Harvesting CMMI® Benefits – The Six Sigma Sickle

SEPG Conference -2006

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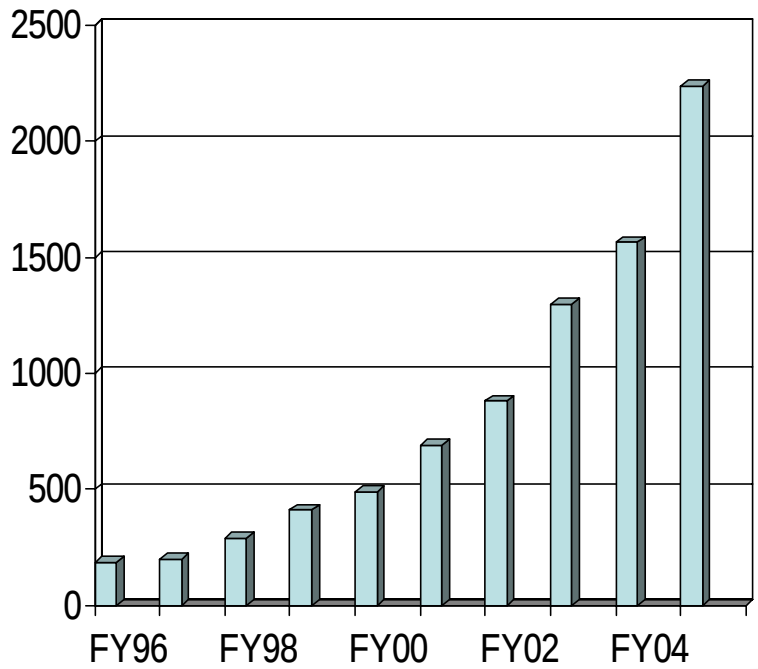
TWENTY-FIVE YEARS 25 IN NORTH AMERICA

value infinite

Key Facts About Tata Consultancy Services (TCS)

- Established in 1968
- U.S. offices established in 1979
- More than 45,000 associates globally, with more than 9,000 in the U.S.
- FY 2004-2005 revenues of $2.24 B (60% coming from North America)
- Publicly-held – Market cap of approx. $12 B
- Global presence – Operations in 32 countries, 153 offices across the globe
- More than 50 locations in the U.S.

