

Performance Effect of CMMI Based Process Improvement in Motorola

Angel Liu

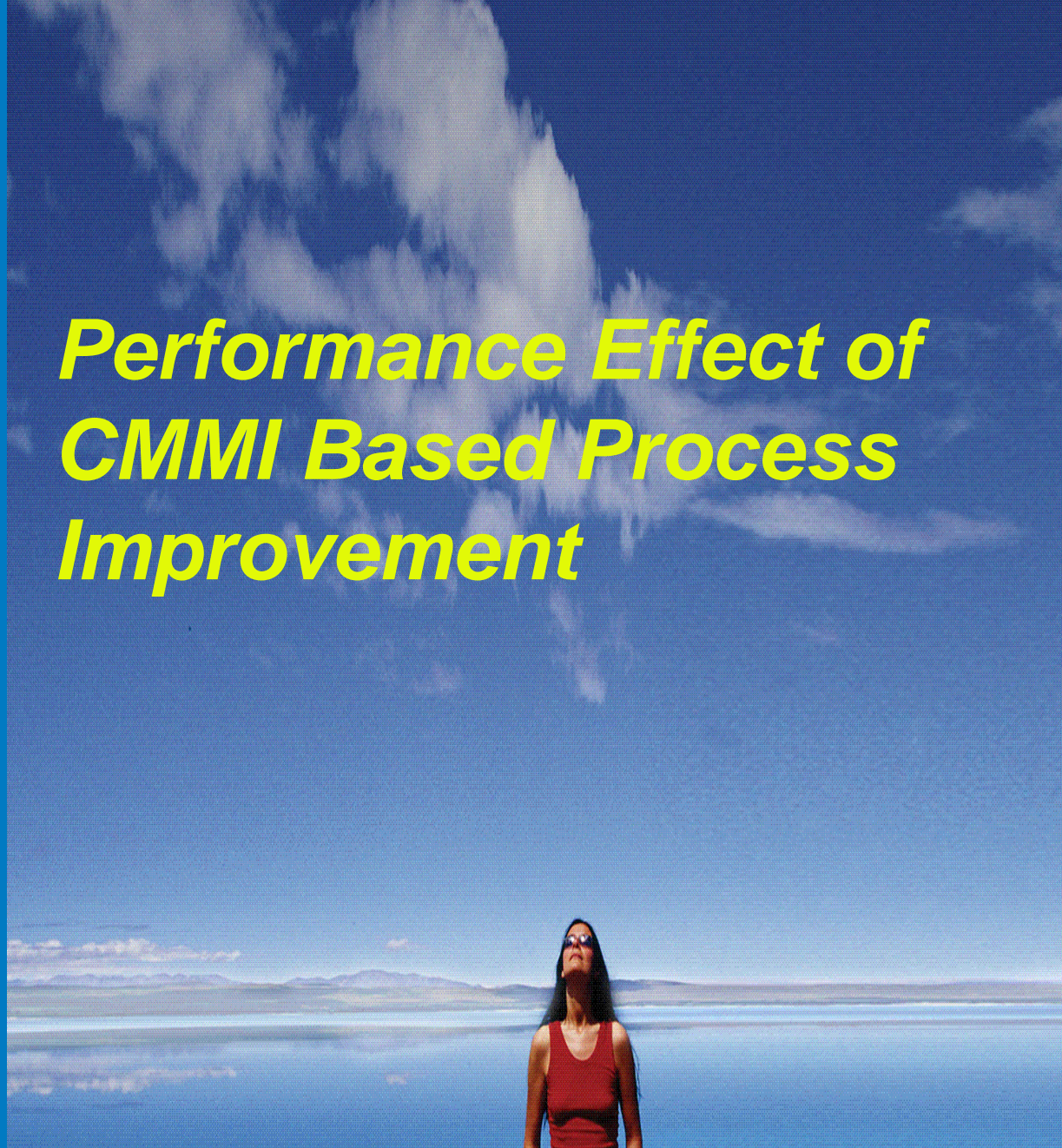
*Motorola Software Group,
China*



HERE

Performance Effect of CMMI Based Process Improvement

- ◆ Why to Measure
- ◆ How to Measure
- ◆ What to Measure
- ◆ What to Be Measured
- ◆ What Changes to Lead the Result
- ◆ Performance Result & Benefit



Why it is important to measure the CMMI Performance Result?

◆ Why to Measure

◆ How to Measure

◆ What to Measure

◆ What to Be Measured

◆ What Changes to Lead the Result

◆ Performance Result & Benefit

We are often questioned about the cost & return of CMMI-based process improvement?

- ◆ Sponsor - Why sponsor? What is the value to business?
- ◆ Project Manager – Why process? My customer only care about the schedule
- ◆ Engineer - Why measure? Does it measure my performance?

Why it is important to measure CMMI Performance Result?

◆ Why to Measure

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◆ Performance Result & Benefit

- ◆ Building continuous commitment and sponsorship

- ◆ Understanding the value of CMMI to Motorola business

Process Improvement is oriented by business and is expected to benefit business

- ◆ Benchmarking with other organizations

- ◆ Set up the baseline for continuous improvement

◆ Why to Measure

◆ How to Measure

◆ What to Measure

◆ What to Be Measured

◆ What Changes to Lead the Result

◆ Performance Result & Benefit

Performance Effect of CMMI Based Process Improvement



◆ How to Measure

Measure Performance in Business Context



- 👉 Understand what are the **BUSINESS NEEDS**
- 👉 Analyze what are the business goal of **CUSTOMER**
- 👉 Analyze what's **PERFORMANCE & Quality Trend**
- 👉 Benchmark and know what's our Position
- 👉 Calibrate the analysis result and setup business goal
- 👉 Know our performance **RESULT**



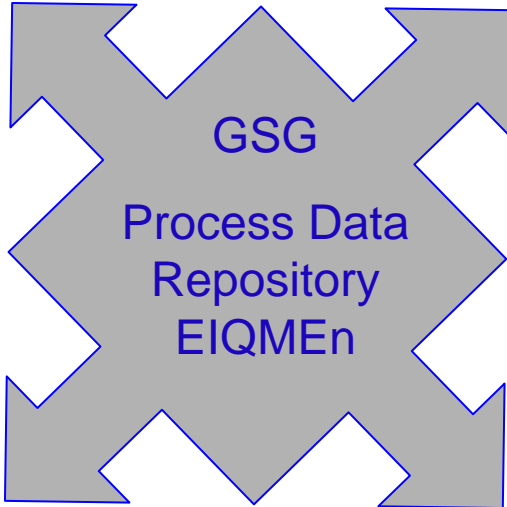
Measurement System Overview

Global Metrics-CCB & Site Metrics-CCB

- Metrics Core Team
- M-CCB Mechanism
- Org. Data Audit Team
- PQ Monthly Review

Project Level Focus

- Goal Setting (SQAP)
- Monthly Project Review
- Post-mortem/Causal Analysis
- Lessons Learned , POR



Site Level Focus

- Yearly Goal Setting & Monthly Tracking Mechanism
- Org Data Audit Mechanism (Org Audit + SQE Audit + Tool Validation)
- Yearly Baseline Mechanism (YBL/PCB)
- Quality Trend Analysis & POR Mechanism

Process Assets and Standards

- Q Data & SQAP Template
- SW Metrics Spec & Data Collection Guideline
- MA/QPM/OPP process & MA/QPM guideline
- Process Model Usage Guideline
- Metrics Automation Tools

