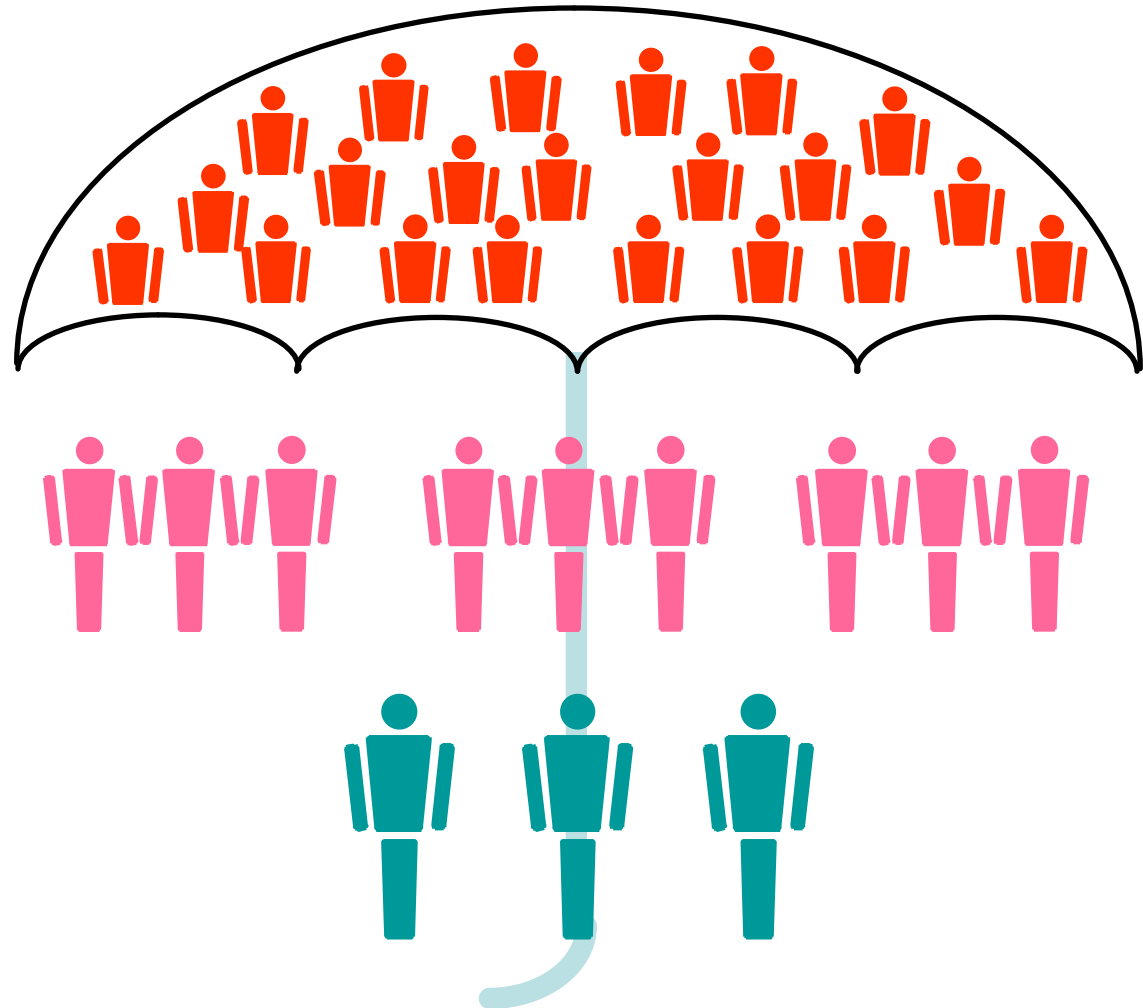
***Ability to support a self-directed team***

# PSP & TSP & CMMI

**CMMI<sup>SM</sup>** - Builds organizational capability

**TSP** - Builds quality products on cost and schedule

**PSP** - Builds individual skill and discipline



# Building Self-Directed and High-Performance Teams



# Personal Software Process (PSP)

- The PSP is a process designed for individual use, based on scaled-down industrial software practice.
- With PSP, engineers
  - are process users and owners
  - routinely estimate and plan their work
  - gather data for tracking and improvement
  - manage quality at every step of the process

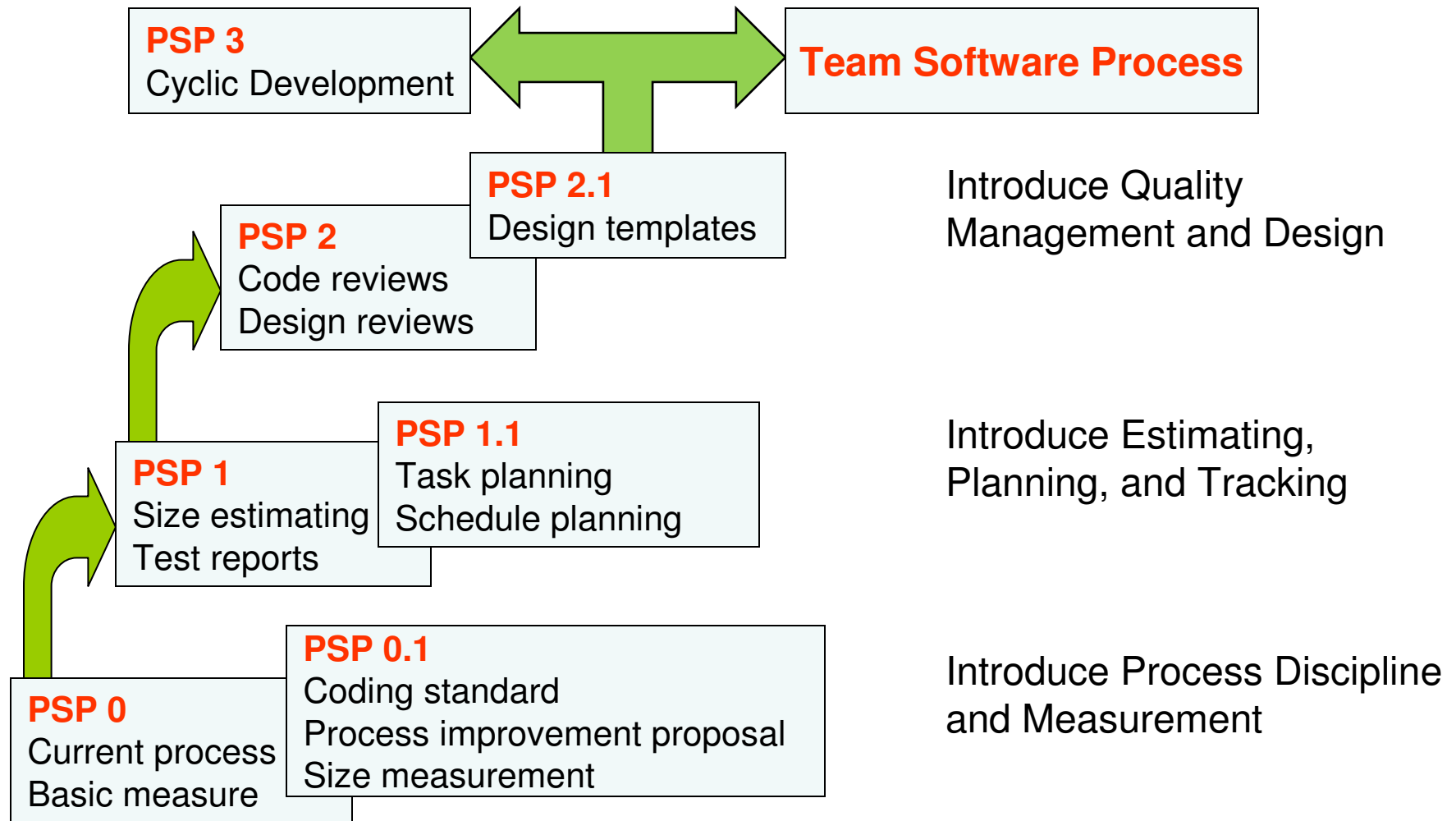
# PSP Strategy

- Personal Software Process (PSP) training teaches software professionals
  - what sound engineering methods are
  - how to use these methods in their work
  - how to use data to improve their work