TCS Revenues in US $ Millions

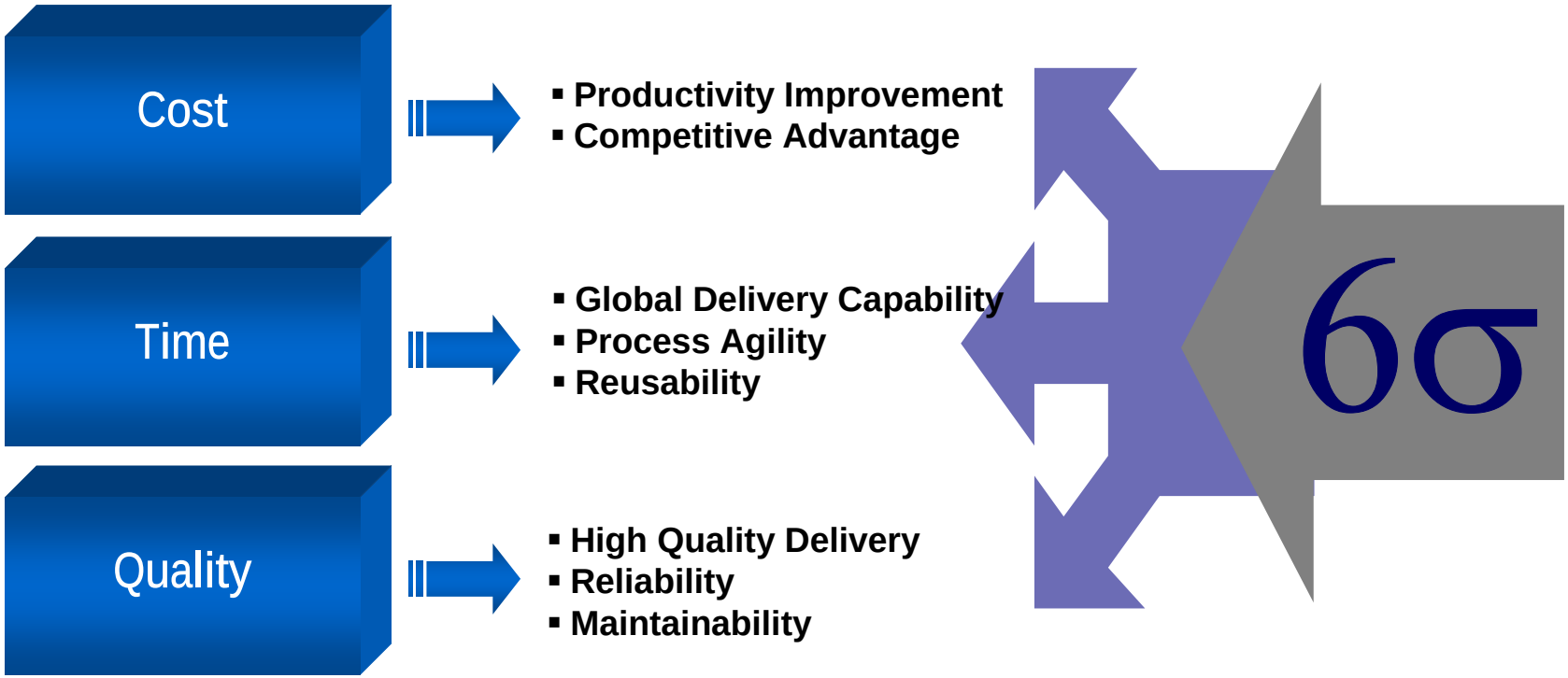


* All Figures as of April 19, 2005

"TCS has the size and reach unlike any other Indian software company."

