



Changing Software Management Culture from Academic

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Our Deep Appreciation to ALL of YOU

We all Japanese have sincerely appreciated your strong and continued support for the nuclear power plant tragedy and earthquake disaster of March 11th, 2011.

We learn from these not only technical advancement but also of our humanity on mutual supports and dependencies over the globe.

Kyushu Institute of Technology

Established 1907 (the 100th year anniversary)

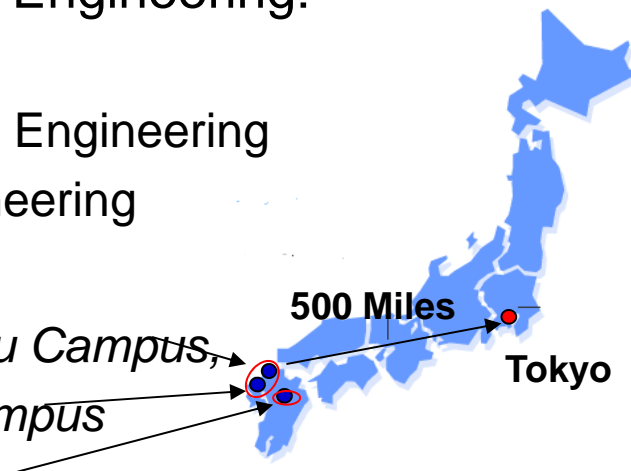
Established two Engineering Schools and three Graduate Schools

Major Graduate Schools related to Engineering:

- Engineering
- Computer Science and Systems Engineering
- Life Science and Systems Engineering

Campuses (Southern Japan):

- KitaKyushu City *Wakamatsu Campus,*
 Tobata Campus
- Iizuka City *Iizuka Campus*





KIT

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TSP Symposium 2011

KIT was founded 1909





KIT

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TSP Symposium 2011



**Schoolhouse of Meiji
College of Technology**



1920 Dormitory



Kyushu Institute of Technology



**1913 Mr. Shigenobu
Okuma's visit**



**1929 a panorama of Meiji College of
Technology**

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Introduction

Dr. Watts Humphrey and the SEI investigated industry for software practice since late 1980s

- High quality and effective management for software is center for modern, safe, and dependable world.
- Software process is the key for the knowledge workers.
- The PSP and TSP were developed and provided by the SEI since 1990s.

Introduction -2

At academic, however,

- Students code & test first, not software design
- Laboratory R&D progress is very slow

In industry, large effort has been spent for long time to improve process but not much change showed.

- Quality is established by testing,
- High quality and performance happen mostly by accident
- Engineers and managers work extremely long hours.

Managing software projects are deeply rooted on the current management culture.

Background

Culture creates the norms that characterize organizations, teams, and individuals, regarding the performance by its beliefs, knowledge, values, rules, behaviors, capabilities, inheritances from previous generations [The FreeDictionary]

Changing culture is measurable through the attributes be changed toward a desired goal, consistently, collectively, and uniformly.

Background -2

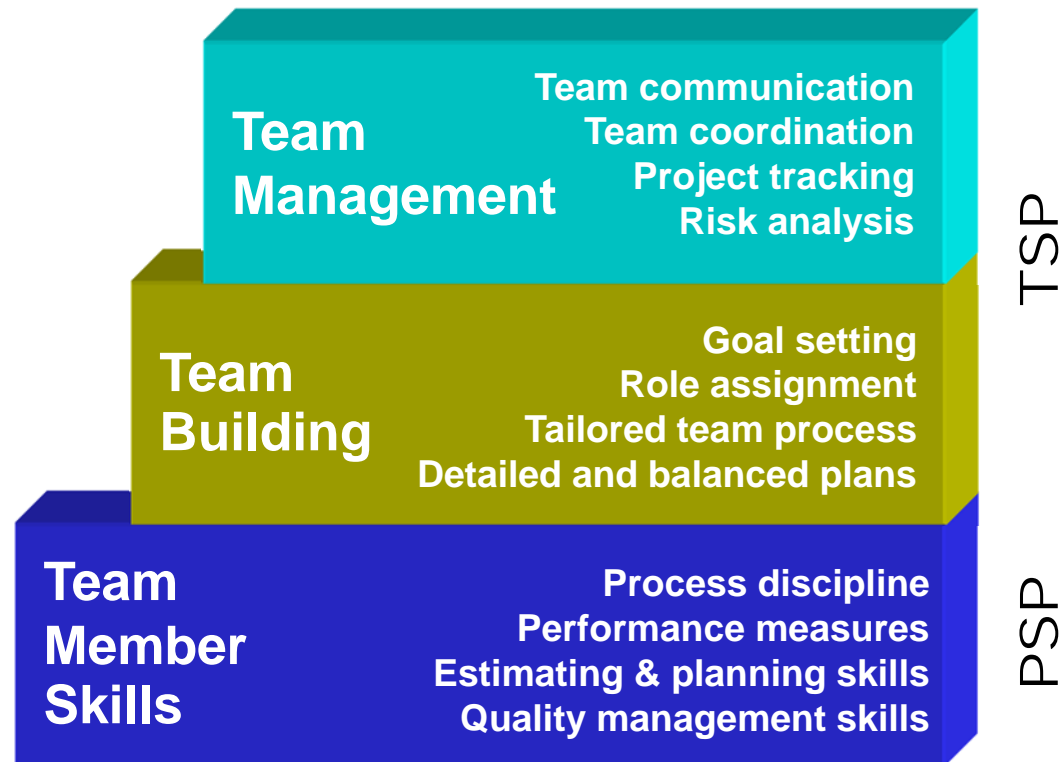
Changing software management culture must be accomplished through a set of attributes of software process, to be planned and measured at team and individual in a decomposed and superposed manner.

The PSP and TSP bring software improvement (changing software management culture!) easily to individual, team, and managers in short time (from week to months.)



Cultural Change Strategy

- Self-directed teams must be built.
- This requires a team-building process.
- These individual skills are necessary for the team and a team member..