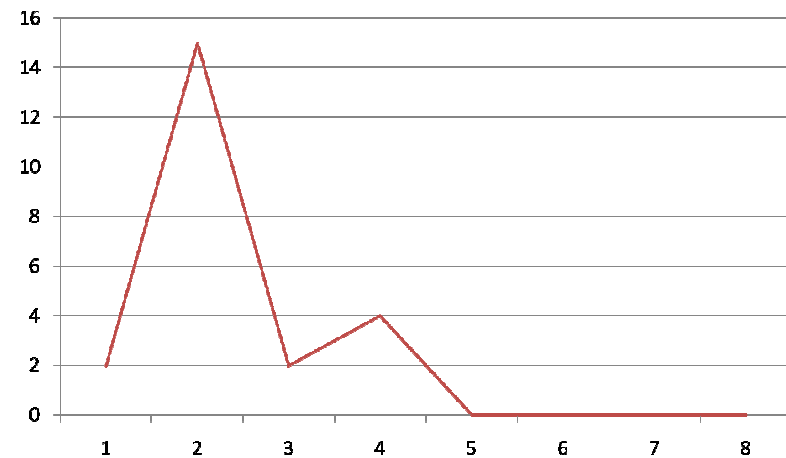
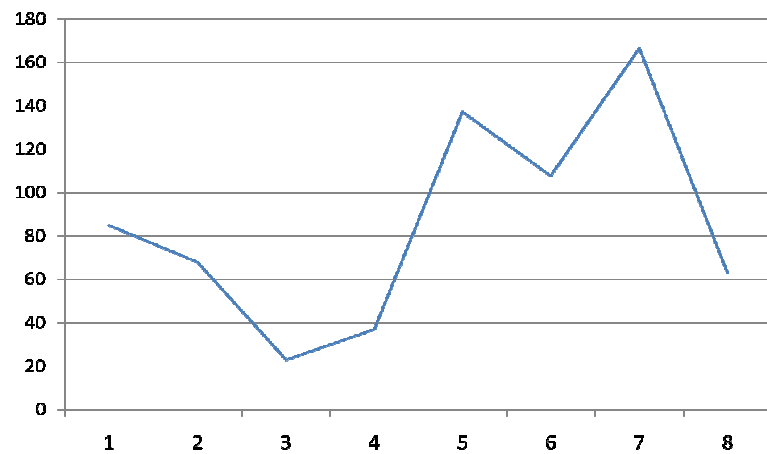
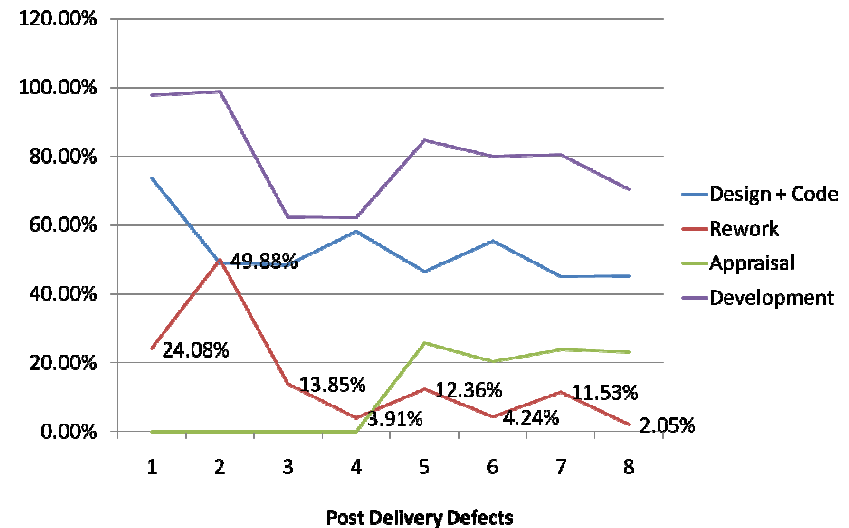
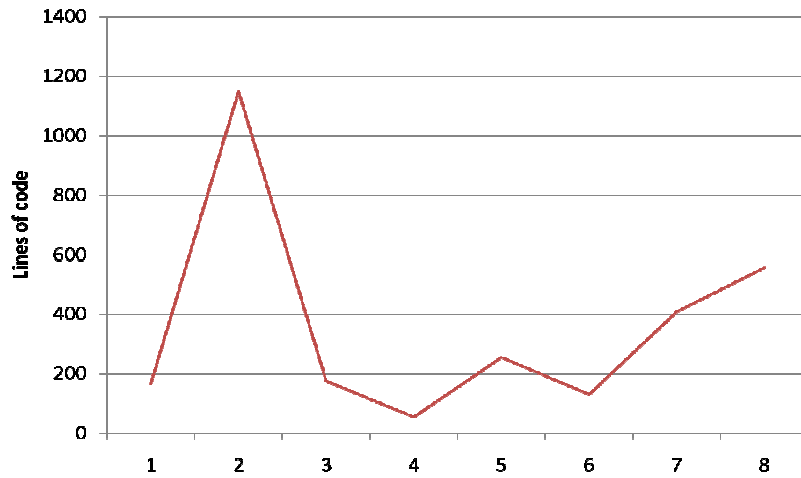
# Sound Engineering Practices

- Until they try them, most programmers do not believe that sound engineering practices will be helpful.
  - They won't try the practices without evidence.
  - They can't get evidence without trying the practices.
- In the PSP courses, engineers use the PSP to write 7 programs.
- They can see from their personal data that sound engineering practices work for them.

# Learning PSP



# My Personal Experience with PSP



# Lesson Learned

- Surprise by the low productivity
- Not following the process costs me both time and quality
- By following the sound engineering practices, I was able to improve both project and quality management skills