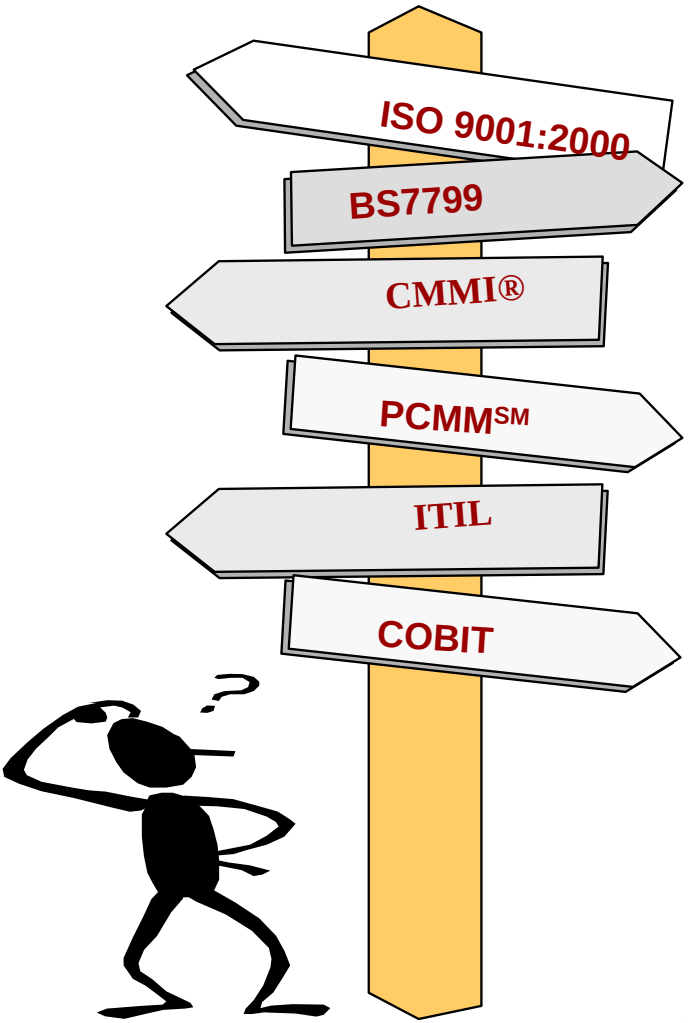
The Wall Street Journal – June 30, 2004

The Business Case for Process Improvement @ TCS – WHY



$$y = f(x)$$

The Critical Decision : Organization Process Framework

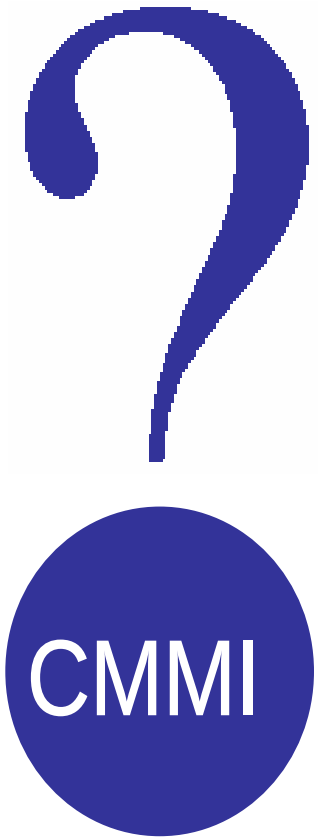


Factors for Framework Selection*	
General: Geographic Origin/ Spread Scientific Origin Development/ Stability Popularity Software Specific Prescriptive/ Descriptive Adaptability	Process: Assessment Assessor Process Improvement method Improvement Initiation Improvement Focus Analysis techniques
Organization: Actors/ Roles/ Stakeholders Improvement Focus Analysis techniques	Quality: Quality Perspective Progression

**Source: A Taxonomy to Compare Software Process Improvement Frameworks, 12th International Conference on Software Quality*

Best of People and Technology cannot guarantee best of the Products and Services unless the Processes are Effective