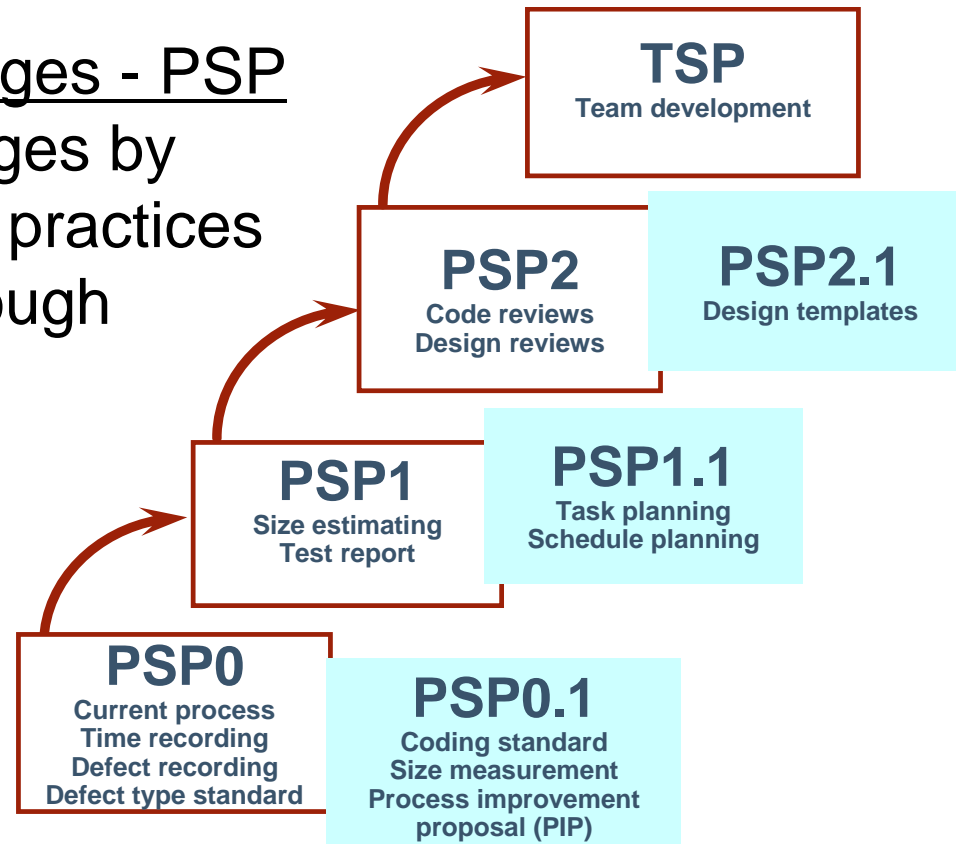


Ref. SEI course "Leading a Development Team"



Cultural Change Strategy -2

Stepwise Changes - PSP
(Cultural) changes by
extending PSP practices
from PSP0 through
PSP2.1



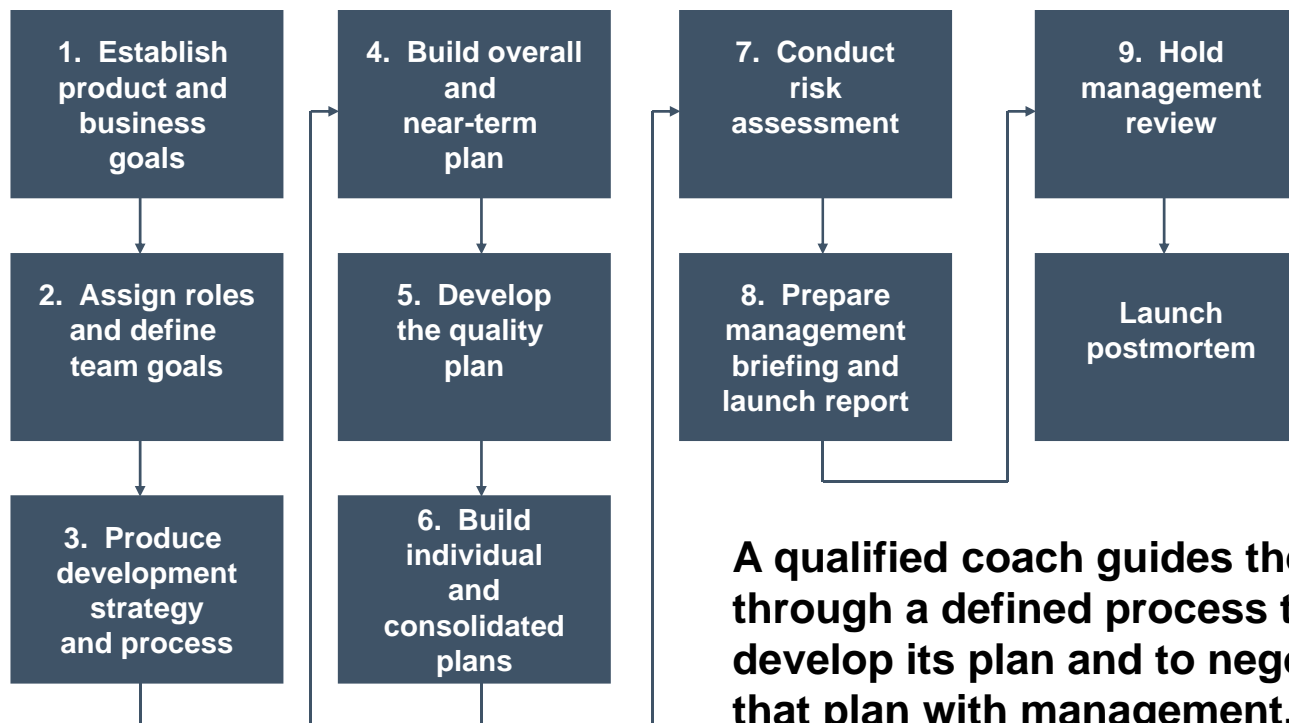
Ref. SEI course "PSP for Engineers - Planning"