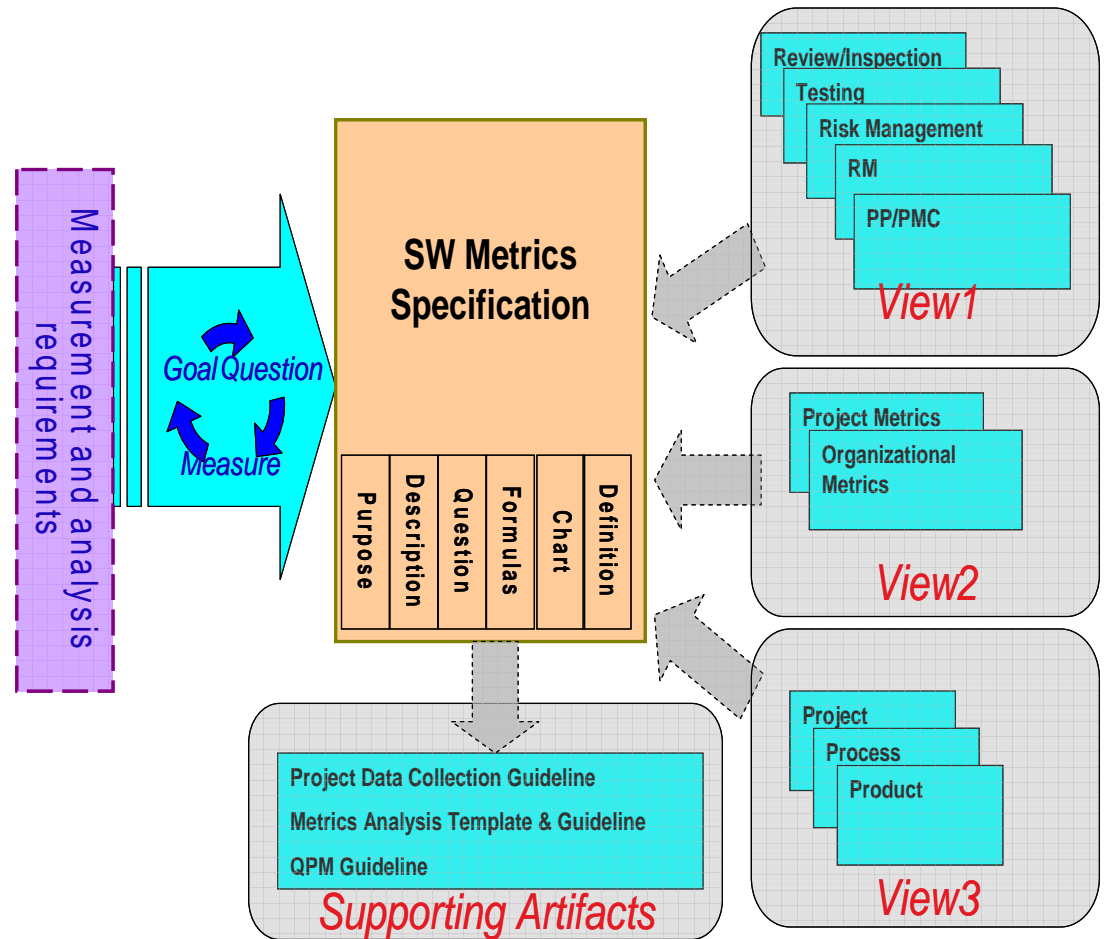
Metrics Dictionary

Define Common Measures of Performance

Business Needs & Value



Measures of CMMI PA Product Project



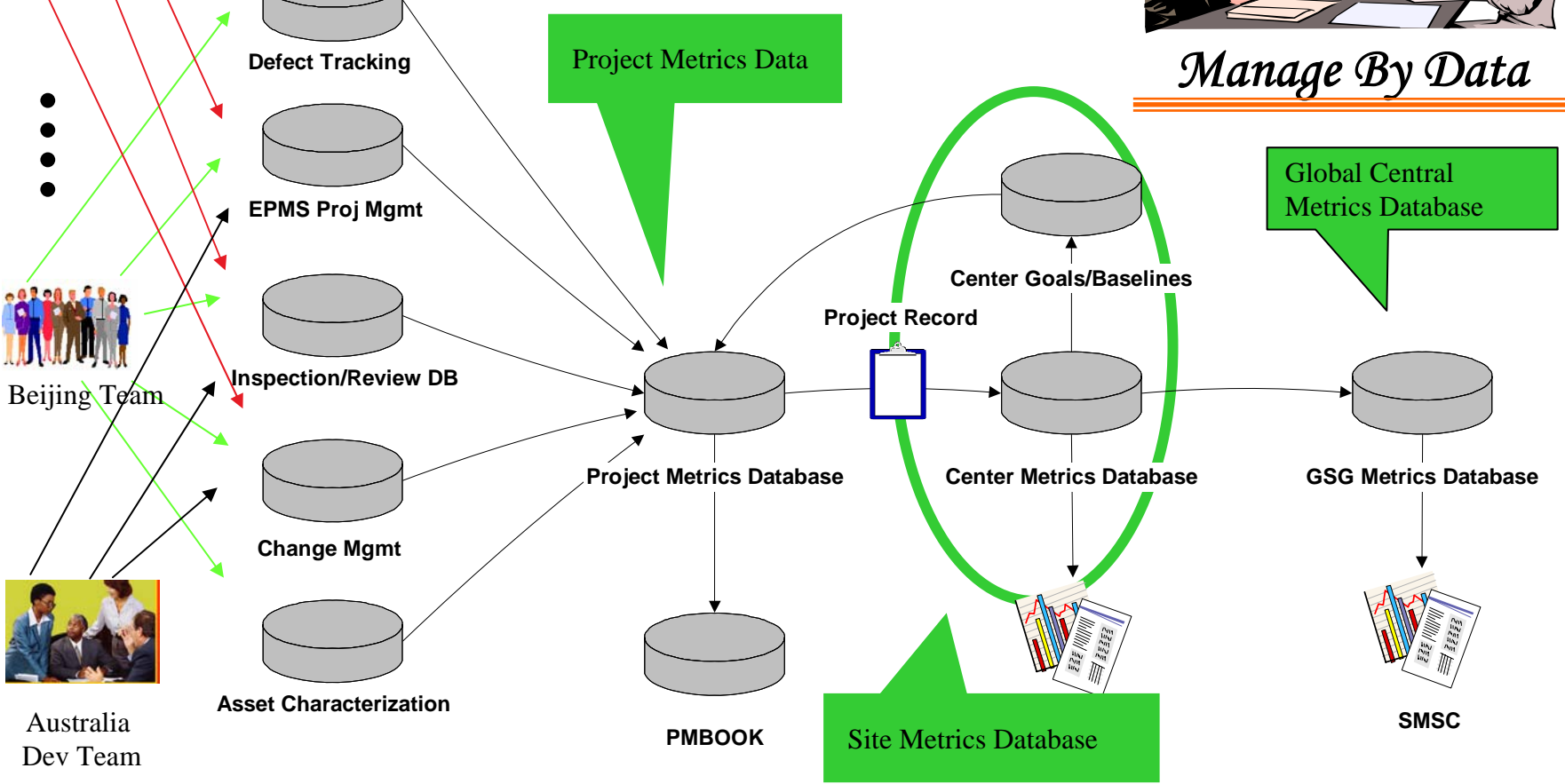
GSG Process Measurement Environment



Business Partner Environment



Manage By Data



◆ Why to Measure

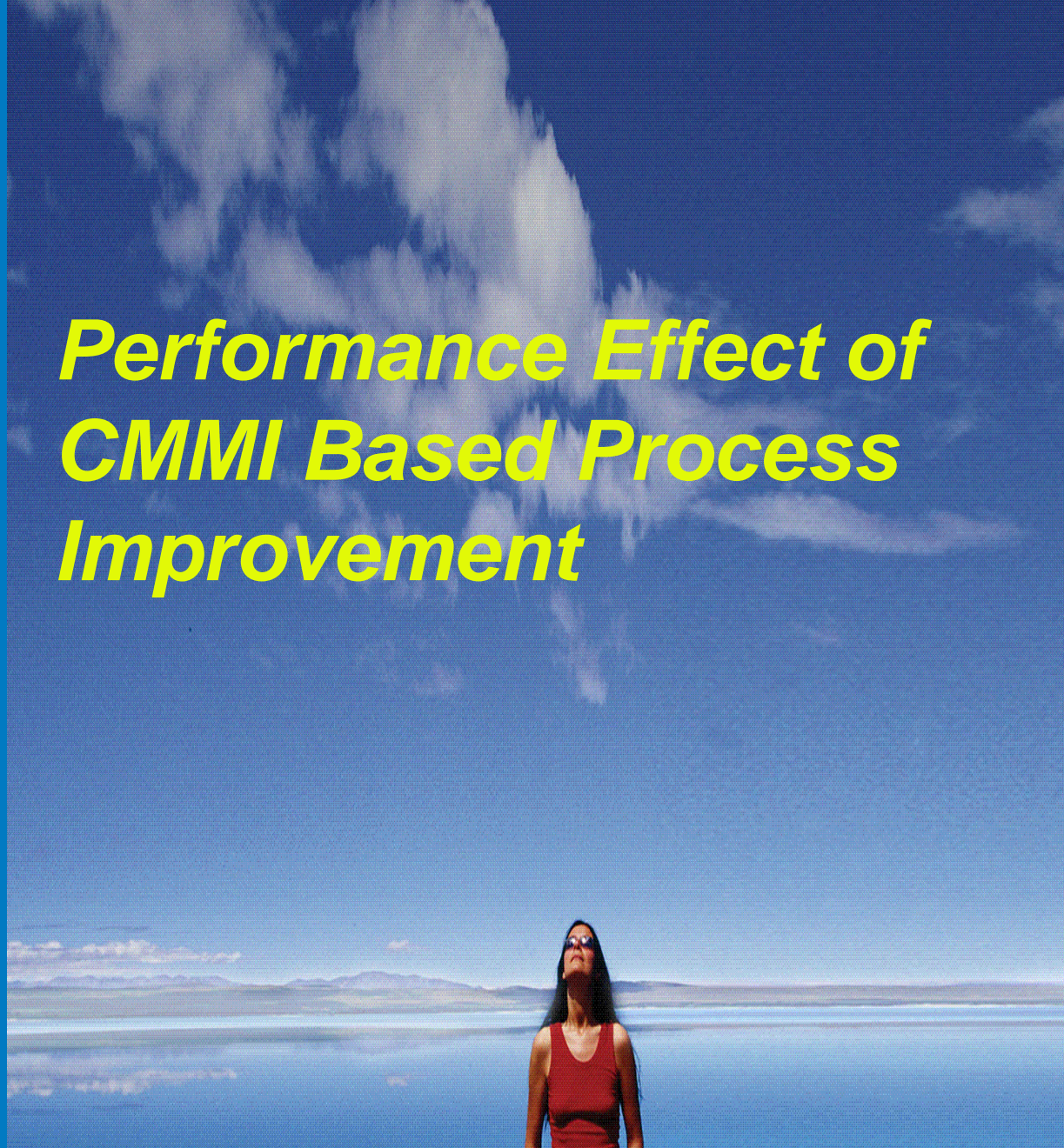
◆ How to Measure

◆ What to Be Measured

◆ What Changes to Lead the Result

◆ Performance Result & Benefit

Performance Effect of CMMI Based Process Improvement



ives & Benefit Analysis

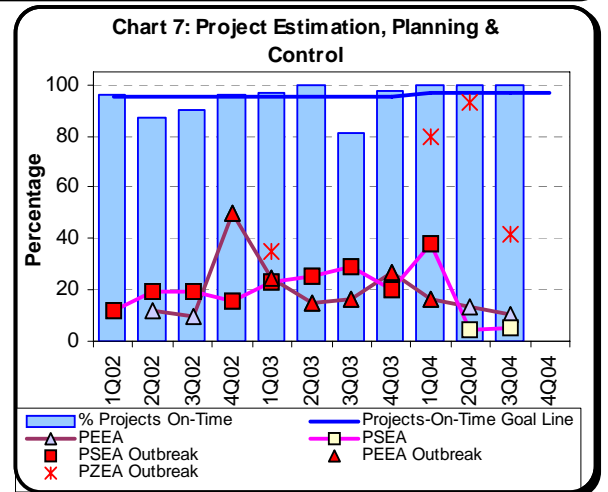
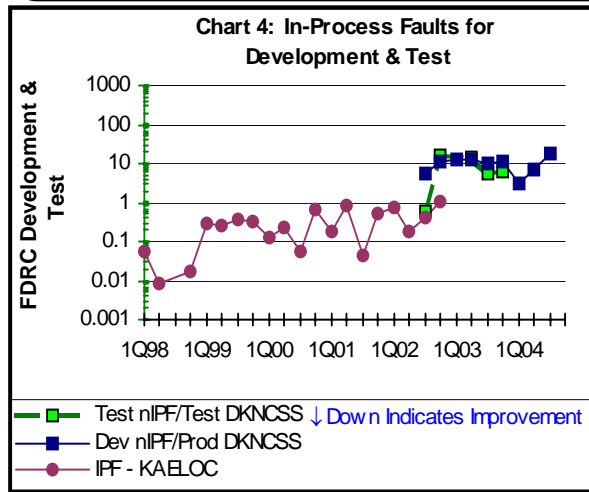
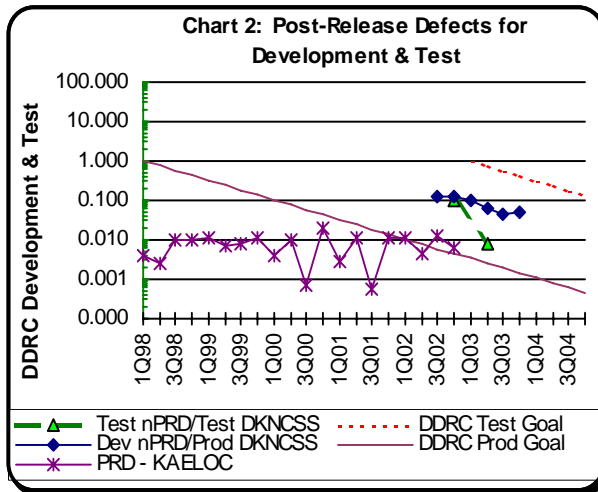
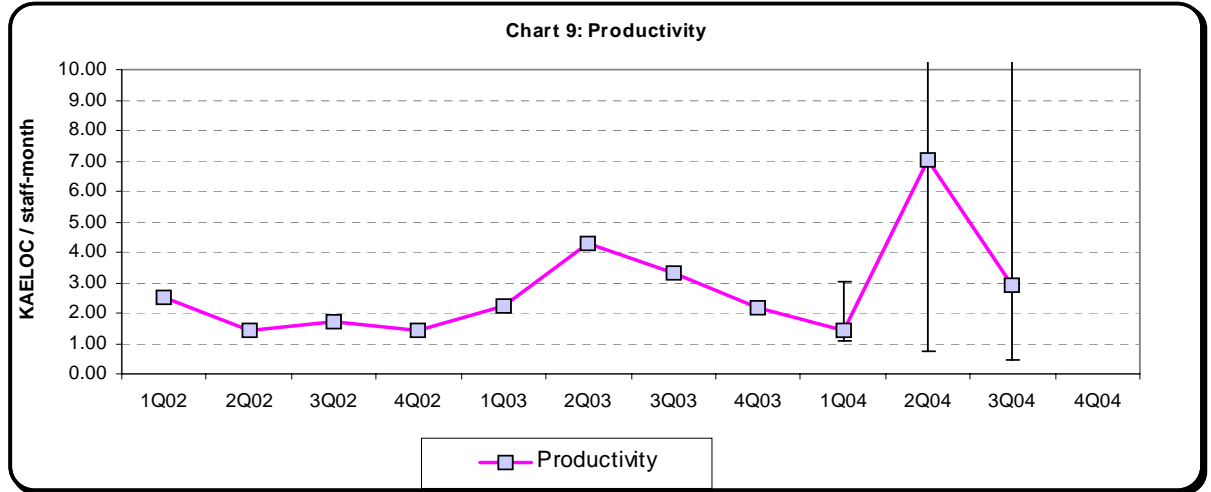
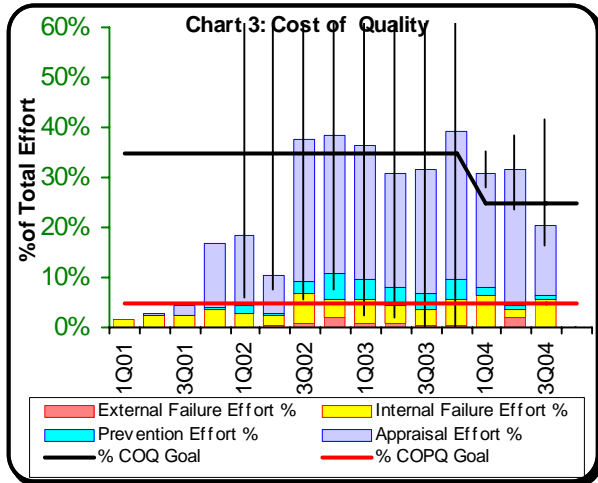
Business Goal & Benefit

- JProductivity*
- JSchedule*
- JCost of Quality*
- JCost of Poor Quality*
- JCycle Time*
- JROI*
- JOn Time Delivery*
- JCustomer Satisfaction*

	BG1	BG2	BG3	BG4	BG5	BG6	BG7	BG8
PI-1 (PP)	✓	✓						✓
PI-2 (RSK)			✓		✓			
PI-3 (RM)	✓	✓			✓		✓	
PI-4 (CAR)					✓			
PI-5 (MA)						✓		
PI-6 (OID)			✓				✓	
PI-7 (VER-PR)				✓		✓		