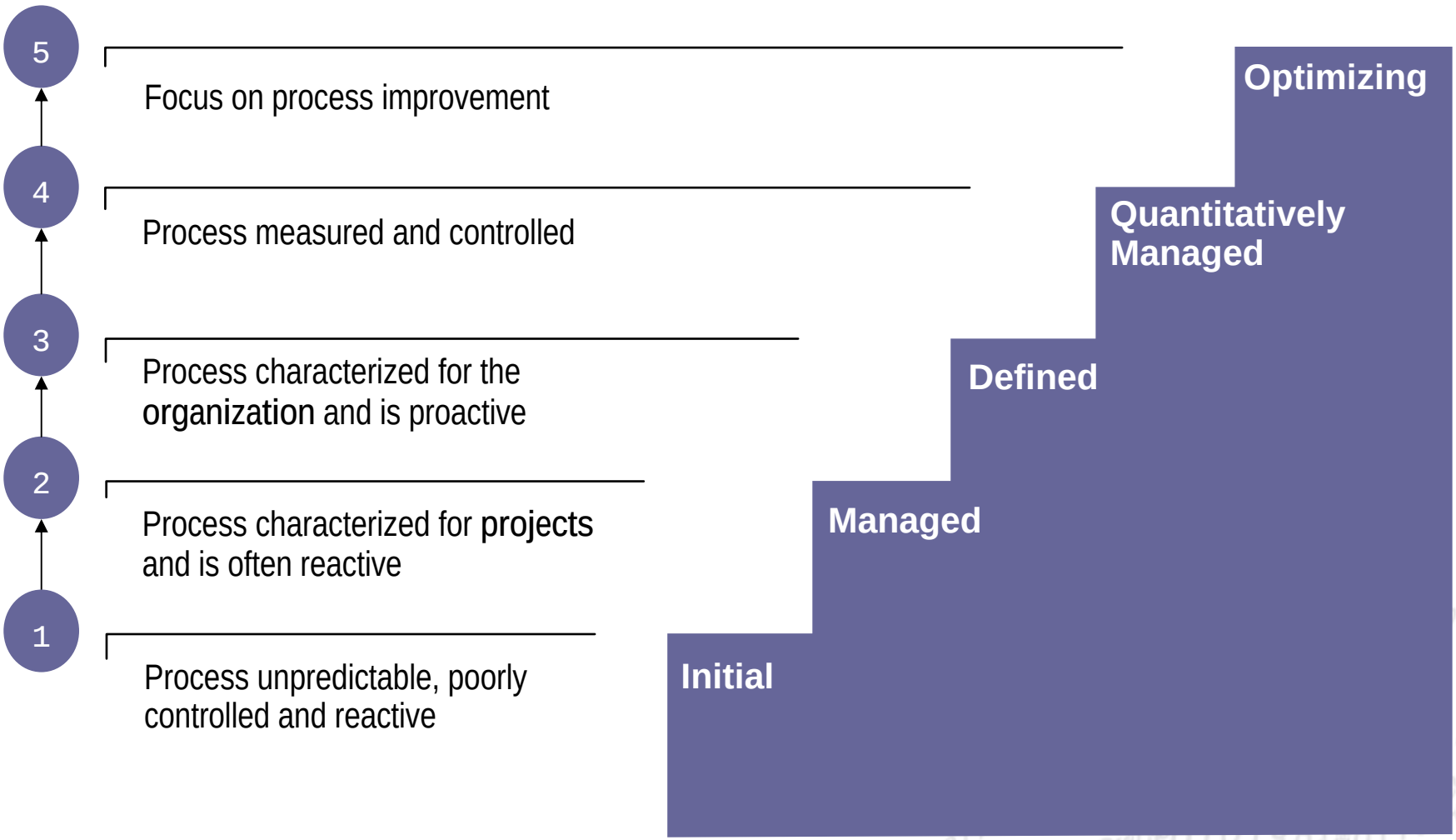
Why CMMI works for TCS



- Most endorsed benchmark for a process industry
- Focuses on ability to manage the development, acquisition, and maintenance of products and services
- Facilitates enterprise-wide process improvement
- Provides a consistent, enduring framework that accommodates new initiatives
- Comprehensive framework providing a clear roadmap to develop and optimize processes
- Can be adapted along with other Quality Models: ISO,TBEM, PCMM