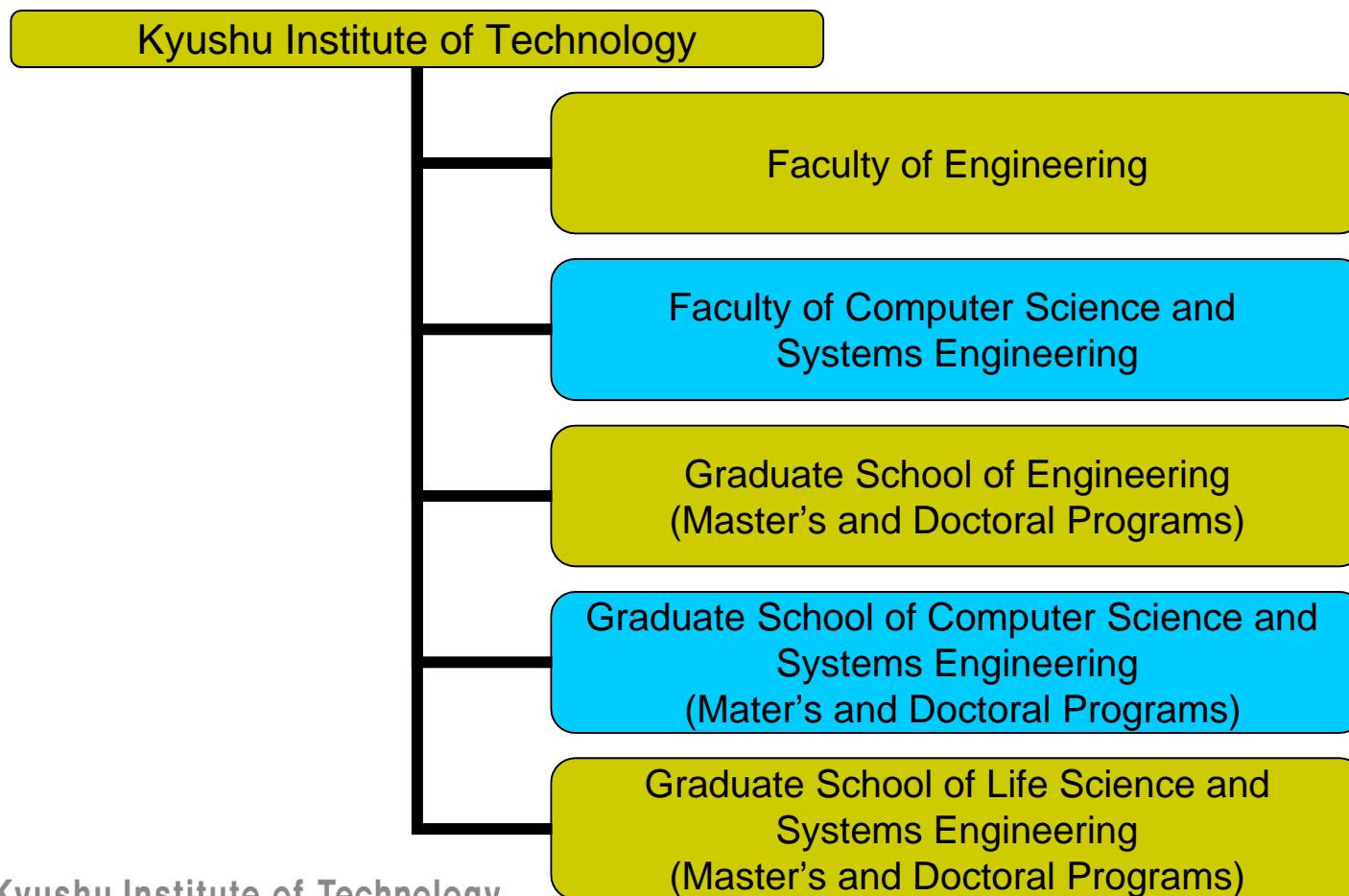
Cultural Change Strategy -3

Team level changes by team building for self-directed



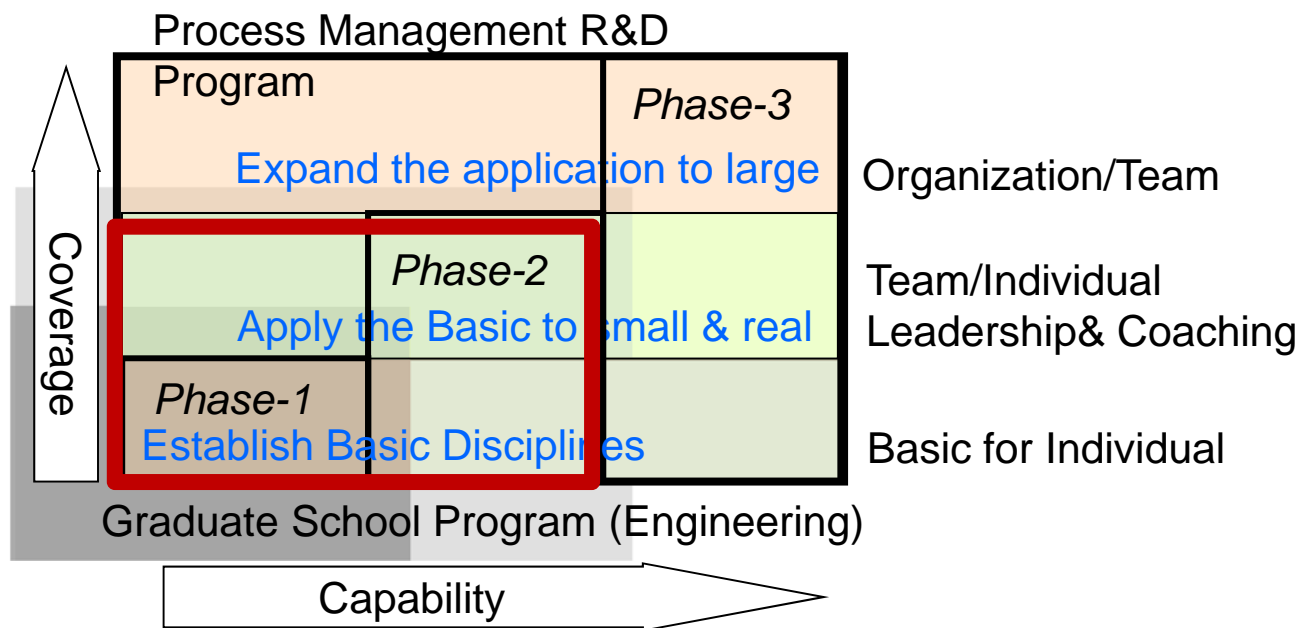
Ref. SEI course "Leading a Development Team"

Organization



KIT's three phased approach

KIT introduced a program of the PSP and TSPi based software engineering education with SEI:



Opening Talk and Seminar at KIT



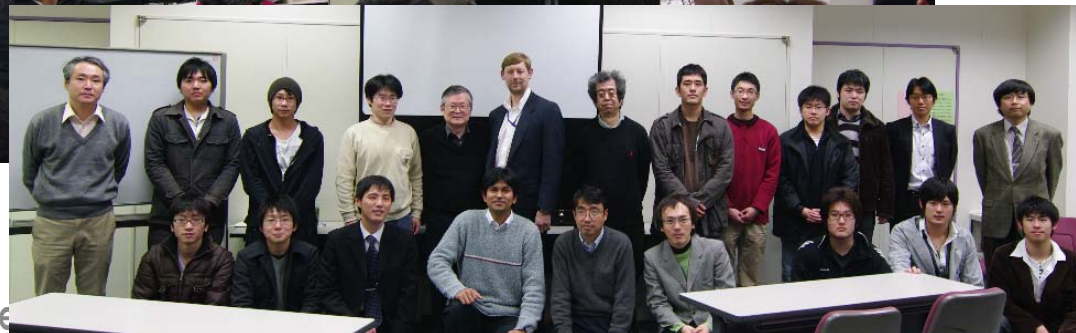
Software Engineering and the
Performance Improvement
World: A Personal View