***With PSP, I am able to better manage my work and produce better outcome***

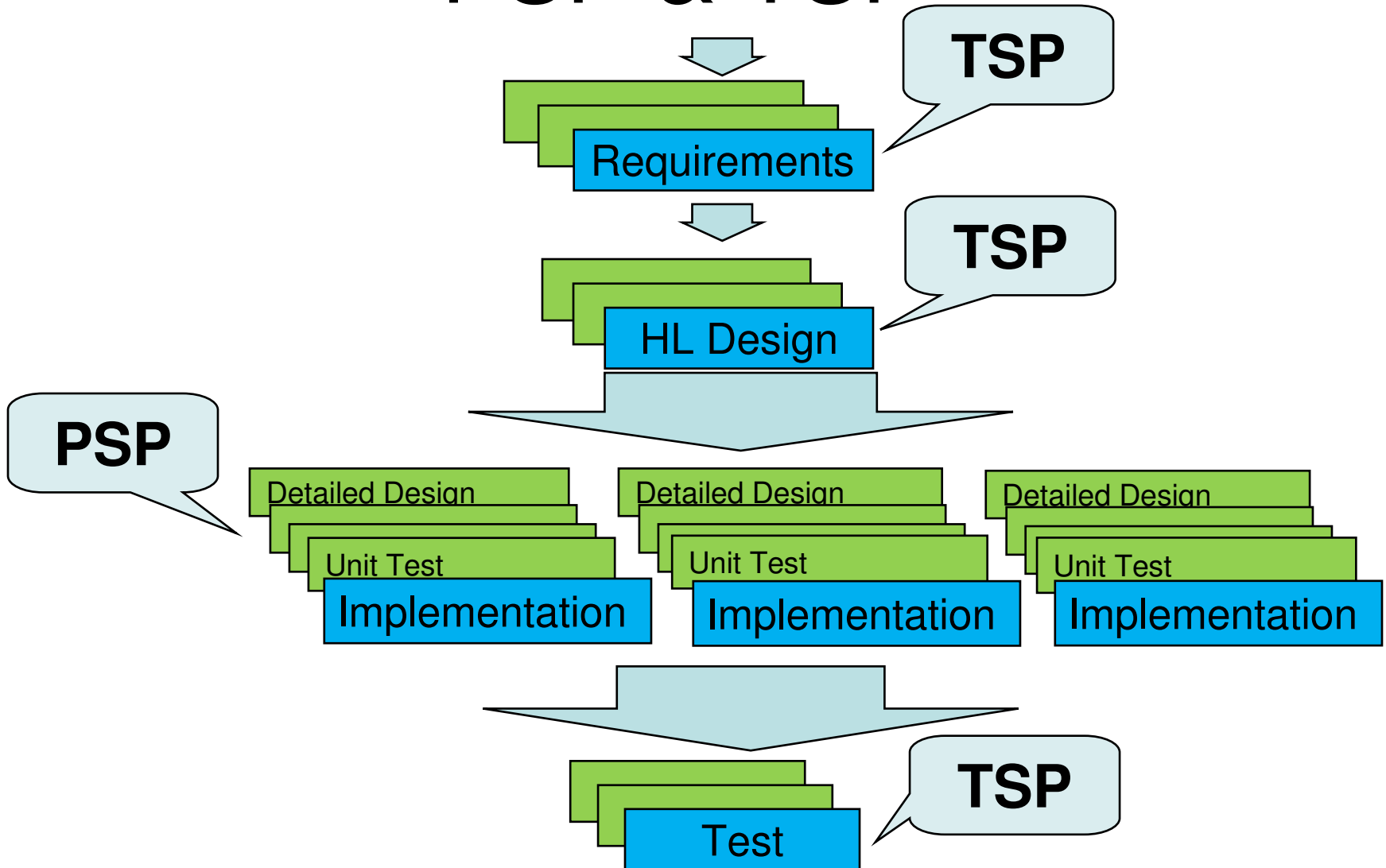
# TSP

- The TSP is a process framework for building and guiding engineering teams that develop software.
- A typical TSP team consists of 3 to 15 members, not necessarily all software engineers.
- Team members must exercise process discipline, so PSP is a prerequisite for TSP.

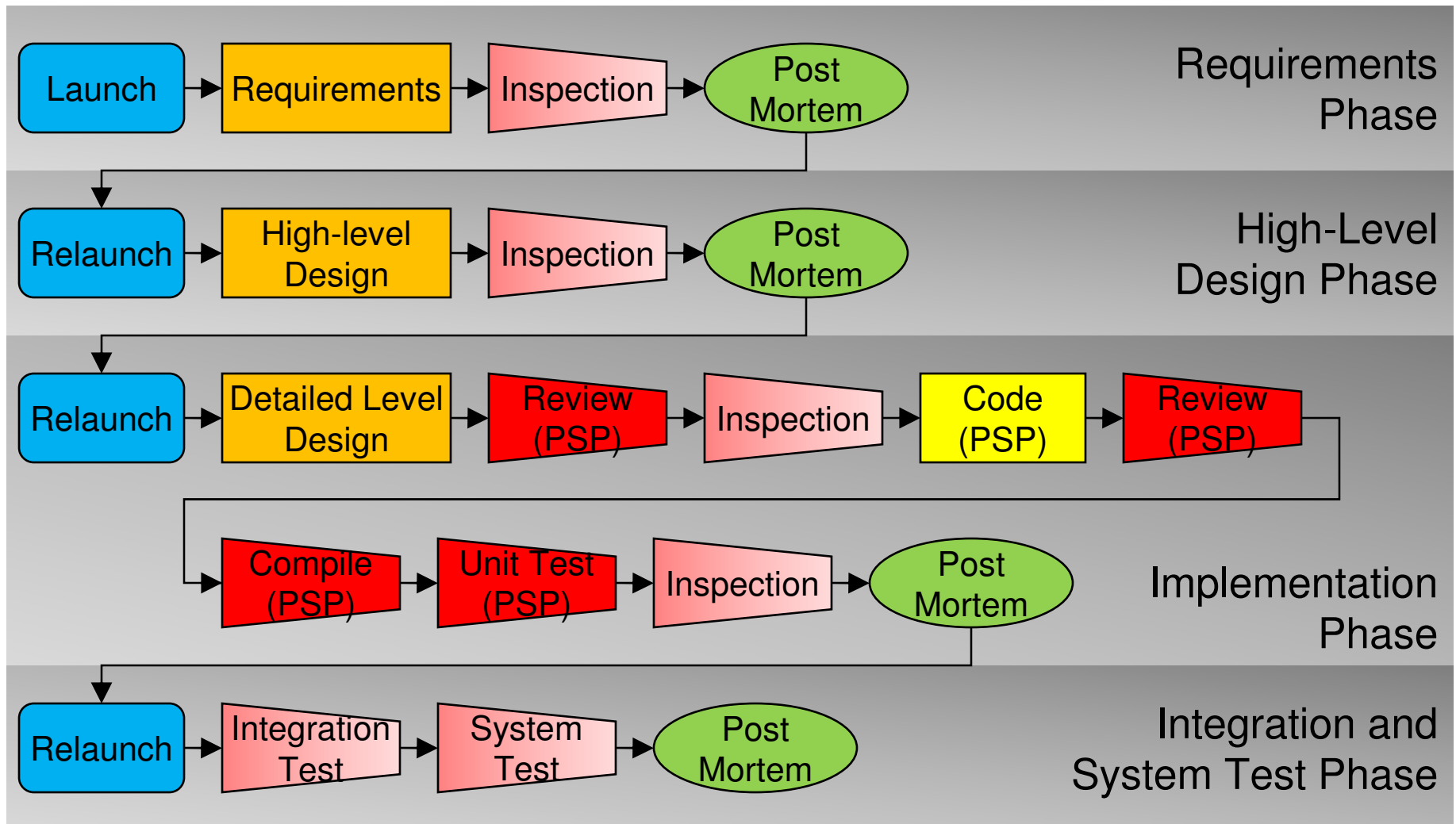
# TSP Strategy

- With the Team Software Process (TSP), professionals use the methods they learned in PSP training. They
  - follow a defined and measured process
  - plan, track, and manage their personal work
  - gather time, size and defect data
  - use these data to consistently produce quality products