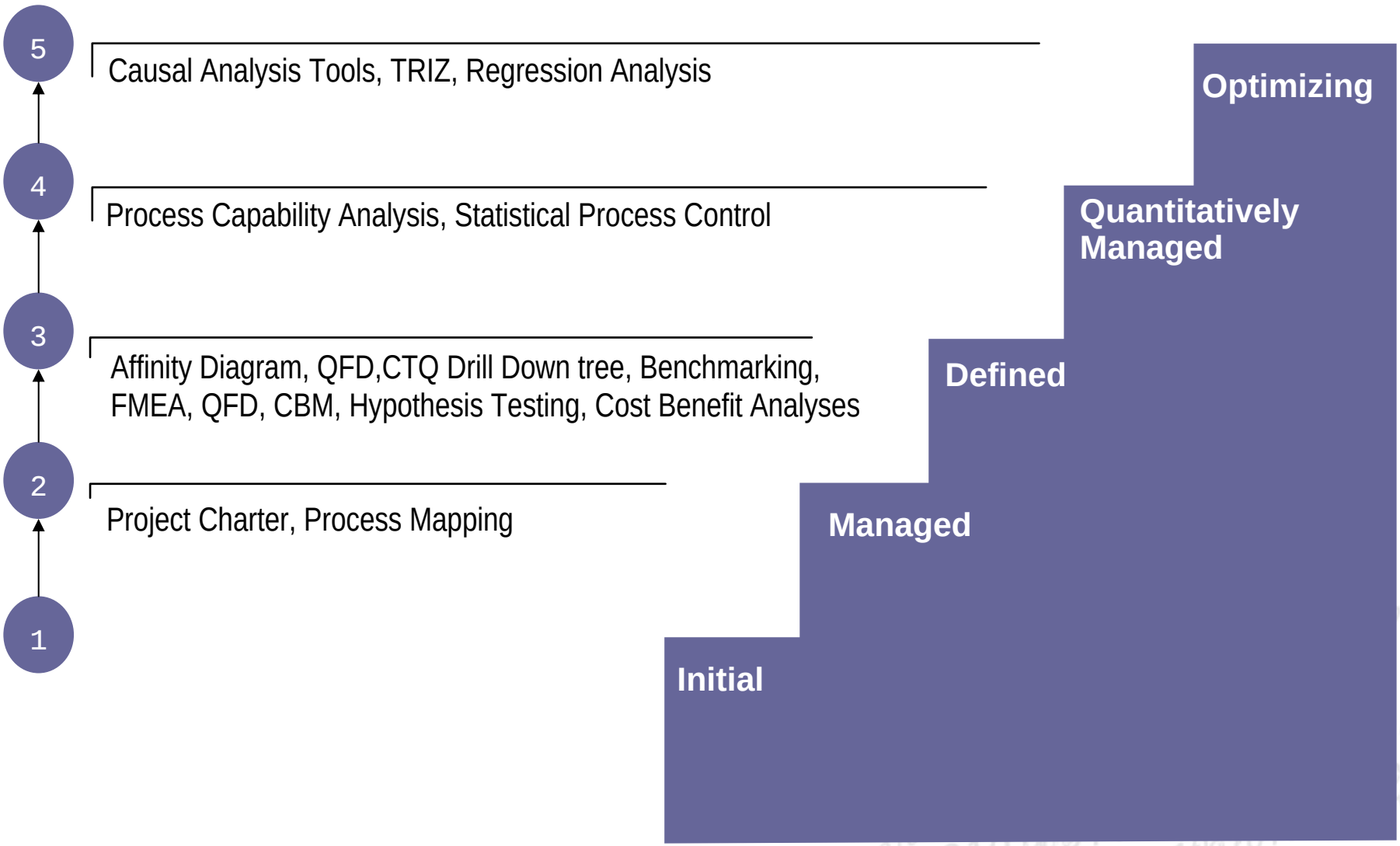
CMMI Maturity Levels

TCS has been assessed Enterprise wide to be operating at CMMI Level 5 in Sep 2004