Center for Information and
Communication Technology
Education
Kyushu Institute of Technology

Paul Nielsen
Director, Software Engineering Institute
10 May 2007



TSP Seminar at KIT - Mar. 2008 and Feb. 2010



PSP Certificate of Completion from Dr. Nielsen and Pres. Shimomura



15 September, 2009

Introduction of PSP at KIT

- Course: PSP for Engineers (PSP-I & PSP-II)
- Main Issues
 - Course schedule structure
 - SEI: 5 consecutive days (over 40hr)
 - KIT: 1.5hr x 15 periods (22.5hr)
 - Insufficient programming skills and experience
 - No experience in industry
 - Poor programming skills
 - Small-scale software development
 - No experience of software estimation

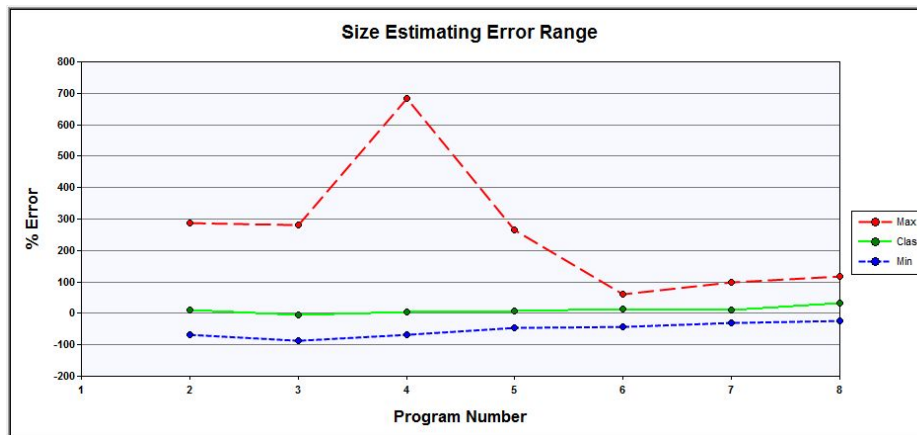
Schedules for PSP Courses

Year	Part	Method	Completion of PSP-I(%)
2007	PSP-I	3hr lectures over 5 consecutive days	43
	PSP-II	3hr lectures once every two days	
2008	PSP-I	6hr pre-course exercise, 3hr lectures once a week	75
	PSP-II	3hr lecture once every two days	
2009	PSP-I PSP-II	3hr lecture once a week and plan review several days after lecture	80
2010			100
2011			100

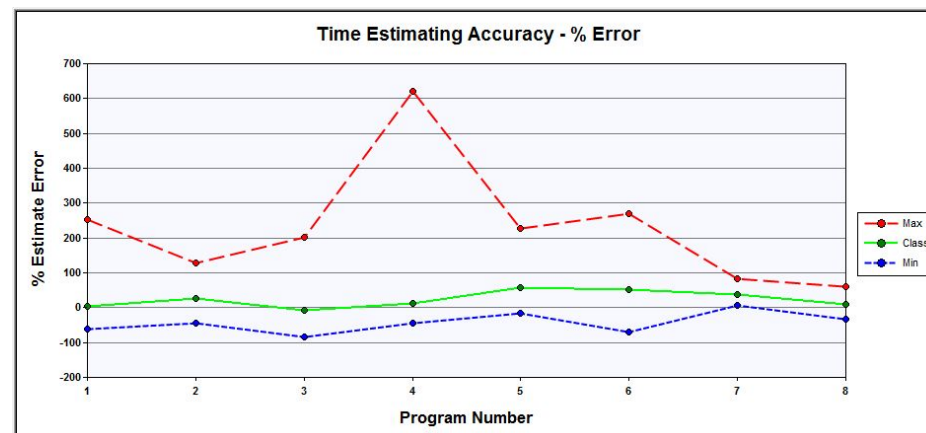


Performance of PSP Courses

- Size and Time Estimating Error -



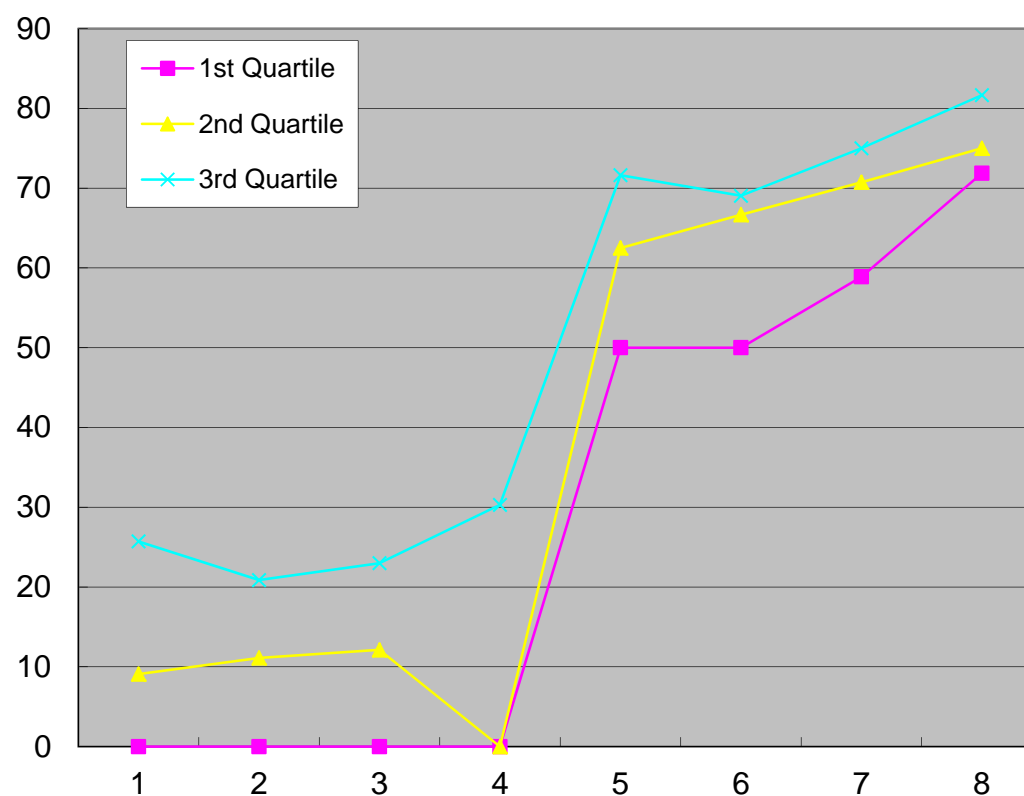
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(2007-2010)