# PSP & TSP



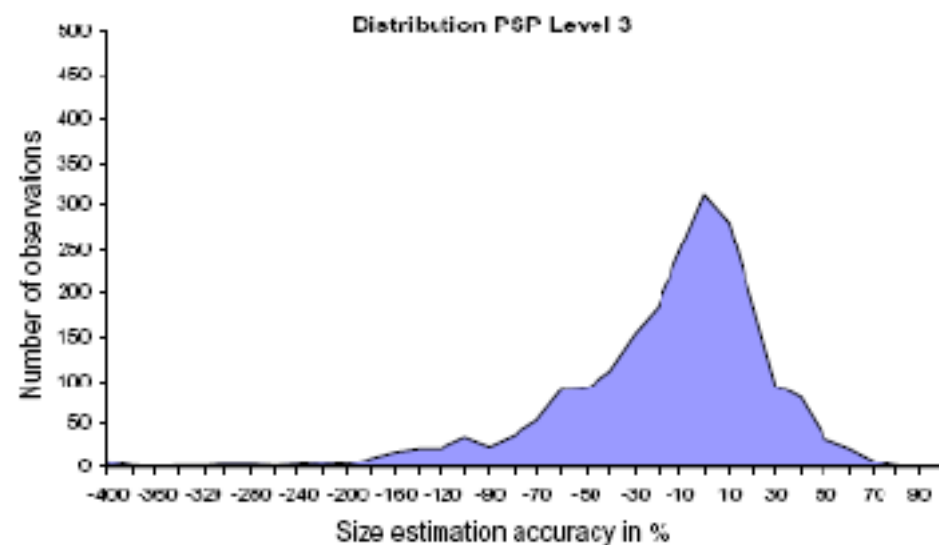
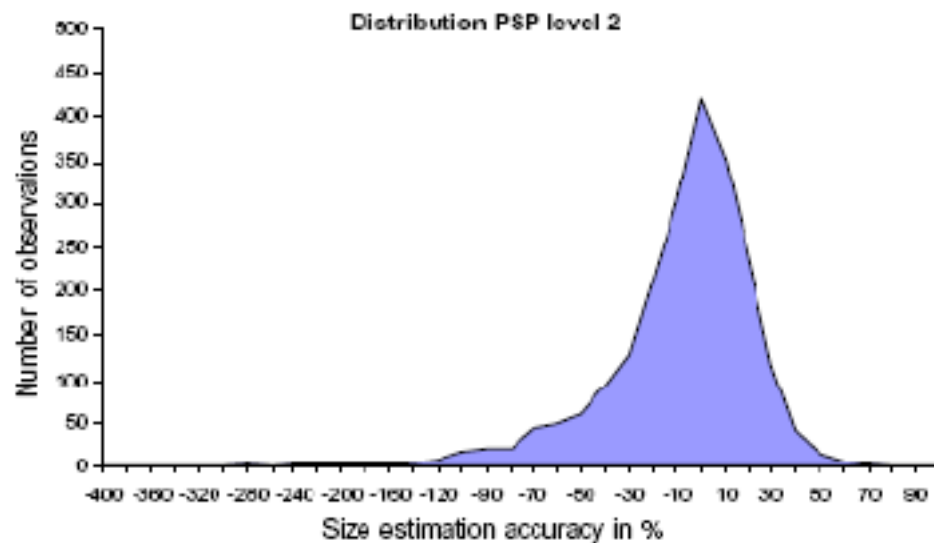
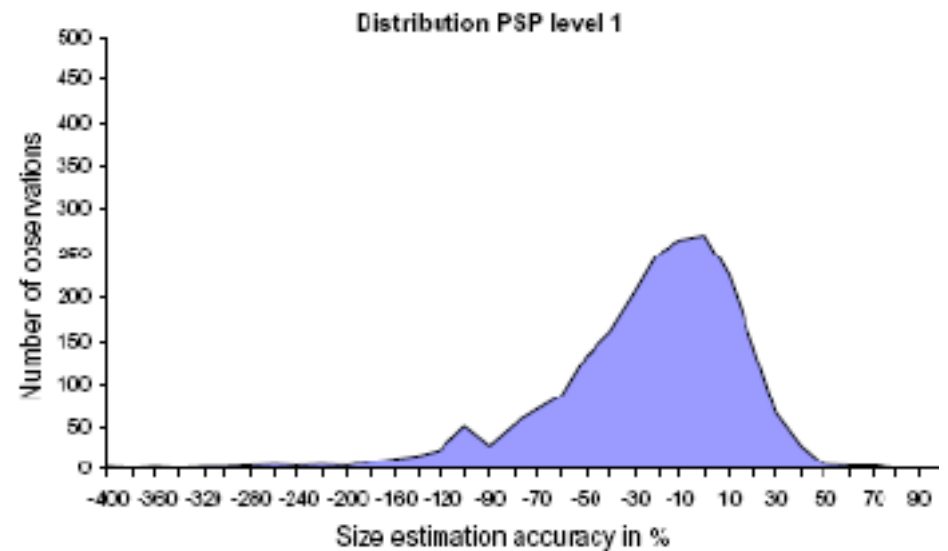
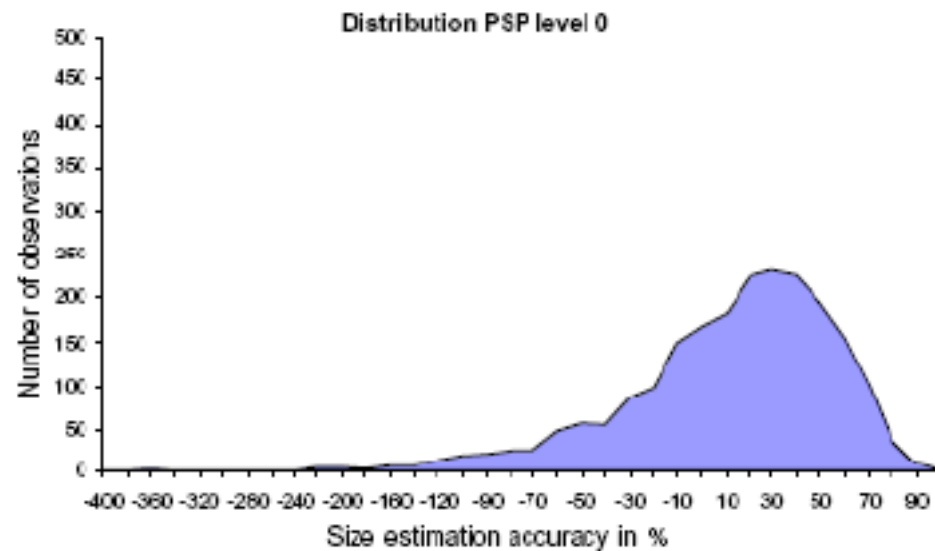
# PSP & TSP Together



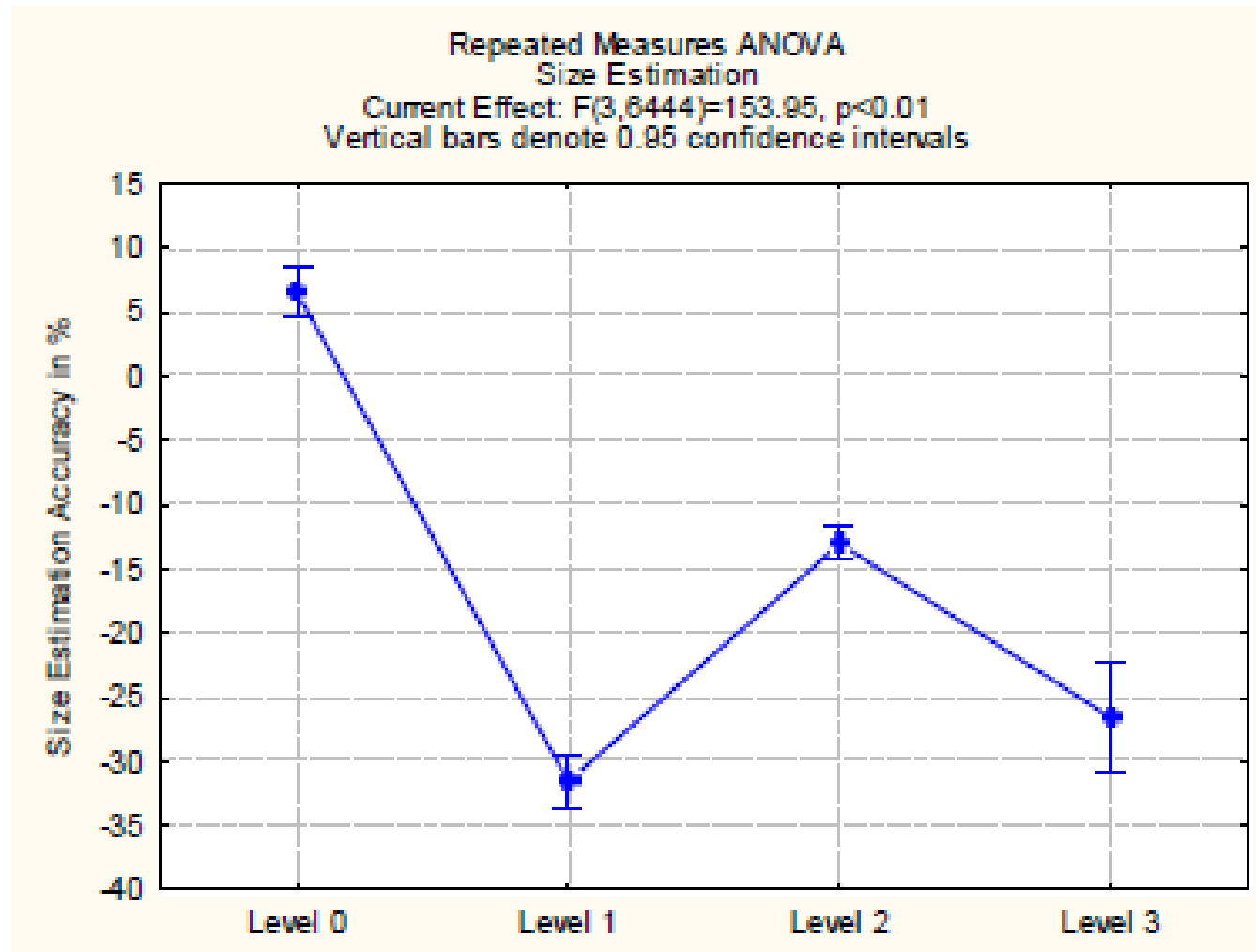
# A Study on Benefits of PSP

- Alexis Ocampo, *PSP Data Study*, F Fraunhofer Institute for Experimental Software Engineering, May 2008
- Examine the benefits of disciplined process management based on the data of the PSP training of 3090 engineers regarding to
  - size estimation accuracy
  - effort estimation accuracy
  - defect estimation accuracy
  - productivity
  - products' defect density, and on the yield