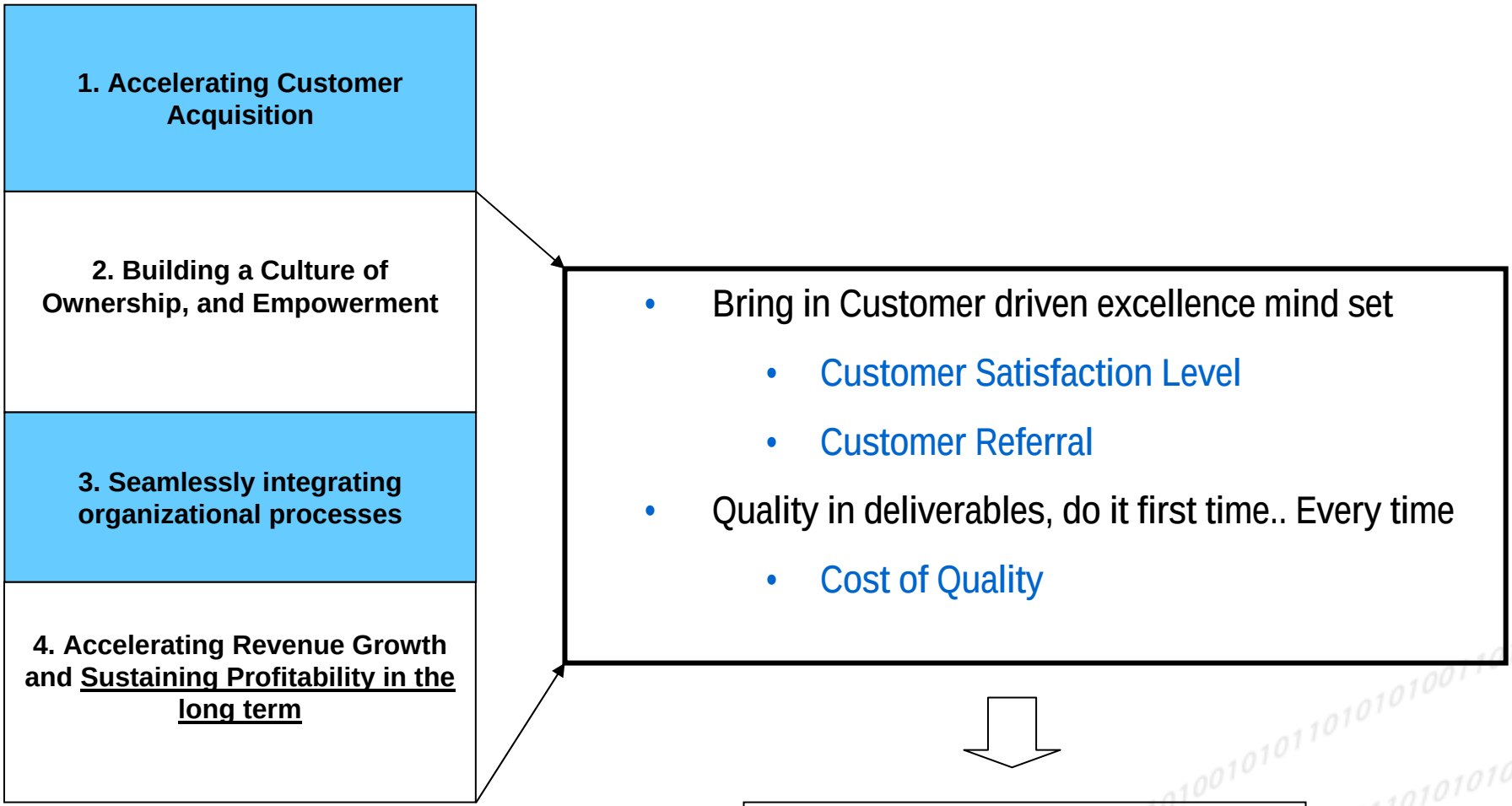


Source CMMI V 1.1 Tutorial

Six Sigma Sickle : The Rigor for Success



Strategic Challenges @ TCS



CMMI know “WHAT”