PI-8 (VER-Test)				✓	✓	✓		
PI-9 (OPP)				✓				
PI-10 (OID-2)						✓	✓	

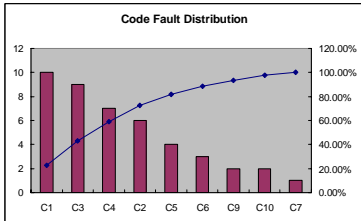
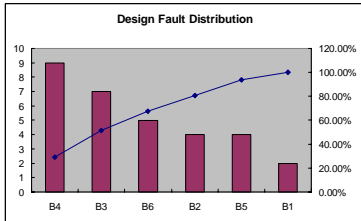
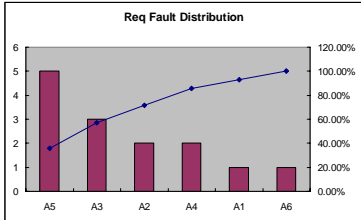
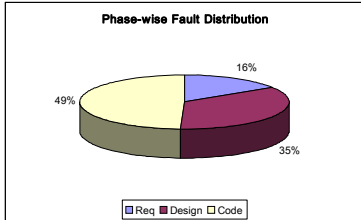
Process Initiatives : All major initiatives will have ROI analysis in POR System

Organization Performance Tracking

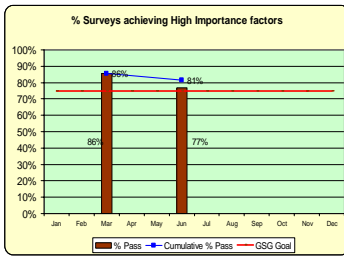
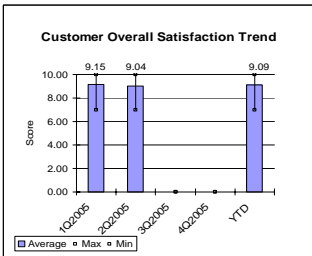
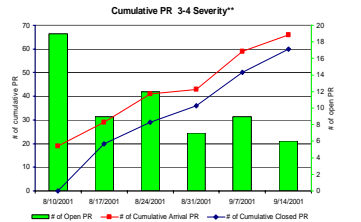
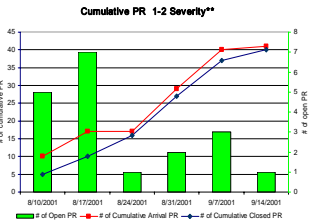


GSG Software Metrics Summary Chart (SMSC)

Project Performance Dashboard



Current Phase: []			Key Metrics Summary Chart			As up to: [mm/dd/yyyy]	
Project Category: [DEV/CLC/POR-DEL/VSP]			Actual	Est.latest	Est.Initial	IPF - Total(nIPF/DKNCSS)	
Effort(Stf Wks):						Current	
Cycle Time(Wks):						Goal	
Prod. Size(DKNCSS):						Baseline	UCL
Prod. Size(KAELOC):						Avg.	LCL
SPR1(LOC/Staff Hour)						COQ	
Current		Goal				Current	Goal
Baseline		UCL				Baseline	UCL
Avg.		LCL				Avg.	LCL
SPR4(LOC/Staff Hour)						COPQ	
Current		Goal				Current	Goal
Baseline		UCL				Baseline	UCL
Avg.		LCL				Avg.	LCL