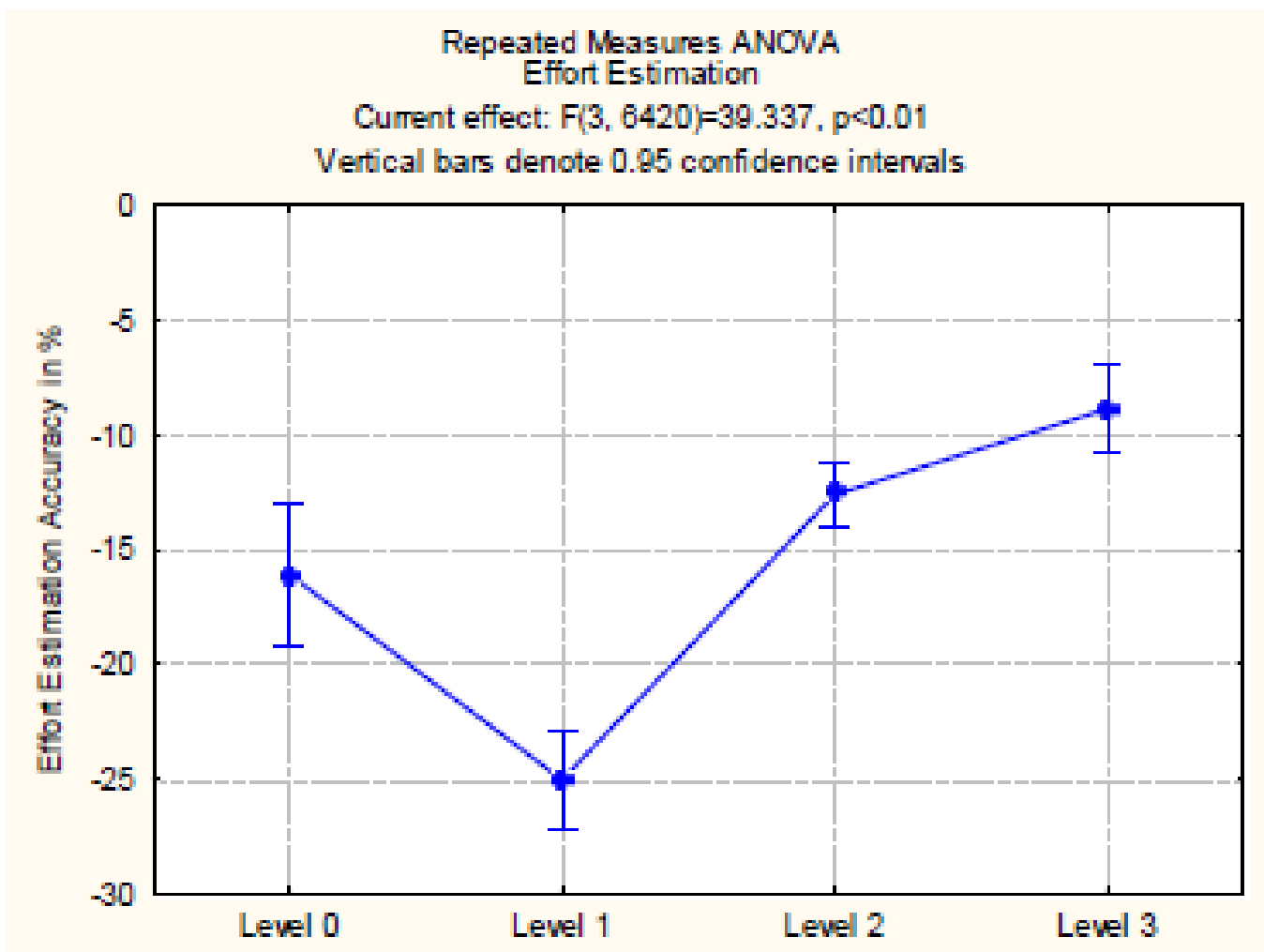
# PSP & Size Estimation



# PSP & Size Estimation



# PSP & Effort Estimation

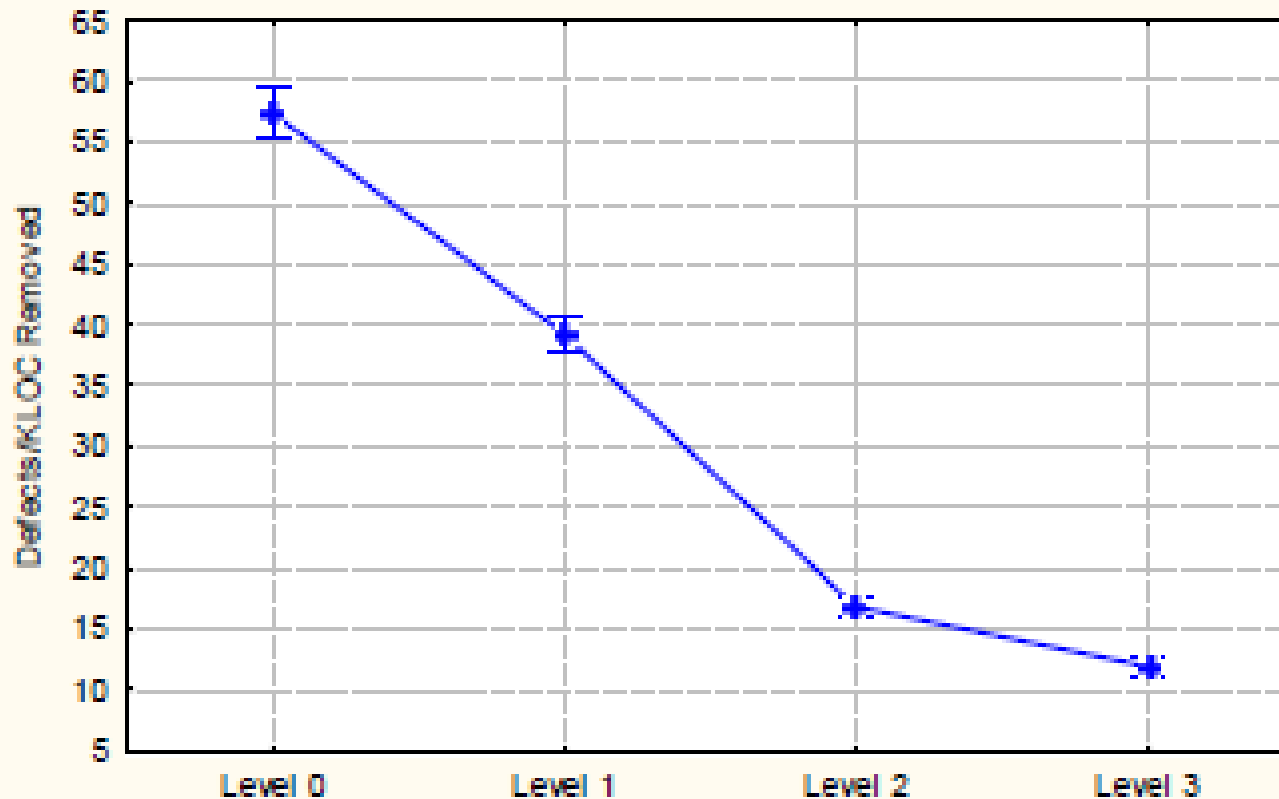


# Conclusion from the Study – 1

- As engineers progress through the PSP training, their effort estimates gradually grow closer to the actual effort expended for the entire life cycle. More specifically, with the introduction of a statistical technique (linear regression) in PSP level 1, there is a notable improvement in the accuracy of engineers' effort estimates.