Performance of PSP Courses

- Process Yield -

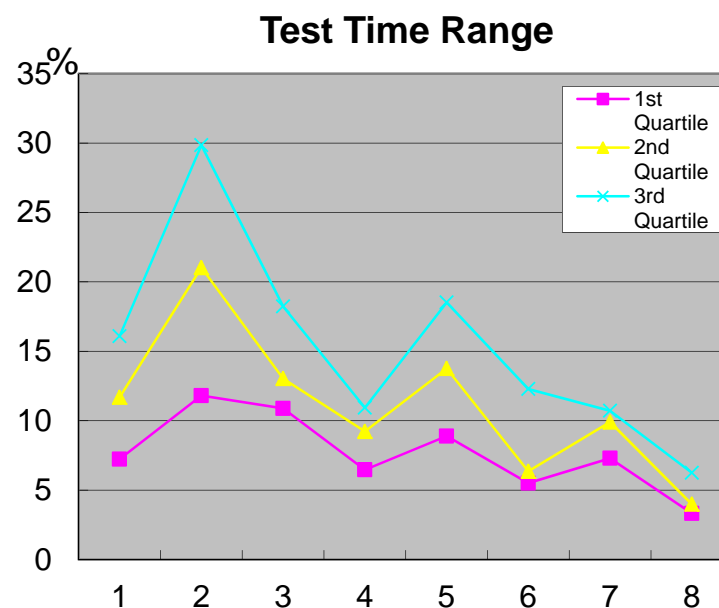
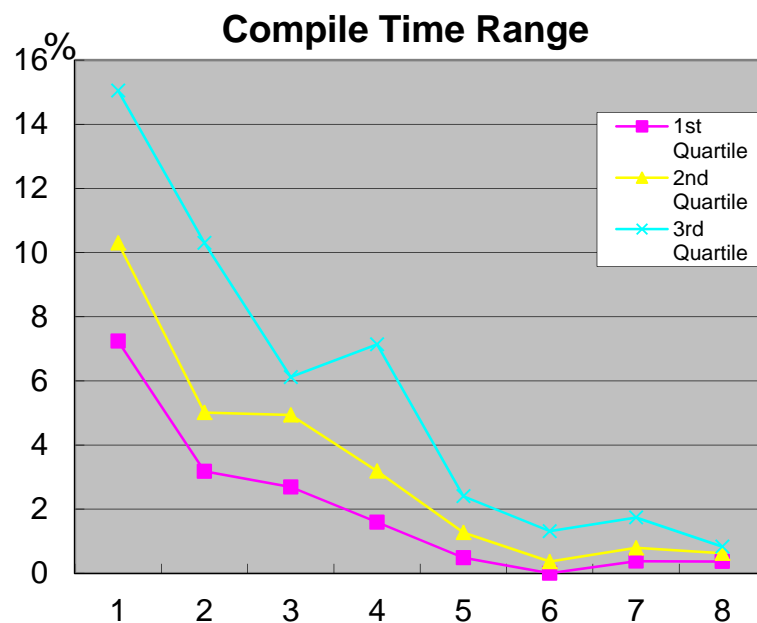
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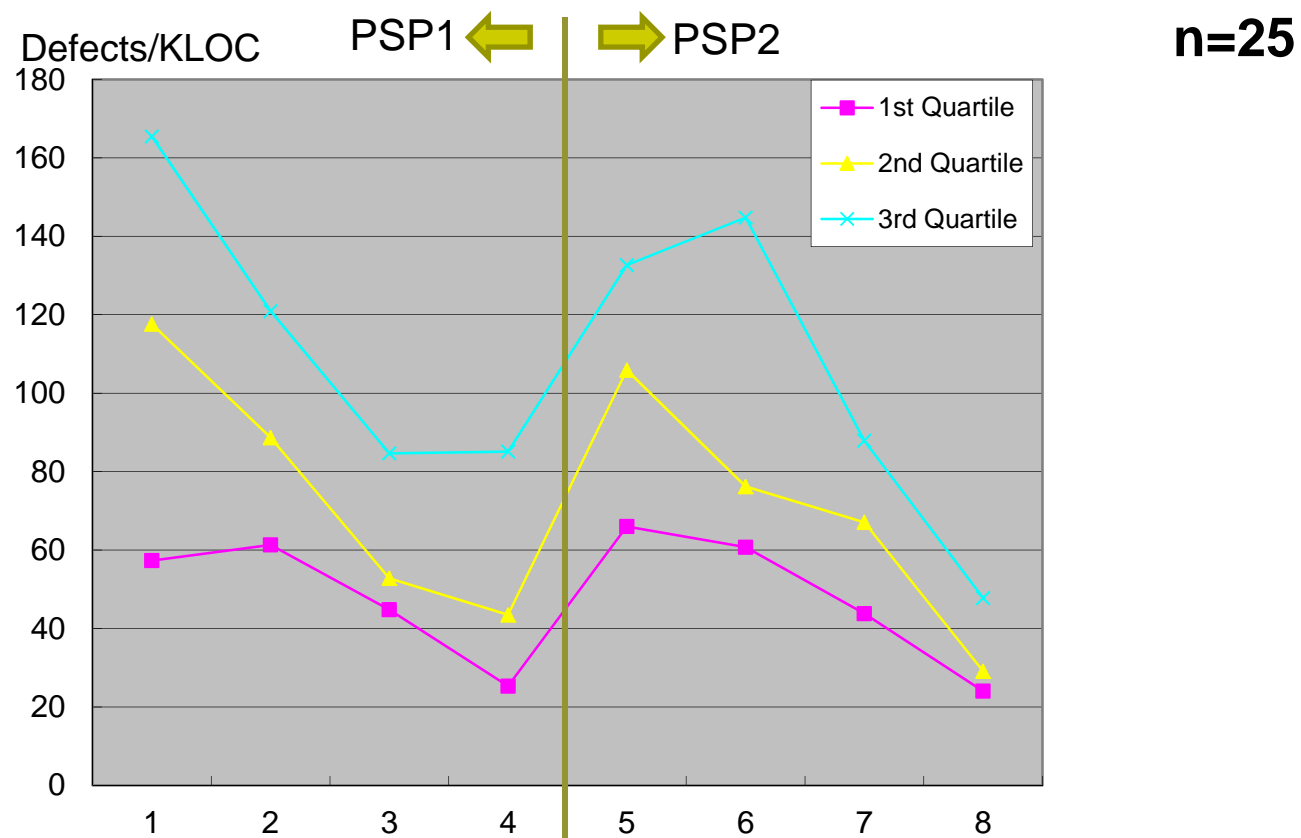
Performance of PSP Courses