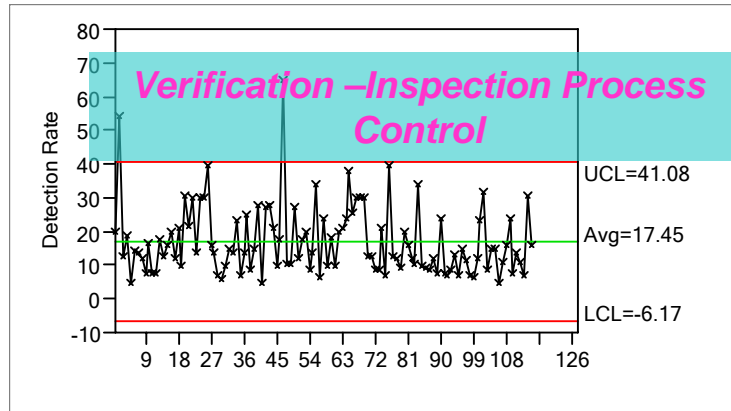
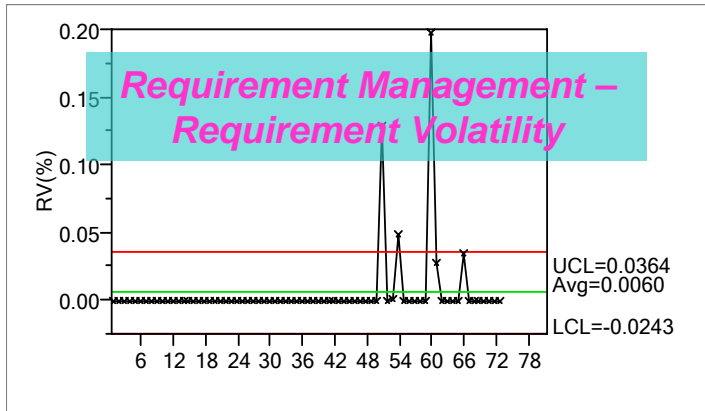
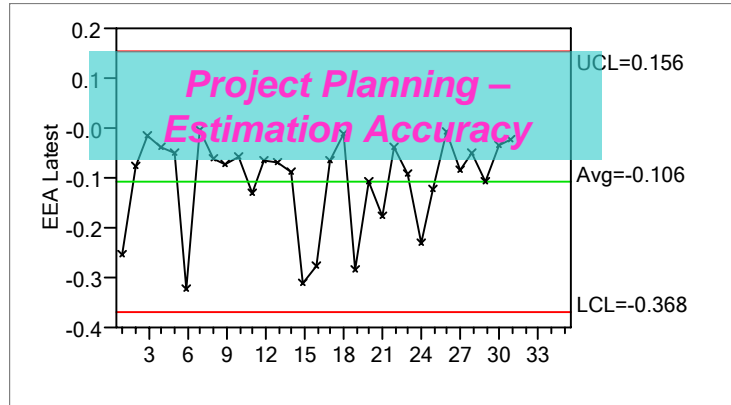
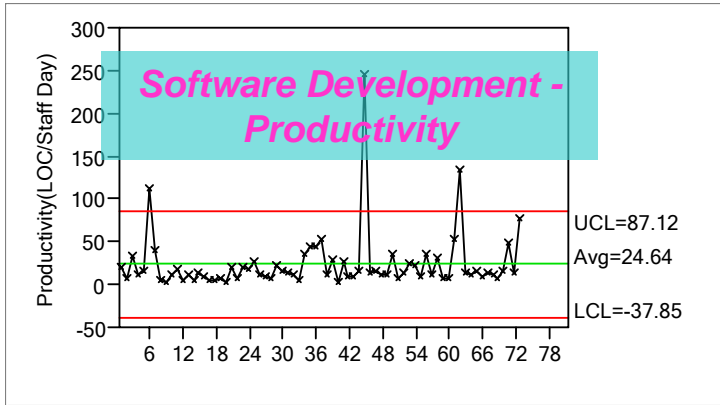


Phase Introduced	Phase Detected					Statistics	
	Req	Design	CUT	IT	ST	Projected Faults	Actual Faults
	Req						
Design							
CUT							
PCE Actual							
PCE Goal							
PSE Actual							
PSE Goal							

Measure the Performance at different level



Process Performance Baseline



◆ Why to Measure

◆ How to Measure

◆ What to Be Measured

◆ What Changes to Lead the Result

◆ Performance Result & Benefit

What new and changed process led to the performance result in GSG?



Process Architecture and Integrated Project Process

◆ GSG Process Hierarchy Structure

Adapted to accommodate process changes due to CMMI.

◆ Tailoring Flexibility

Organized to assist the projects on process model selection, and provides guidance and flexibility to select and tailor the processes at a detailed sub-process level.

◆ Easy Access

The process asset library can be accessed by several criteria, including CMMI process areas, phase, process templates, checklists, and other types of documents.

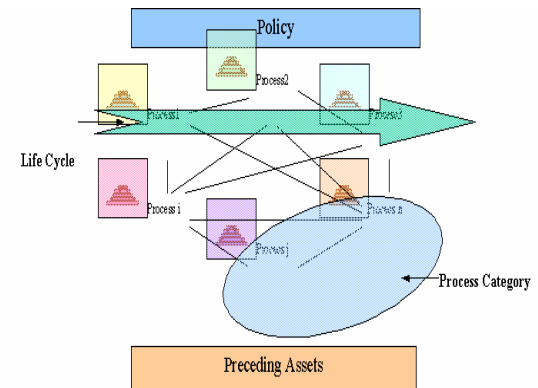
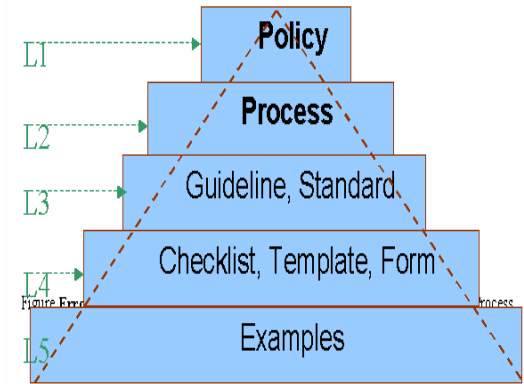


Figure 2-1 Overview of Organizational Process Hierarchy

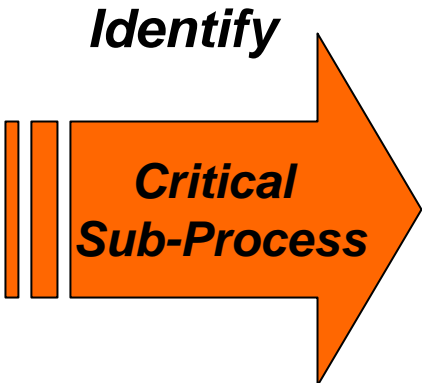
Quantitative Project Management Process

Focus more on critical processes aligned with business objectives, particularly in the areas of requirements management and verification.

- **Understand Scorecard**
- COQ, COPQ, Productivity, Defect Leakage, Customer Satisfaction, On-Time Delivery ...

- **Analyze Process Performance**
- Process Capability Baseline, Yearly Baseline, Benchmark Result....

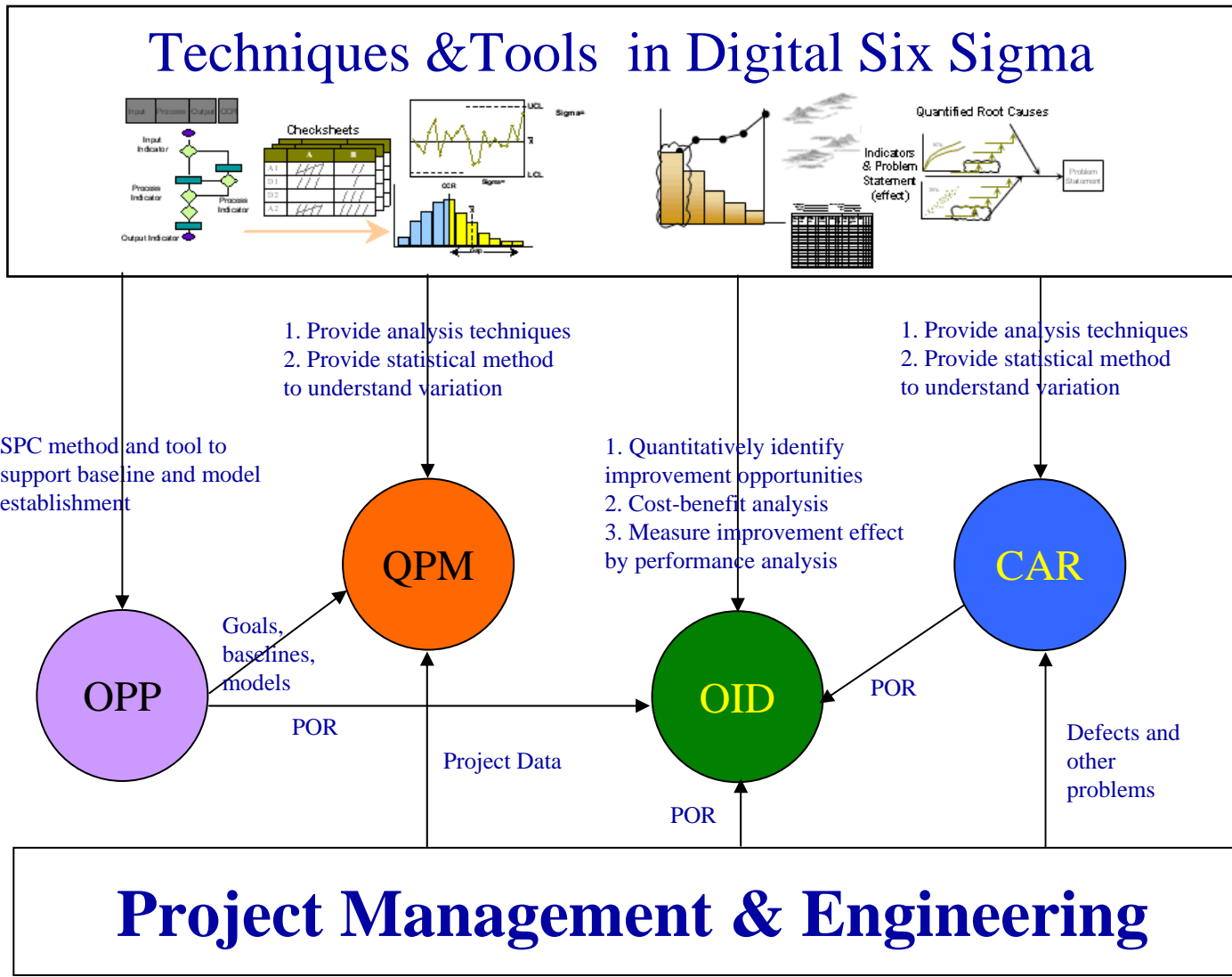
- **Process Opportunity**
- Estimation Improvement, Test Process Improvement, etc
- ...