# PSP & Defect Density: Compile Defects

Repeated Measures ANOVA  
Defect Density, Compile  
Current effect:  $F(3, 4893) = 1494.6, p < 0.01$   
Vertical bars denote 0,95 confidence intervals

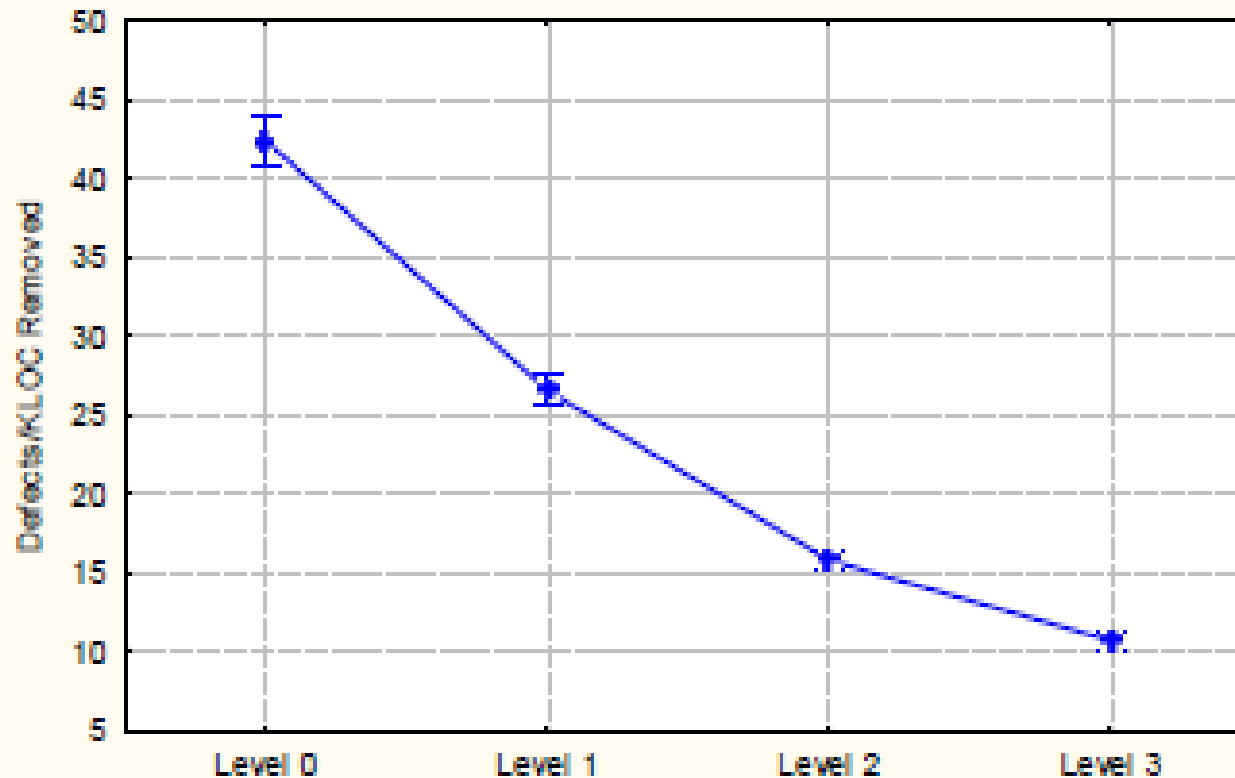


# PSP & Defect Density: Test Defects

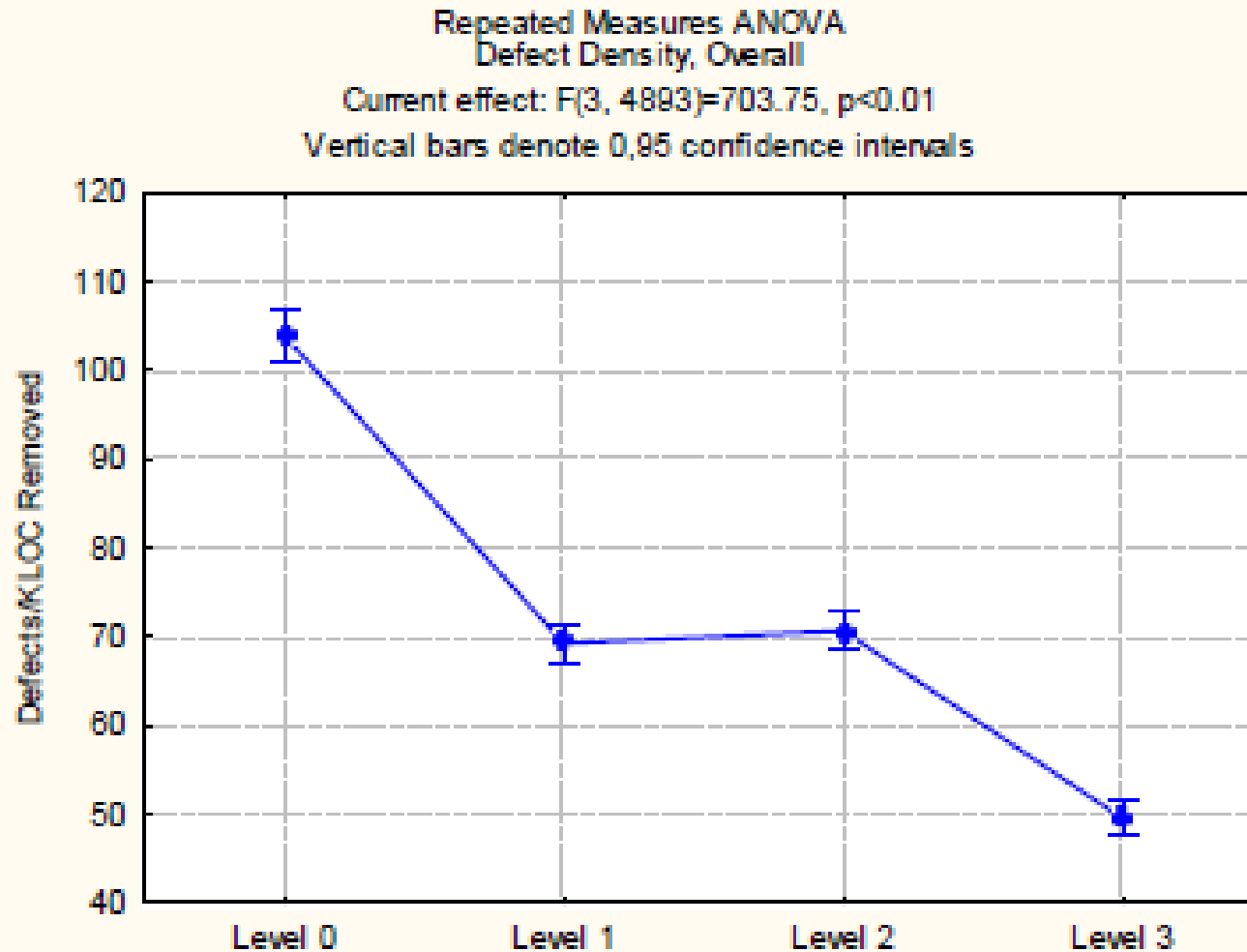
Repeated Measures ANOVA  
Defect Density, Test