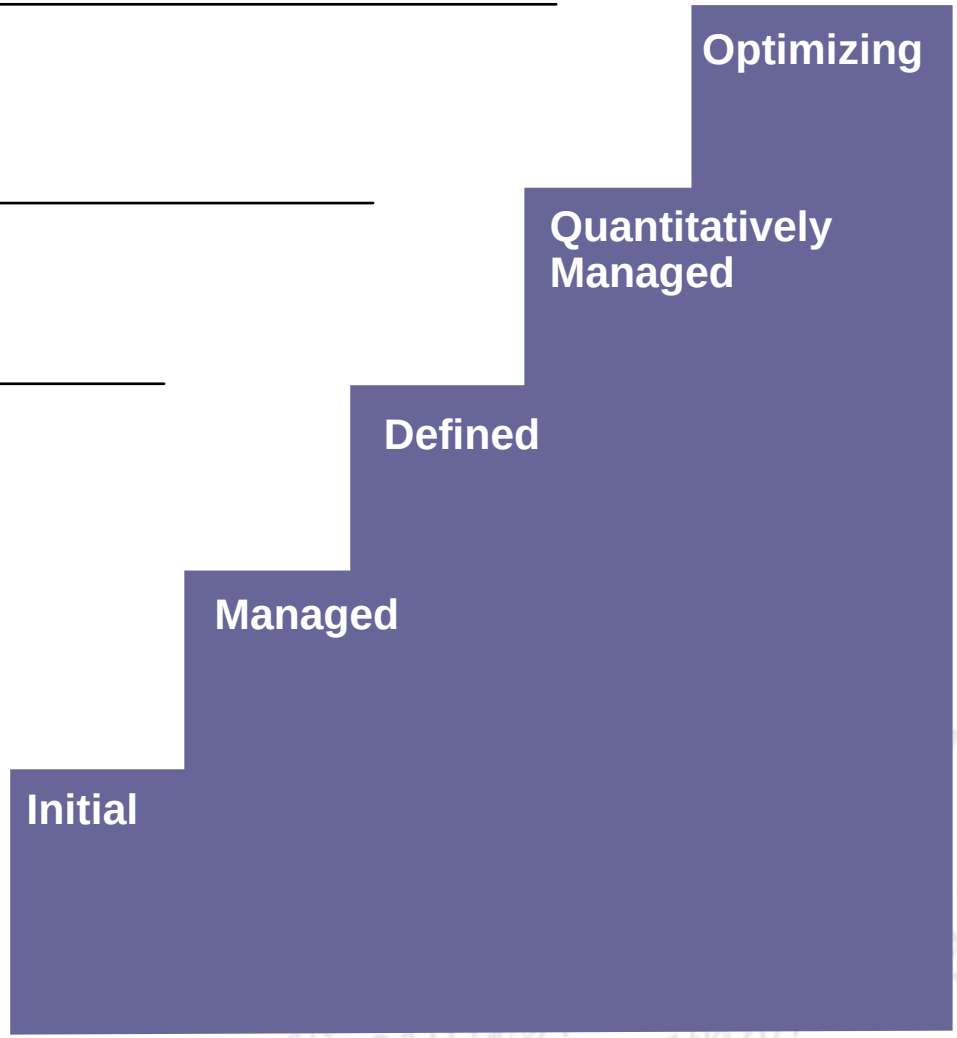
5
Causal Analysis and Resolution

4
Quantitative Project Management

3
Organizational Process Definition
Decision Analysis and Resolution
Requirements Development
Risk Management

2

1



CMMI know "WHAT" → Six Sigma know "HOW"

But do you know how to do this?

Six Sigma tells you How

"What"s of CMMI

- Causal Analysis and Resolution
- Quantitative Project Management
- Organizational Process Definition
- Risk Management
- Decision Analysis and Resolution
- Requirements Development

Know How with Six Sigma

- Ishikawa, Pareto Chart
- Control Charts
- Process Mapping
- Failure Mode Effect Analysis, PPA
- Criteria Based Matrix
- Affinity Diagram, QFD

Together, Six Sigma and CMMI help organizations improve marketplace competitiveness and achieve business goals faster

CMMI know “WHAT” → Six Sigma know “HOW” : Example

CMMI Process Areas (Example)

Causal Analysis and Resolution

PA of Maturity Level 5

The purpose of Causal Analysis and Resolution is to identify causes of defects and other problems and take action to prevent them from occurring in the future

Specific Goals

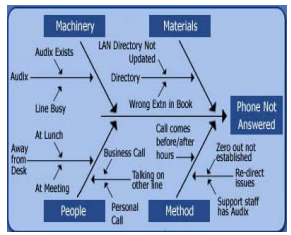
SG 1: Determine Causes of Defects
SG 2: Address Causes of Defects

Applicable Six Sigma Tools (Example)

Ishikawa / Fishbone diagram

What is a Ishikawa Diagram?