- Compile and Test Time Range -



Performance of PSP Courses

- Defect Density -

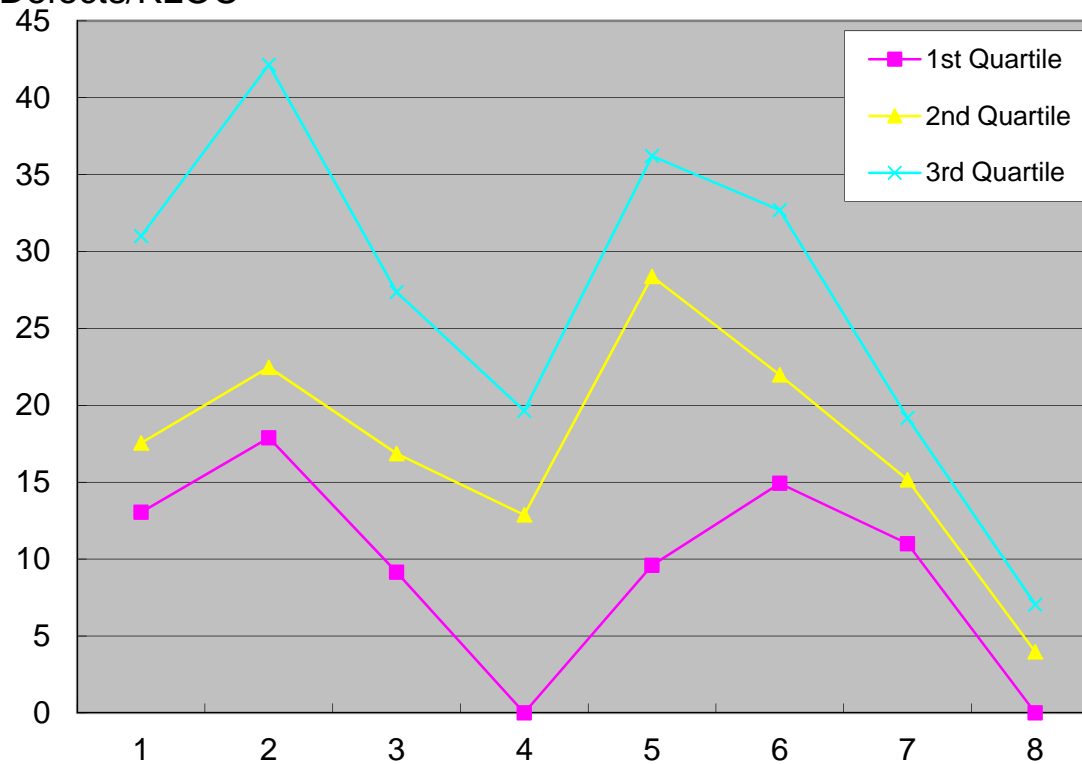




Performance of PSP Courses

- Defect Density (Unit Test) -

Defects/KLOC

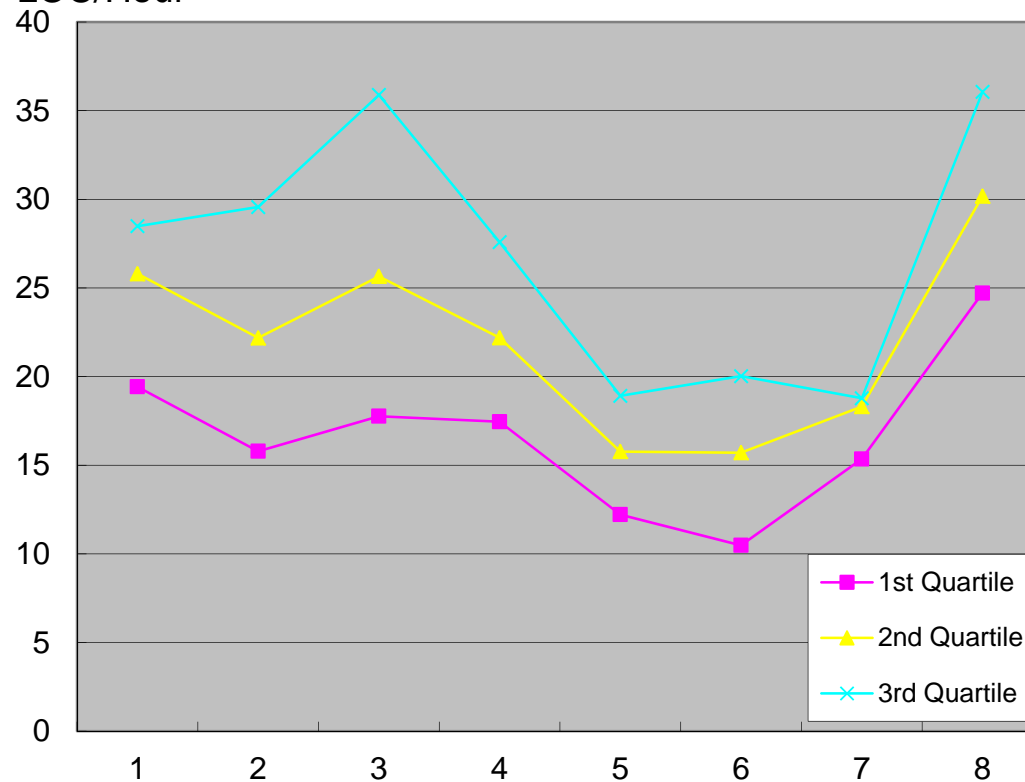
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Performance of PSP Courses

- Productivity -

LOC/Hour

n=25

What PSP Course Students Understood

- How to make a plan
- Importance of design and review
- Defect reduction by recording a defect log
- Completion of software development as planned by reducing time variations in defects
- Process Improvements by using process data
- Students recognize performance differences between themselves and other students who have not studied PSP