Using of High Level Process Area

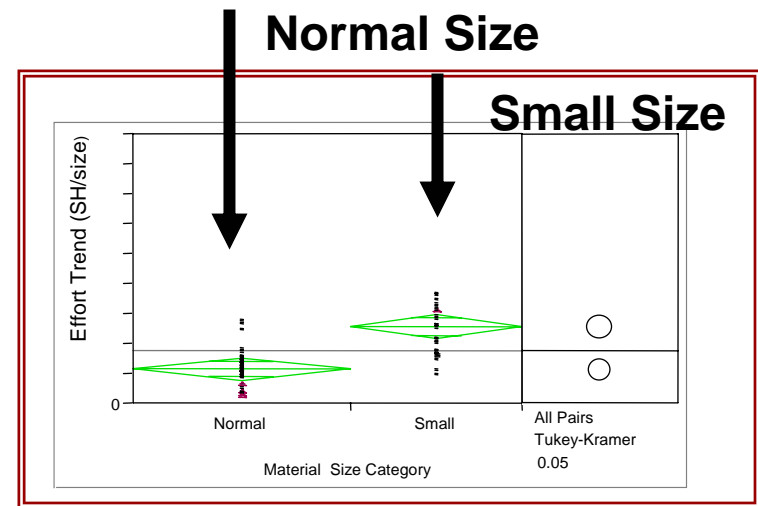
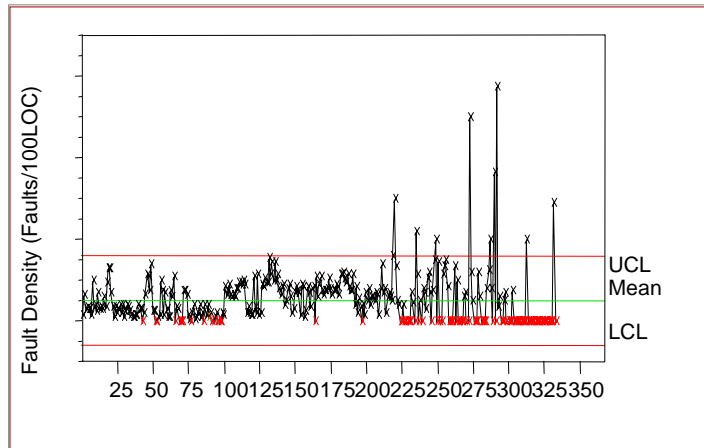
Using of Support Process Area

Using of High Level Process Area



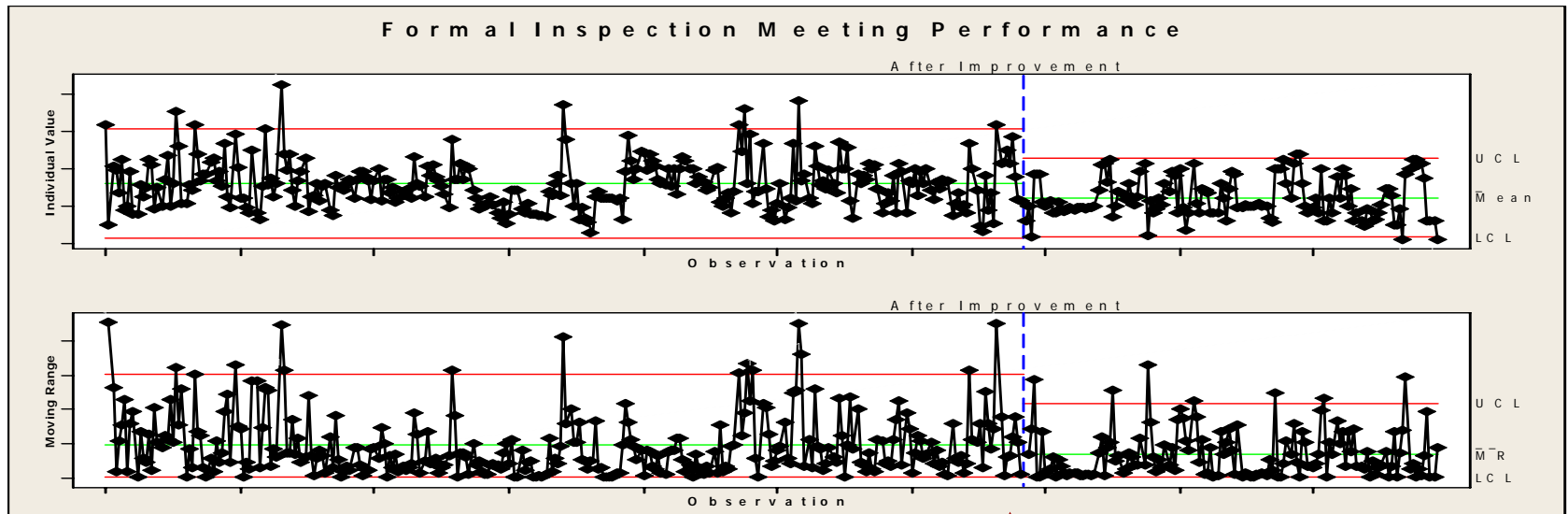
Support Verification Process Improvement

- ◆ CAR and OID-based processes were used to improve verification process effectiveness without compromising quality in specific classes of cases.
- ◆ The formal process rules the Center previously used were less effective for smaller documents and project teams.



Inspection Process Improvement

◆ Mini-reviews and mini-inspections were introduced; effort and cost were reduced without affecting defect density. The results were used to establish new baselines for planning and quantitative project management.



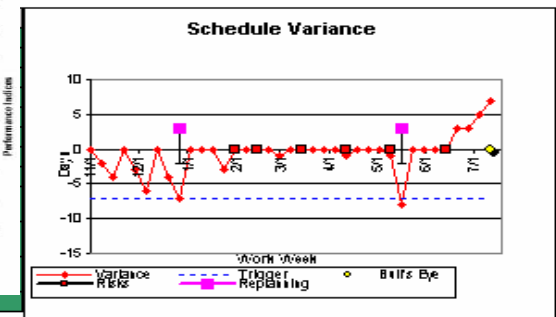
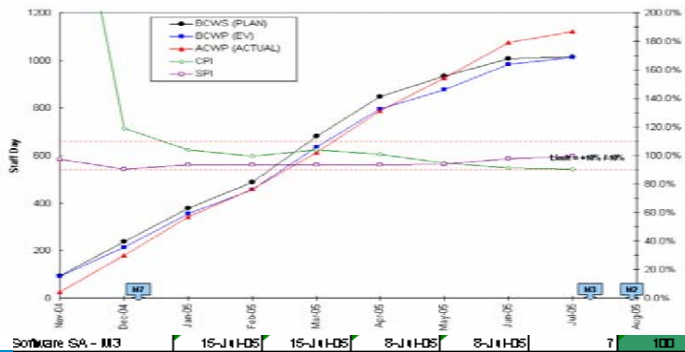
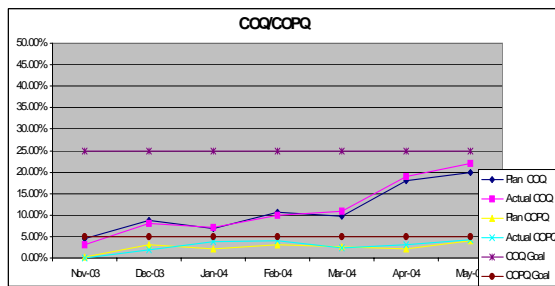
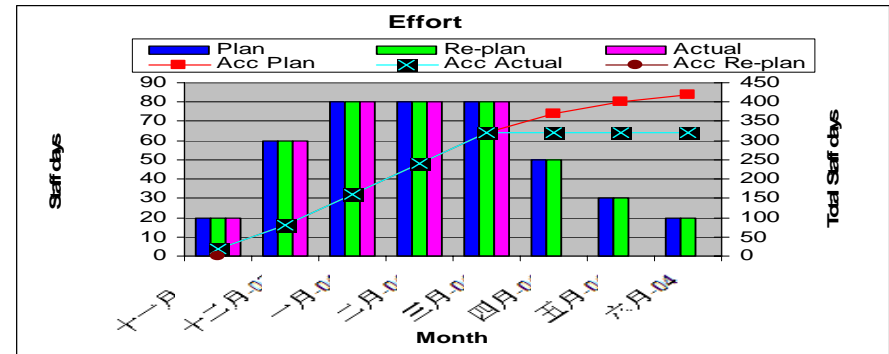
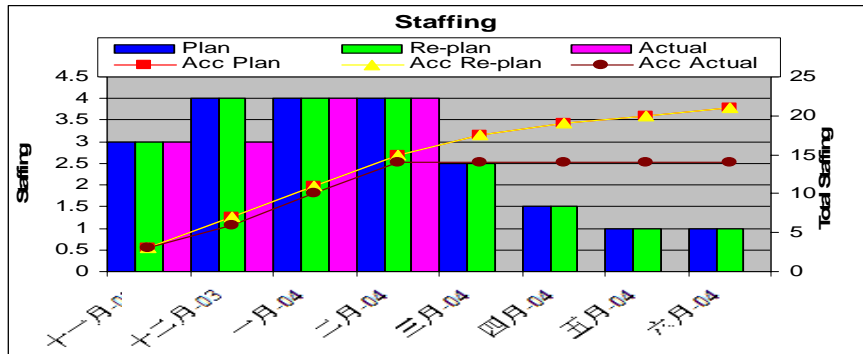
Before Improvement



After Improvement

Enterprise Project Management System

- ◆ Use Enterprises Project Management System (EPMS) as a common project management platform to manage global team
- ◆ Use Project Pamphlet as a local supply tool of EPMS for PM performance tracking



Requirement Management Process Improvement

RM Improvement is based on guidance in CMMI

◆ Requirement Volatility

Late additions and changes to requirements are measured.

◆ RM Process Performance and Management

F The project level results then are rolled up to the organizational level for senior management insight

F Set control limits for future use in quantitative process management of requirements volatility.