Current effect:  $F(3, 4893) = 1110.2, p < 0.01$

Vertical bars denote 0,95 confidence intervals



# PSP & Defect Density: Overall



# Conclusion from the Study – 2

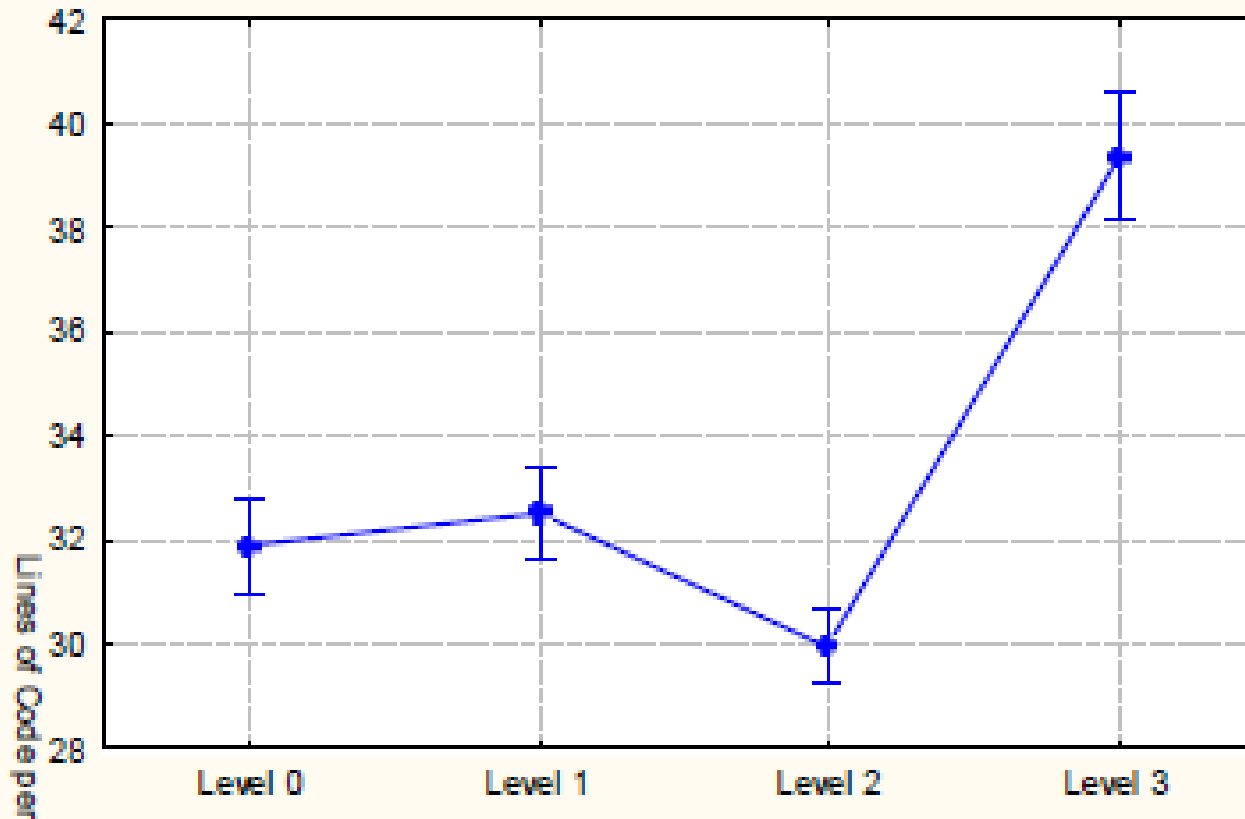
- As engineers progress through the PSP training, the number of defects injected and therefore removed per thousand lines of code (KLOC) decreases. With the introduction of design and code reviews in PSP level 2, the defect density of programs entering the compile and test phases decrease significantly

# PSP & Productivity

Repeated Measures ANOVA  
Productivity

Current effect:  $F(3, 622.2) = 104.99, p < 0.01$

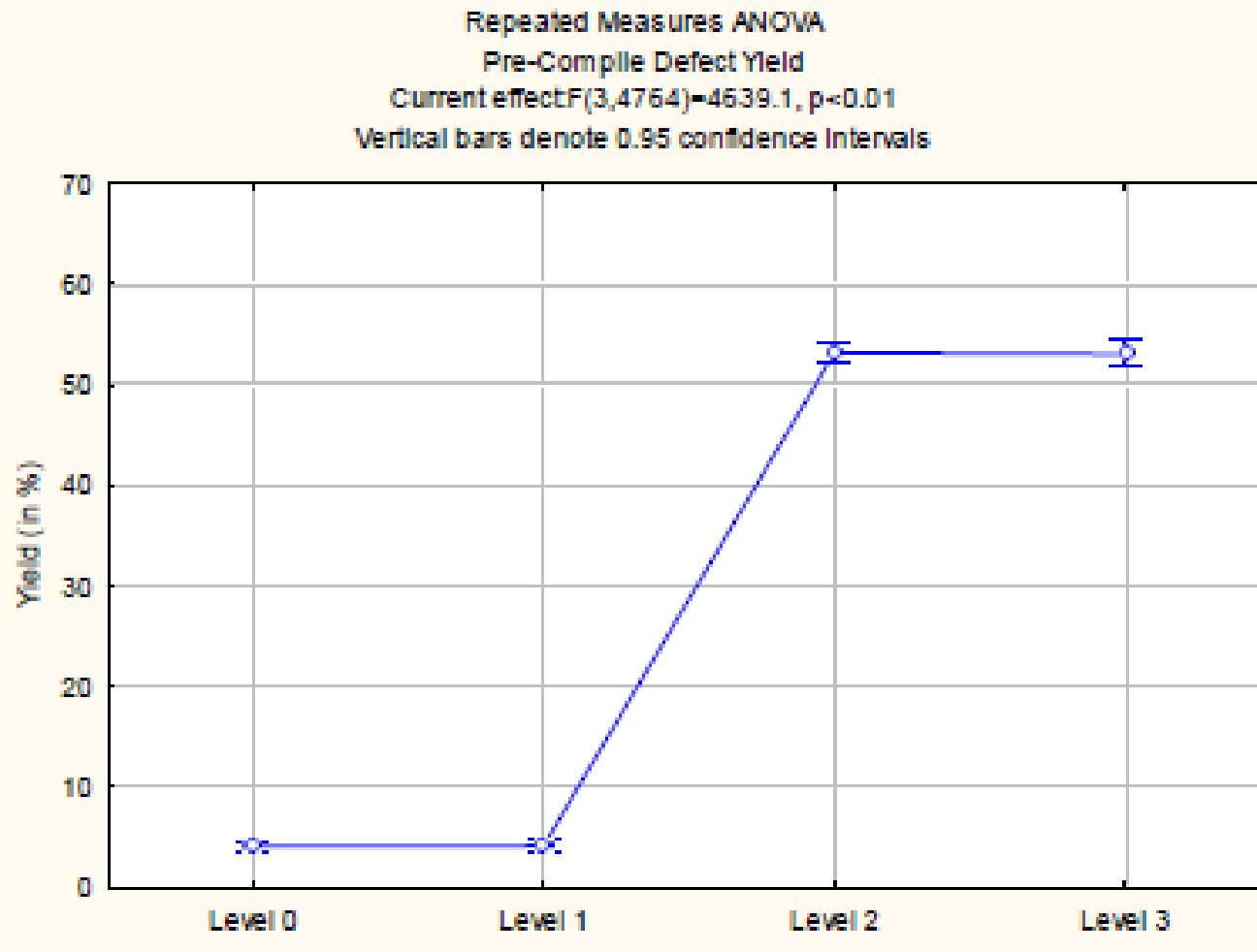
Vertical bars denote 0.95 confidence intervals



# Conclusion from the Study – 3

- Productivity, expressed and defined in PSP by the number of LOC per hour spent increases with a higher PSP level.

# PSP and pre-compile yield



# Conclusion from the Study – 4

- As engineers progress through the PSP training, their yield increases significantly. More specifically, the introduction of design review and code review following PSP level 1 has a significant impact on the value of the engineers' yield.