Introduction of TSPi on top of PSP

- Main Issues
 - Course Schedule Structure
 - Limited class time → 3 hours x 15 periods
 - Lack of Experience
 - No experience in industry
 - Small-scale software development
 - Small group activities – school festivals, part-time jobs, ...
 - Teaching Experience
 - Mid-scale software development project
 - No TSPi teaching Experience
 - Faculty workshop

Performance of TSPi Team

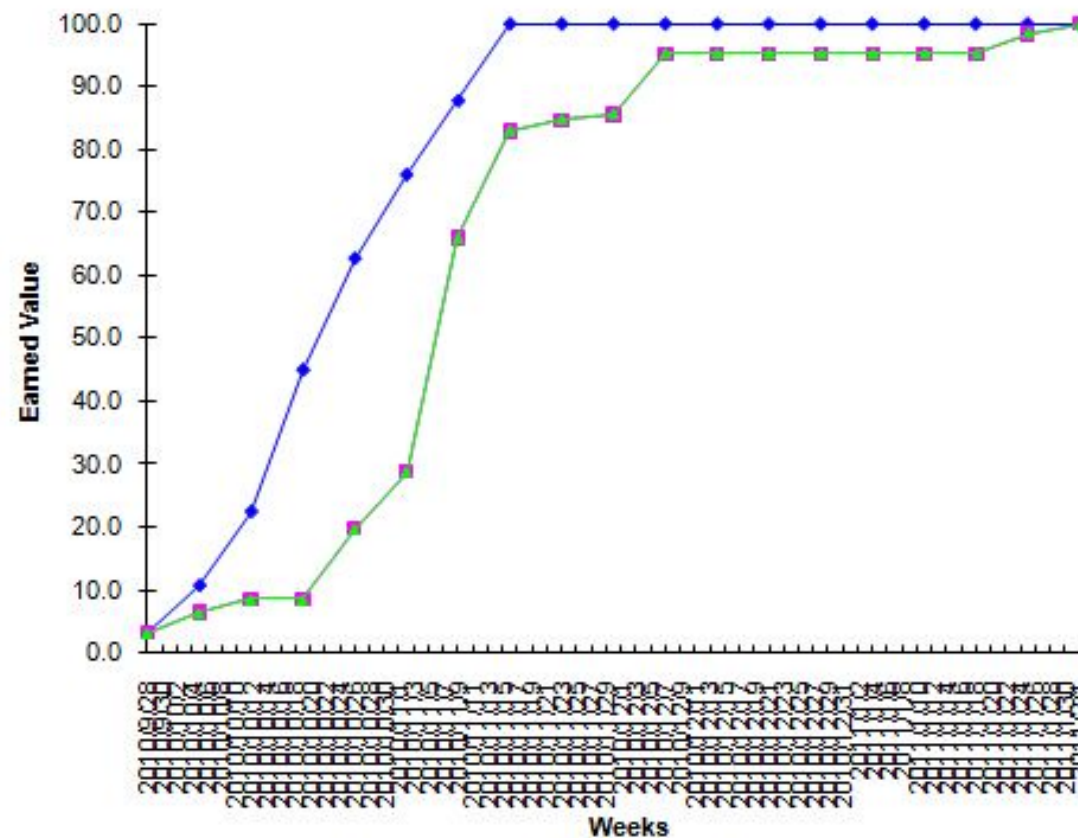
- Overview -

- Team members
 - 3 members and each member has 2 roles
 - Each member completed 6A at least
- Project
 - Change counter in TSPi text book
 - 2 cycles plan (13weeks)
- Result
 - 1 cycle completed
 - 0 defects in system test
 - 42.6 defects/KLOC in the worst module



Performance of TSPi Team

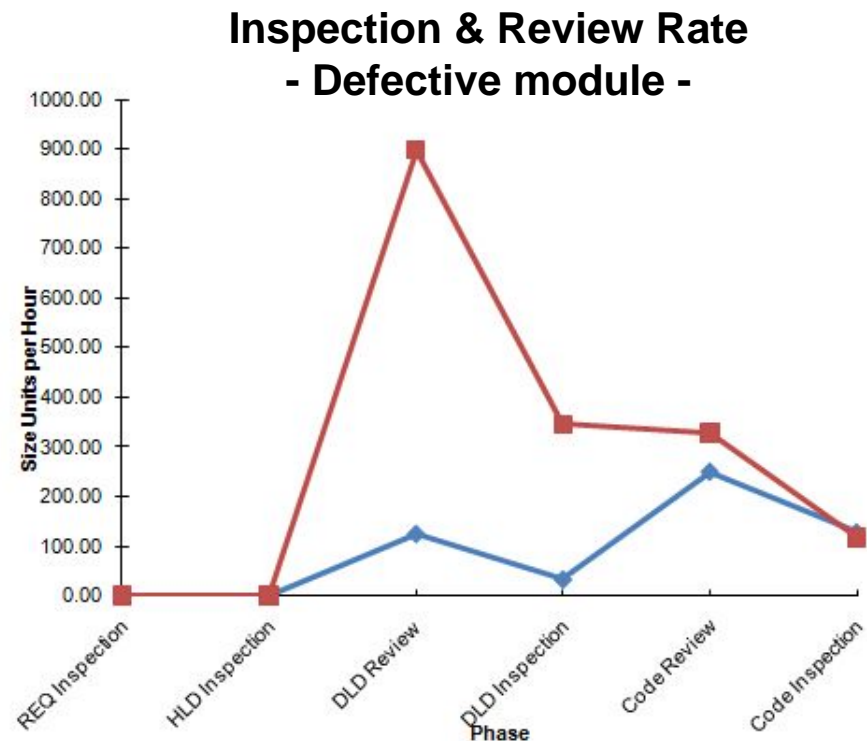
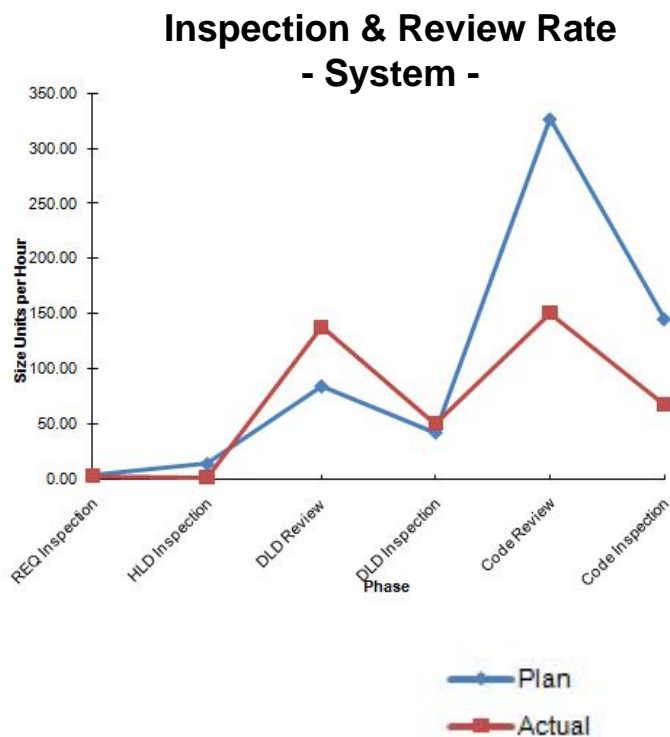
- Cumulative Earned Value -