◆ Use of RM Measure Result

The measured and estimated impact of the requirements changes

*F Led to new project processes for **replanning, estimation,** and*

*F A factual basis for **negotiation with customers.***

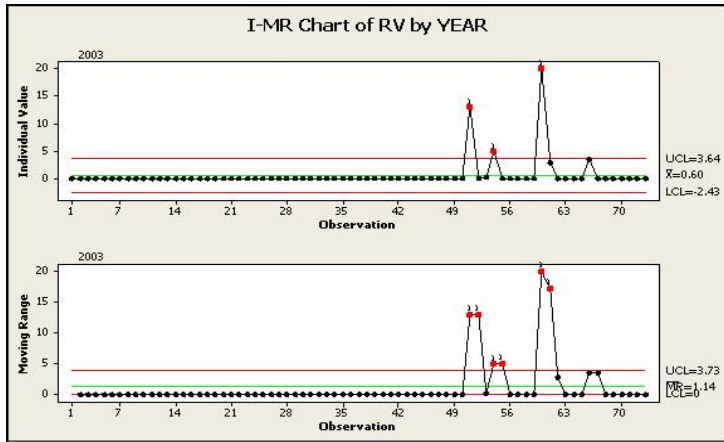
Better Manage the Change

Better Project Management

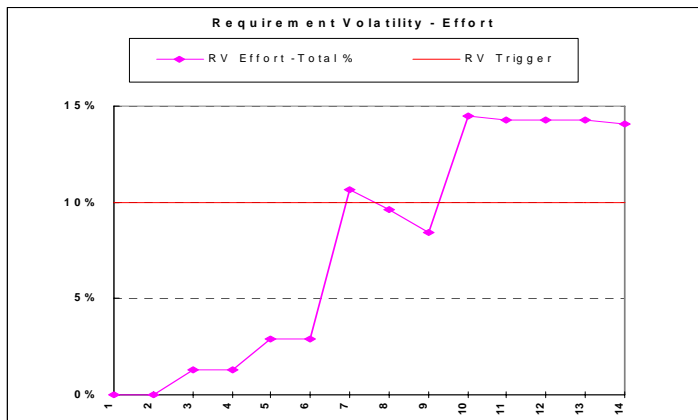
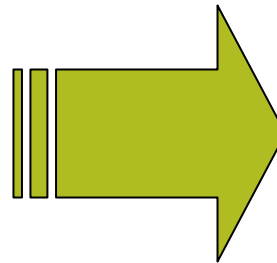
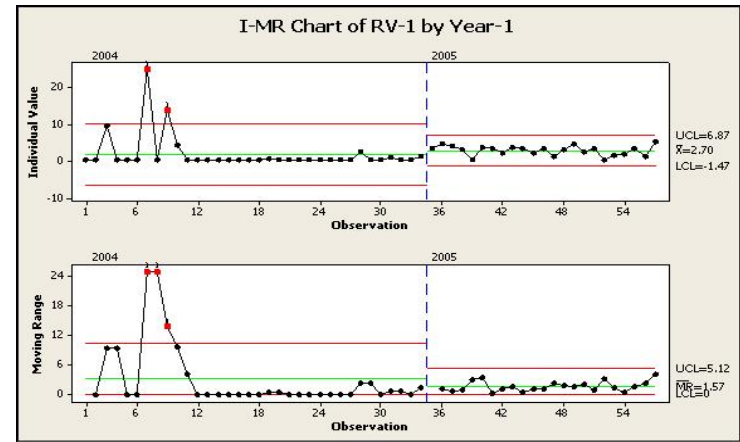
Delight the Customer

Requirement Management Process Improvement

2003 – Before CMMI

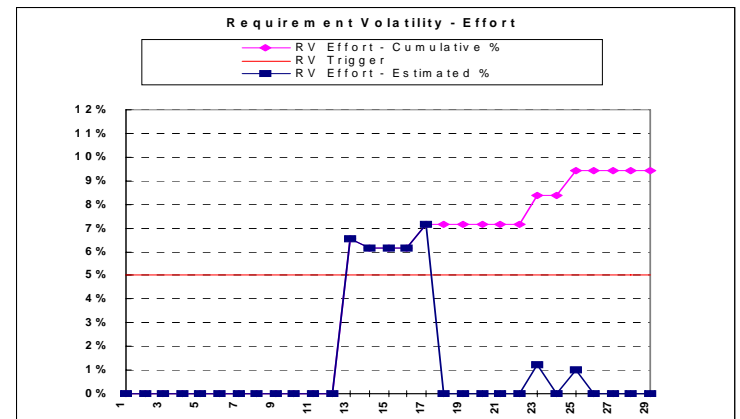


2004/2005 – After CMMI



Improvement Action:

1. RM process
2. IAD template
3. RM TRMX template
4. RV data sheet

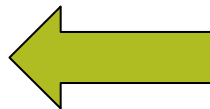


Decision Analysis and Resolution

◆ New practices based on the CMMI Decision Analysis and Resolution (DAR) process area were used to improve the Center's managerial and engineering processes, particularly those that map to *Technical Solution, Configuration Management, and OID process areas*

◆ These DAR-based practices have been applied to improve decision making effectiveness at both the organization and project level.

Decision



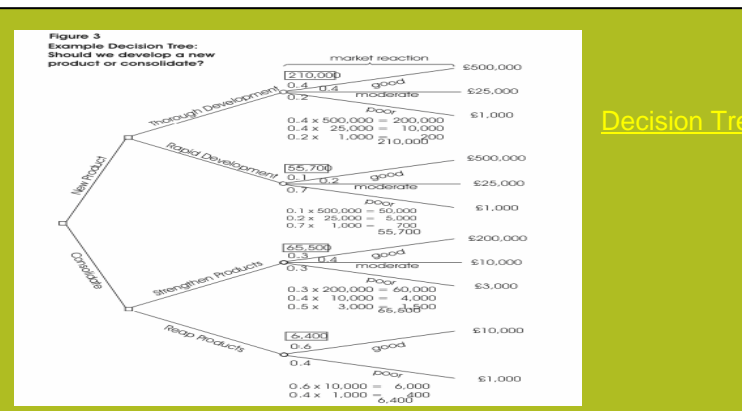
ROI Analysis

Weighted-Average

Project Name: xxx

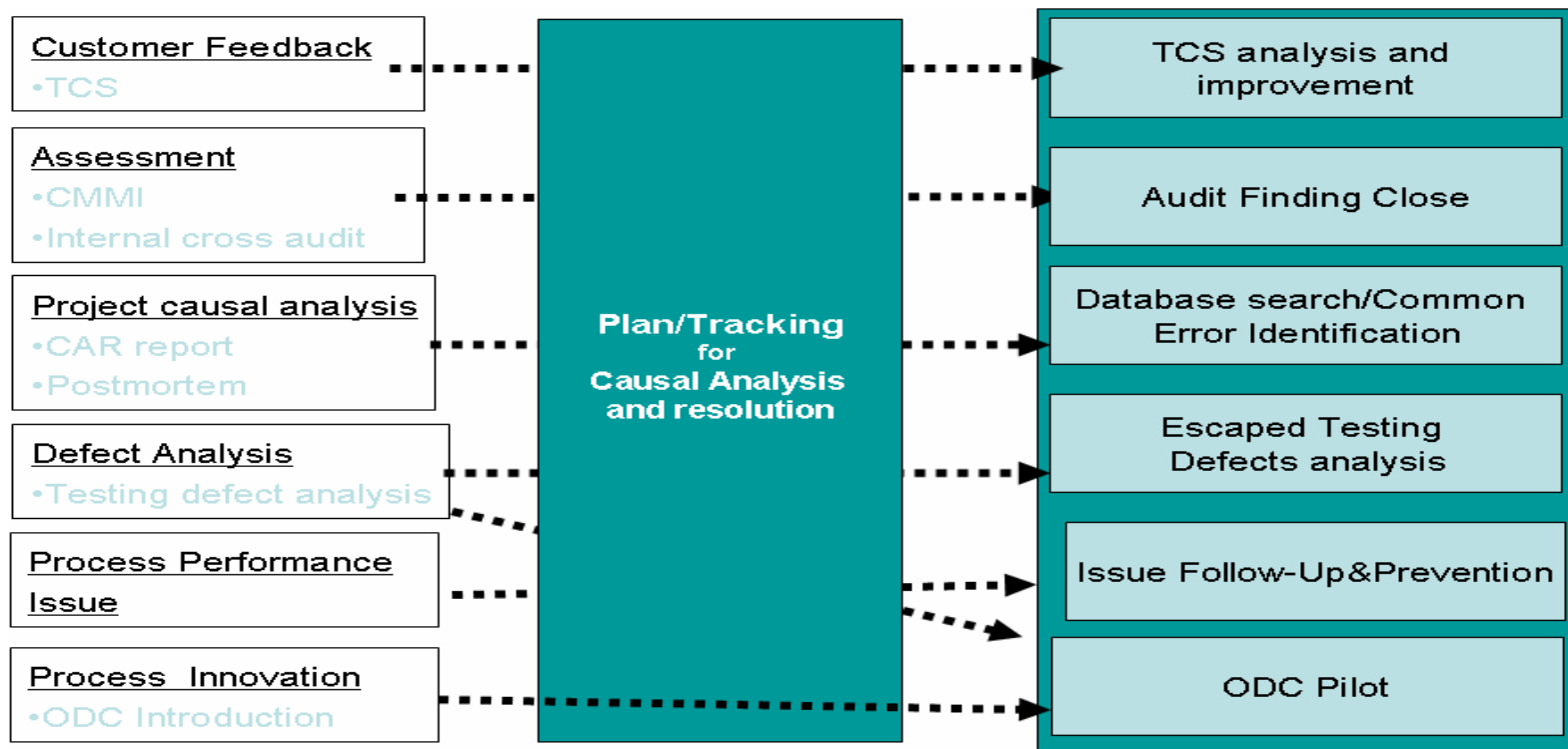
Criteria >>>	Cost	Schedule Impact	Benefit	Customer Satisfaction	Performance	
Relative Importance >>>	6	10	10	6	4	
Alternatives	Ranking					Weighted Average
A1	3	2	4	7	3	3.7
A2	2	6	4	5	3	4.3
A3	6	3	3	3	5	3.7
A4	1	8	3	2	5	4.1
	0	0	0	0	0	0.0
	0	0	0	0	0	0.0
	0	0	0	0	0	0.0
	0	0	0	0	0	0.0