# Result from an Indian company

	Before	After introducing CMM	After Introducing PSP
Schedule Variance	112%	37%	5%
Effort Variance	85%	20%	1%
Defects before test	0.6 per KLOC	N/A	0.09 per KLOC
System test duration	2 days per KLOC	N/A	0.5 days per KLOC

# Result from various company

	Before PSP	After PSP
Effort Variance	18 – 100%	10 – 12%
Schedule Variance	25 – 135%	-10 – 10%
Defects found in acceptance test	0.1 - 0.8 per KLOC	0.01 - 0.1 per KLOC
Defects deliver to customer	0.2 - 1.2 per KLOC	0.0 - 0.1 per KLOC

# Projected Return On Investment

- Potential of 35% Cost saving (in rework time)
  - For a developer with salary of 20,000 Baht/month
  - 7,000 baht/month of saving
- Potential of 20% Time saving (in fixing defects)
  - 20% more productivity

# Fast Lane to CMMI

- A team at US unit achieve CMMI Level 4 within 16 Months
- Mexico initiative tries to accelerate CMMI level 3 achievement in 12 months using PSP/TSP
- A CMM Level-5 India company achieve better performance after implementing PSP/TSP

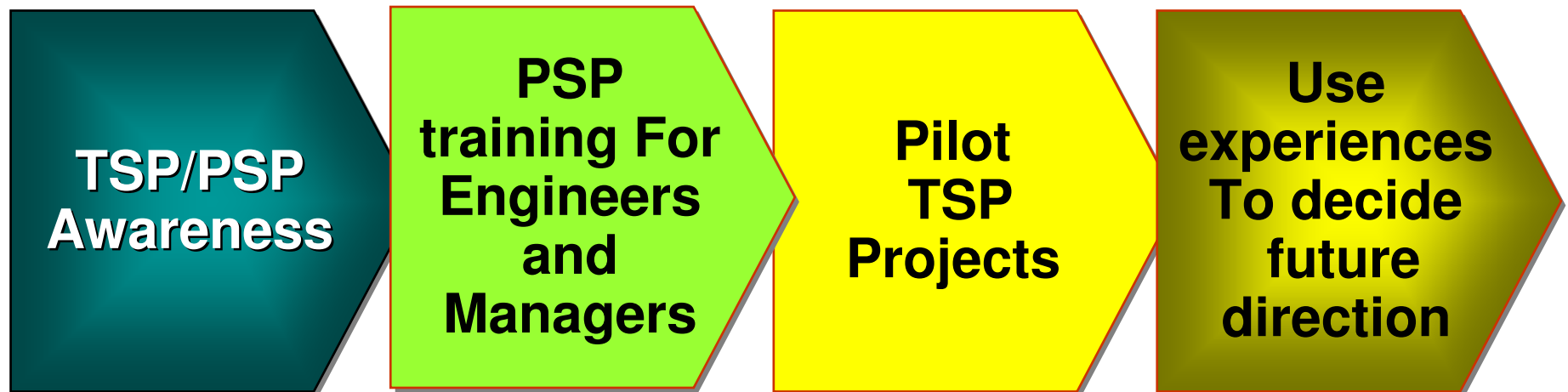
		Level 2						Level 3										Level 4		Level 5			
		REQM	PP	PMC	MA	PPQA	CM	RD	TS	PI	VER	VAL	OPF	OPD	OT	IPM	RSKM	DAR	OPP	QPM	OID	CAR	
SG 1	SP 1.1	M	H	H	M	M	H	M	L	M	H	L	L	L	M	H	L	H	H	H	M	H	
	SP 1.2	M	H	H	H	H	L	M	L	L	M	M	L	L	L	H	H	H	H	H	H	H	
	SP 1.3	H	H	H	H		H			M	M	M	M	L	M	H	H	H	H	H	H		
	SP 1.4	L	H	M	H									L	M	H		M	H	H	M		
	SP 1.5	H		M										H		H		M	H				
	SP 1.6			H										H		H		M					
	SP 1.7			H																			
SG 2	SP 2.1		H	H	H	M	H	M	M	M	H	M	M	H	M	H	H			H	M	H	
	SP 2.2		H	H	H	M	L	M	M	L	H	L	M	H	M	H	H			H	M	H	
	SP 2.3		M	H	H			M	M		H			L	M	M				H	H	H	
	SP 2.4		H		H				L											H			
	SP 2.5		L																				
	SP 2.6		M																				
	SP 2.7		H																				
SG 3	SP 3.1		H				L	H	H	M	H		M			H	H						
	SP 3.2		H				L	H	H	M	M					H	H						
	SP 3.3		H					L		M			L			H							
	SP 3.4							M		L			L			H							
	SP 3.5							M								H							
GG 2	GP 2.1	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
	GP 2.2	H	H	H	M	M	H	H	H	H	H	M	M	L	M	H	H	M	H	M	M	M	
	GP 2.3	H	H	H	H	M	M	H	H	H	H	H	L	L	M	H	H	H	H	H	H	H	
	GP 2.4	H	H	H	H	M	H	H	H	H	H	H	L	L	M	H	H	H	H	H	L	H	
	GP 2.5	M	H	H	H	M	L	M	M	L	M	L	M	M	M	H	H	H	H	H	M	M	
	GP 2.6	H	M	M	H	M	L	H	M	M	H	M	L	L	L	H	M	H	H	H	L	M	
	GP 2.7	H	H	H	H	M	H	H	H	M	H	M	L	L	L	H	H	H	H	H	L	H	
	GP 2.8	H	H	H	H	M	H	H	H	H	H	H	M	L	M	H	H	H	H	H	L	H	
	GP 2.9	M	M	M	H	M	M	M	M	M	M	M	L	L	L	M	H	H	H	H	L	M	
	GP 2.10	M	H	H	H	M	L	M	M	M	M	M	L	L	L	H	H	H	H	H	L	M	
GG 3	GP 3.1	H	H	H	H	M	M	H	M	M	M	M	L	L	L	H	H	M	L	H	L	H	
	GP 3.2	M	L	L	H	M	H	M	M	M	M	M	L	L	L	L	H	M	L	H	L	H	
GG 4	GP 4.1	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	
	GP 4.2	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	
GG 5	GP 5.1	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	
	GP 5.2	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	

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<span style="display: inline-block; width: 15px; height: 15px; background-color: #FFFF00; border: 1px solid black;"></span> Medium
<span style="display: inline-block; width: 15px; height: 15px; background-color: #FF0000; border: 1px solid black;"></span> Low

# Cautions

- Tailoring is required to make it work in our organizations
- Implementing PSP/TSP seems easy but it does require effort
- Tools are available and useful but more automation is still needed

# Introducing PSP/TSP



# PSP/TSP Training Roadmap

	Developer	Non-Programmer	Team Lead or Project Manager	Executive	Coach
PSP fundamental	X		O		X
PSP Advance	X		O		X
TSP Team member training		X			
Leading the Development Team	O		X	O	O
TSP Executive Seminar			O	X	
PSP Exam	X				X
PSP Instructor	X				
TSP Coach	X				X

#	Country	Amount	%
1	MEXICO	197	59.16
2	USA	79	23.72
3	JAPAN	19	5.71
4	Unknown	13	3.90
5	INDIA	6	1.80
6	UK	5	1.50
7	CHINA	4	1.20
8	EGYPT	3	0.90
9	AUSTRALIA	1	0.30
10	CANADA	1	0.30
11	GERMANY	1	0.30
12	KOREA	1	0.30
13	PERU	1	0.30
14	PORTUGAL	1	0.30
15	THAILAND	1	0.30
<b>Total</b>		<b>333</b>	<b>100</b>

# Enhancing Quality & Productivity



From GSSC KL News,  
November 2008



International Software Centre Malaysia conducted a Personal Software Productivity/ Team Software Process (PSP/TSP) Interactive Seminar in August. A framework developed by the Software Engineering Institute (SEI), PSP/TSP will help to improve quality and productivity by reducing defects and rework as well as increase motivation levels among project teams. 50 ISCM staff from all ISCM teams attended the seminar.

# Conclusion

- PSP create the foundation at the individual level
- TSP build upon PSP by providing the glue to make PSP works for a self-directed team
- PSP/TSP accelerate the software process improvement effort
- PSP/TSP can be an excellent investment with quick return