Performance of TSPi Team

- Inspection and Review Rate (System & Defective module) -



Feedback from the TSPi Team

- Lack of communication caused late responses with the temporary withdrawal of a member due to health problems
- A team member did not adequately plan for the workload to accommodate the multiple role managers assigned by the team
- CCB was not implemented and risk management was inadequate
- They spent a lot of time on documentation and management more than the time spent on development
- The TSPi tool is efficient in team management
- There is no manual for the TSPi tool, and it works differently depending on the version of Microsoft Office used



Outcomes of PSP Courses

- Estimation
 - Error ranges of size and time tend to be narrow and balanced well along with the course progress
- Quality
 - Process yield $\geq 80\%$ in average
 - 120 defects/KLOC \rightarrow 30 defects/KLOC in average
- Productivity
 - Almost the same at the beginning and end of the courses
 - Tends to be improved more after the courses
- Course completion ratio
 - Almost 100% completed PSP-I
 - **Only a few completed PSP-II**



Discussion on PSP Courses

- Reasons for low completion ratio of PSP-II
 - Attenuation of initial motivation
 - Pressures of other classes and their bosses
 - Home work after the class
- How to motivate?
 - Give real and up-to-date information from successful industries periodically
 - Resolve imbalance between credits and required time
- How to overcome pressure?
 - Motivate/coach/guide students continuously to manage their multiple tasks well
- How to reduce home work?
 - Allocate lab session times by introducing new course scheme including PSP/TSP



Outcomes of TSPi Courses

- Quality
 - Zero defects achieved in system test
 - Quality guidelines directed the team right way
- Schedule
 - Completed only the 1st cycle of 2 cycles plan
 - **Spent long time on unfamiliar work products, such as SRS and Test Plan**
 - **Spent long time on mastering TSPi tool**
- Team work
 - Recognize importance of communication between members
 - **Not enough members for 5 defined roles**

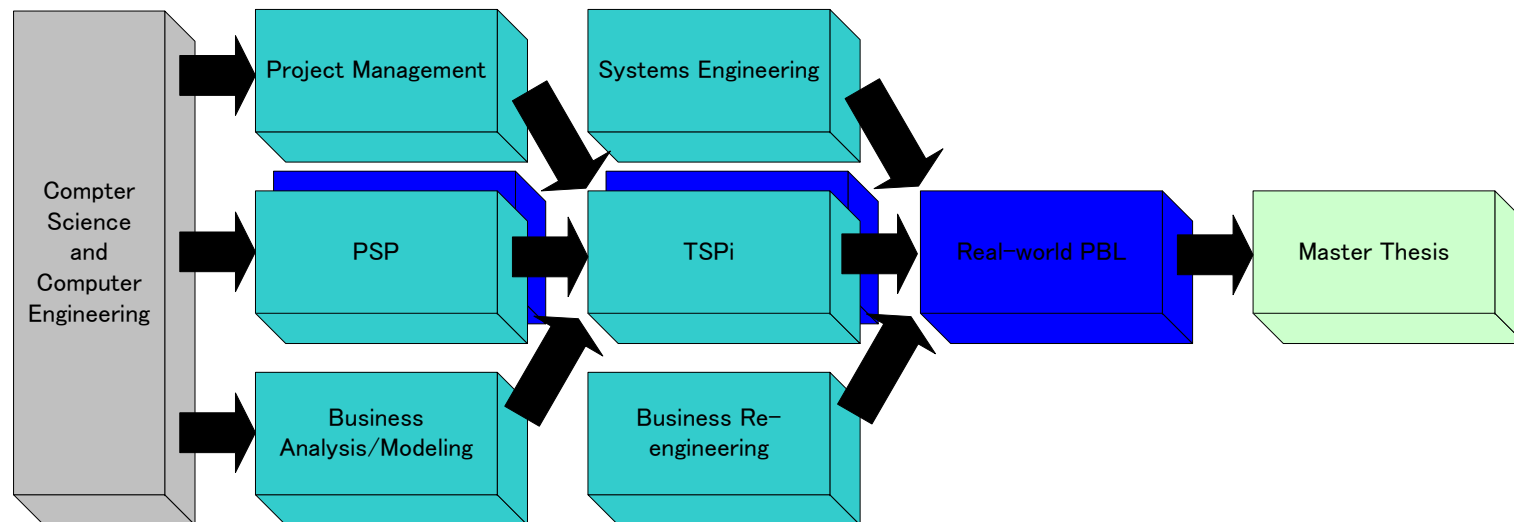
Discussion on TSPi Course

- Whole cycles v.s. products details
 - Industry level documentation of SRS, Test Plan necessary?
 - Experiencing 2 or 3 cycles will help understand whole TSPi
- TSPi v.s. TSP
 - Incomplete TSPi tool wastes important project time
 - Missing but important things of TSP in TSPi
- Insufficient team members
 - 5 or more PSP students expected for 5 roles per team
 - Imbalance between credits and required home work time
- Insufficient engineering knowledge
 - Project management, systems engineering, and business analysis/modeling



New Course Design

- Real-world Project-Based Learning
 - Integrates PSP and TSPi
 - Reserve lab times partially in PBL classes
 - Reorganize and formulate related classes



Conclusions

- KIT graduate school master students show their process improvement by PSP and TSPi which resulted in high quality software from 2007:
 - Quality improvement achieved through the PSP courses
 - TSPi course worked effective because of the students' cultural changes
 - Students learned the process disciplines as ICT professionals
- This demonstrates the first software management culture change at academic education.
- New course design integrating PSP and TSPi courses
 - Enrich requirements analysis and modeling phase
 - Reorganize and formulate related classes for the same goal
- Future expectations - Students who learn the disciplines through these courses will
 - continue to learn new culture changes
 - play a key role in changing the software management culture



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Thank you for your attention!



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