Weighted-Average



Causal Analysis Improvement

Shifted its focus on causal analysis processes from the relatively narrow defect prevention perspective in the SW-CMM to the broader problem prevention focus in CMMI



◆ Why to Measure

◆ How to Measure

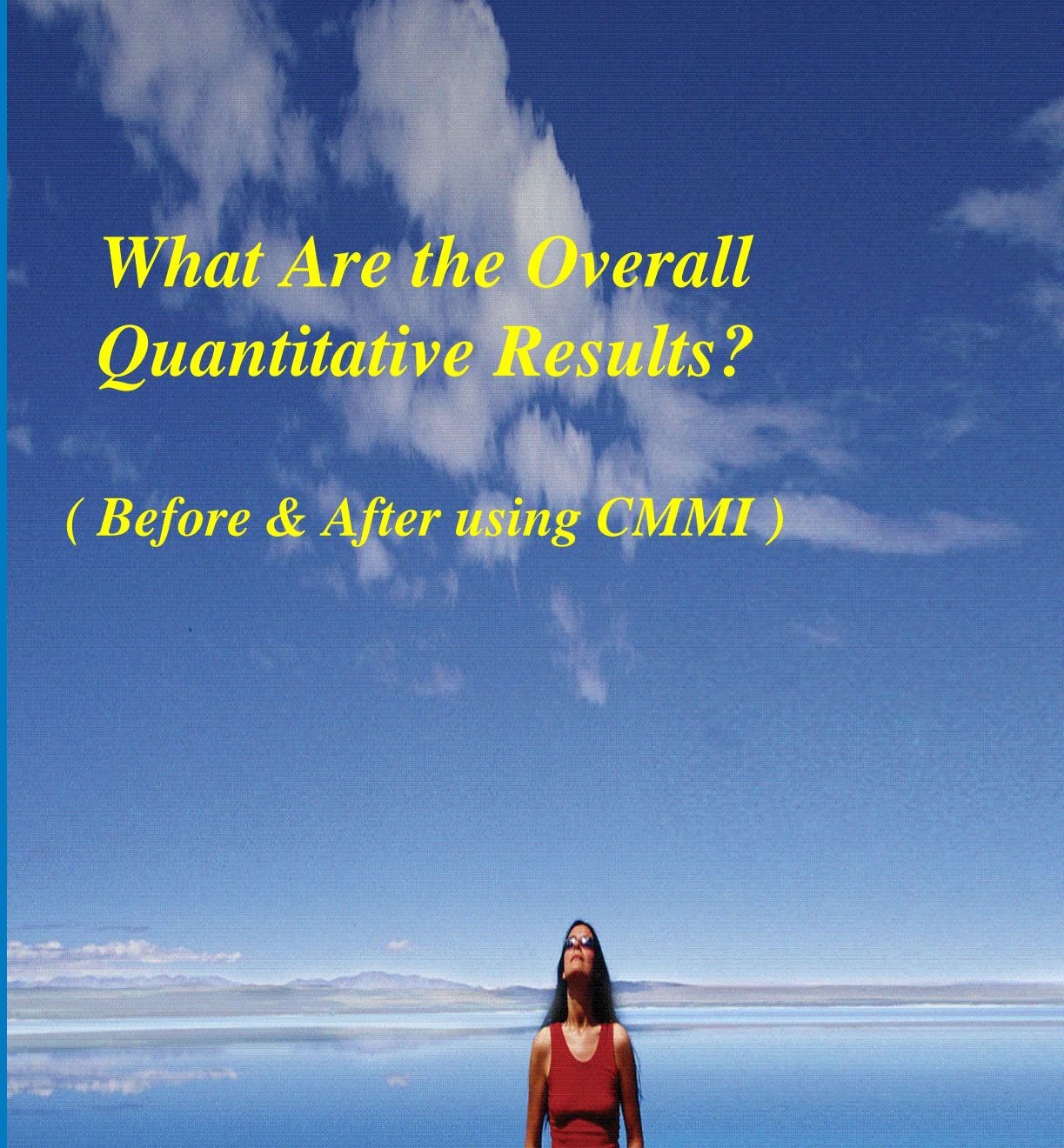
◆ What to Be Measured

◆ What Changes to Lead the Result

◆ Performance Result & Benefit

What Are the Overall Quantitative Results?

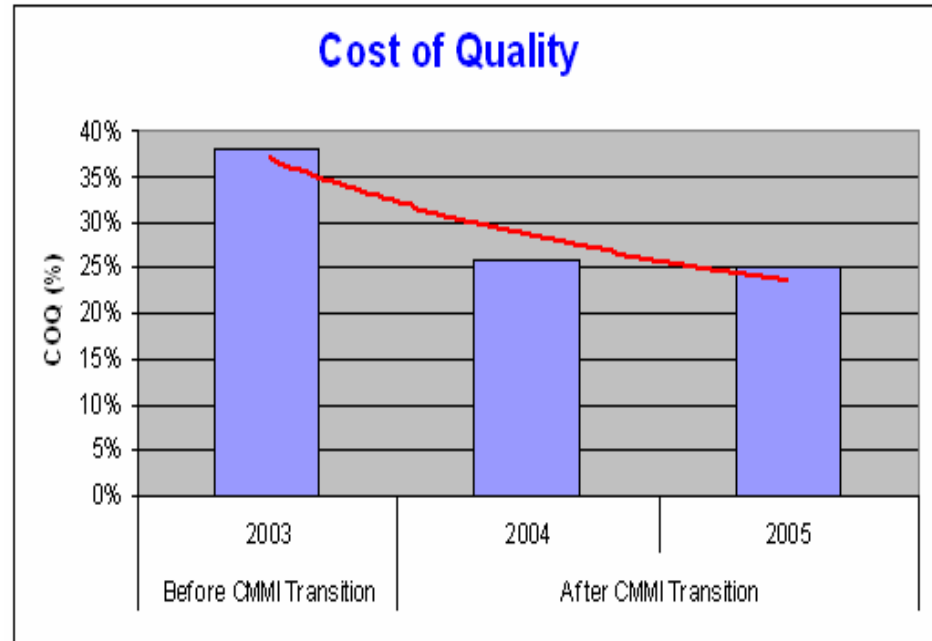
(Before & After using CMMI)



◆ Performance Result & Benefit

- ☞ COQ
- ☞ IPF
- ☞ EA
- ☞ PCE
- ☞ TCS

Reduction of Cost of Quality

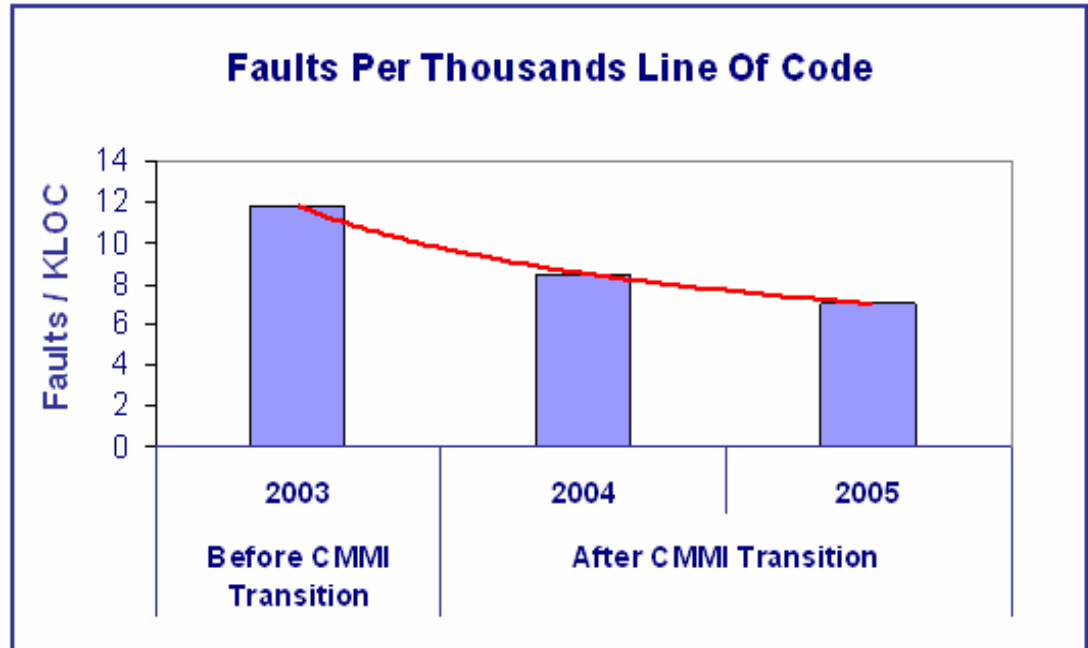


COQ Reduction by one-third from pre-CMMI baseline due to improvement in verification, peer review and software test process.

◆ Performance Result & Benefit

☞ COQ
☞ IPF
☞ EA
☞ PCE
☞ TCS

Improvement in Fault Density

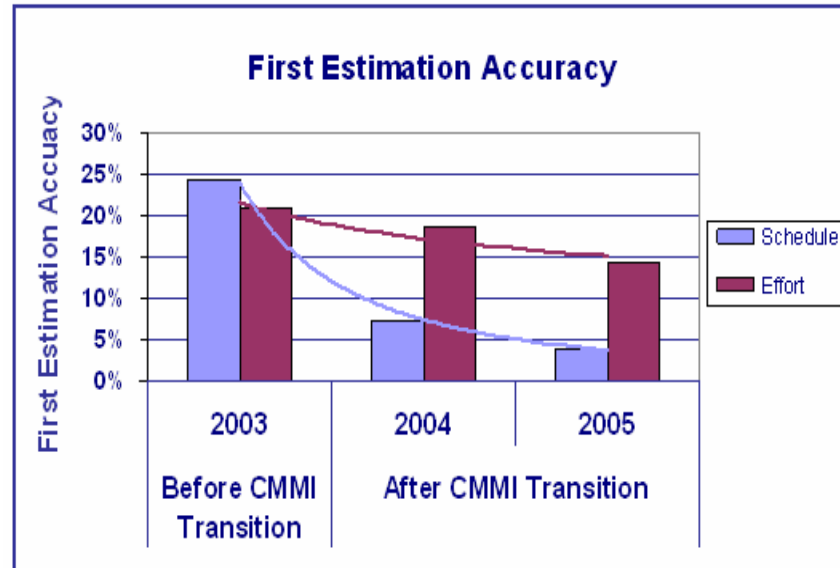


IPF Reduction by 40% due to improved Casual Analysis and Resolution (CAR) procedures by implementing real time RCA and by improved verification process

Improvement in Estimation Accuracies

◆ Performance Result & Benefit

- COQ
- IPF
- EA
- PCE
- TCS

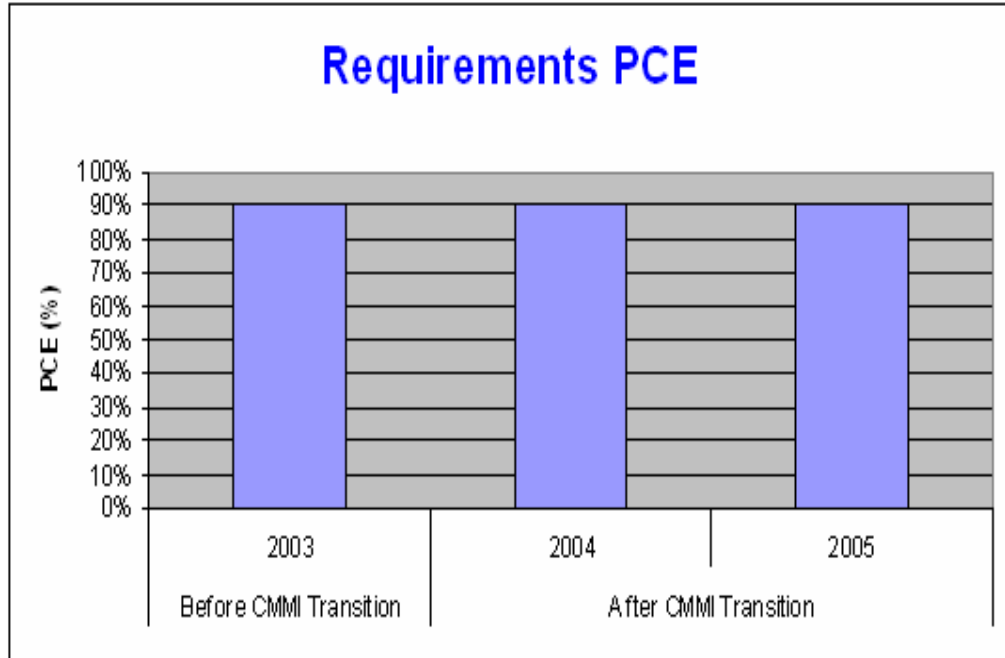


Improvement in Effort Estimation accuracy by 31% and Schedule duration by 84% - due to improved Project Planning and tracking practices.

Requirement Phase Containment

◆ Performance Result & Benefit

- 👉 COQ
- 👉 IPF
- 👉 EA
- 👉 **PCE**
- 👉 TCS



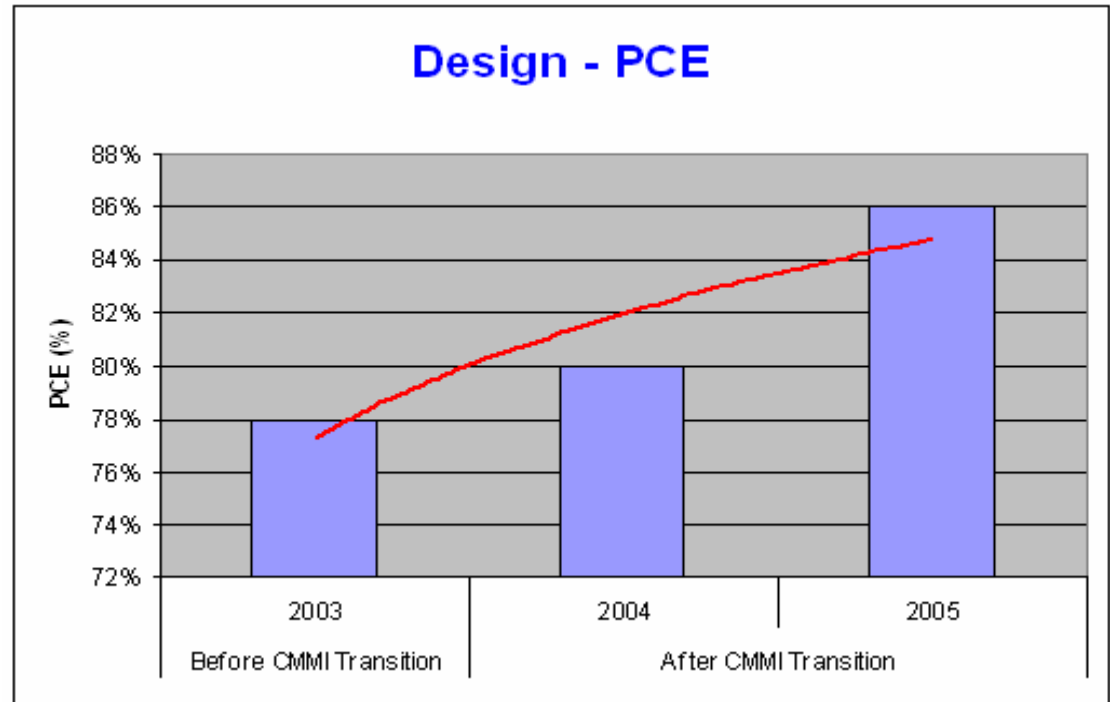
Requirements PCE sustained at 90%

in spite of enormous organizational growth and constant requirement churn in number of projects.

◆ Performance Result & Benefit

- COQ
- IPF
- EA
- PCE**
- TCS

Design Phase Containment



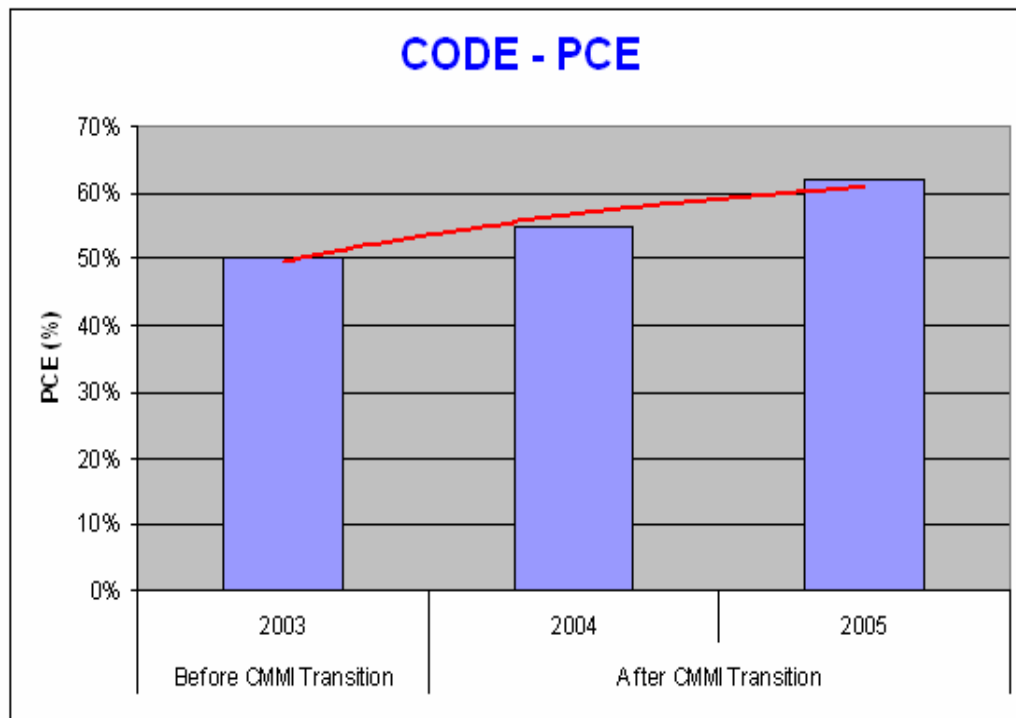
Design PCE improved by 8%

Improvements were due to improved Verification, Technical Solution and Organization Training process areas

Code Phase Containment

◆ Performance Result & Benefit

- 👉 COQ
- 👉 IPF
- 👉 EA
- 👉 **PCE**
- 👉 TCS



Code PCE improved by 12%

Improvements were due to improved Verification, Technical Solution and Organization Training process areas

Customer Satisfaction

◆ Performance Result & Benefit

☞ COQ
☞ IPF
☞ EA
☞ PCE
☞ TCS



- J Consistently received high TCS scores (9/10) with a sustained 100% on-time delivery rate
- J Continued to exceed customers' expectations to show the ability to deliver cost effective, high quality products on time by providing excellent technical solutions and project execution.

Business Benefit

◆ Why to Measure

◆ How to Measure

◆ What to Be Measured

◆ What Changes to Lead the Result

◆ Performance Result & Benefit

F Customer Satisfaction

Sustain to exceed customer expectation (+9/10)

F Business Growth

GSG Population 2225 (Y2000) - > 6840 (2006)

F Engagement Capability

Model Level->System Level->Product Level

◆ Why to Measure

◆ How to Measure

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Thanks