A visual tool used to brainstorm and logically organize possible causes to address a specific problem or effect



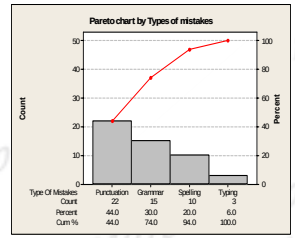
How it is relevant?

Ishikawa Diagram helps addressing SG1 of Causal Analysis and Resolution as it helps in identifying the root causes

Pareto Chart

What is a Pareto?

Pareto chart is a vertical bar graph where a series of bars whose heights reflect the frequency or impact of problems are arranged in descending order of height from left to right



How it is relevant?

Pareto Chart helps addressing the PA Causal Analysis and Resolution as it helps in identifying the vital causes responsible for 80% of the defects.

CMMI know “WHAT” → Six Sigma know “HOW” : Example

CMMI Process Areas (Example)

Quantitative Project Management

PA of Maturity Level 4

The purpose of the Quantitative Project Management process area is to quantitatively manage the project’s defined process to achieve the project’s established quality and process-performance objectives

Specific Goals

SG1: Quantitatively Manage the Project
SG2: Statistically Manage Sub-process Performance

Applicable Six Sigma Tools (Example)

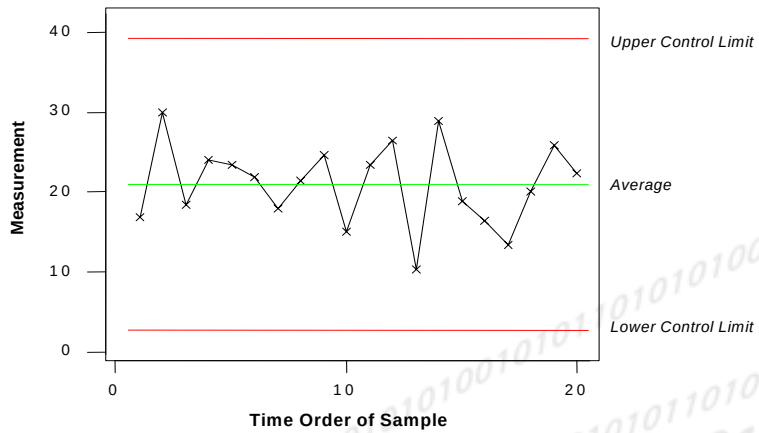
Control Charts

What are Control Charts?

A control chart is a graphical plot of a parameter over time used to identify special cause (assignable) variations and to make adjustments to the process being monitored.

How it is relevant?

Control Charts are the primary tools used for Statistical process Control and hence can be used to achieve the Specific Goal 2 of the PA Quantitative Project Management



CMMI know "WHAT" → Six Sigma know "HOW" : Example

CMMI Process Areas (Example)

Risk Management

PA of Maturity Level 3

The purpose of Risk Management is to identify potential problems before they occur, so that risk-handling activities may be planned and invoked as needed across the life of the product or project to mitigate adverse impacts on achieving objectives.

Specific Goals

SG 1: Prepare for Risk Management
SG 2: Identify and Analyze Risks
SG 3: Mitigate Risks

Applicable Six Sigma Tools (Example)

Potential Problem Analysis (PPA)

What is PPA?

The potential-problem analysis method is designed to provide a challenging analysis of a developed idea or action in order to pre-empt any potential for going wrong

How it is relevant?

PPA helps in addressing the specific SG2 of Risk Management as it:

- lists possible causes for each potential problem
- develops preventive actions and contingency plan

Failure Mode Effect Analysis (FMEA)

What is FMEA?

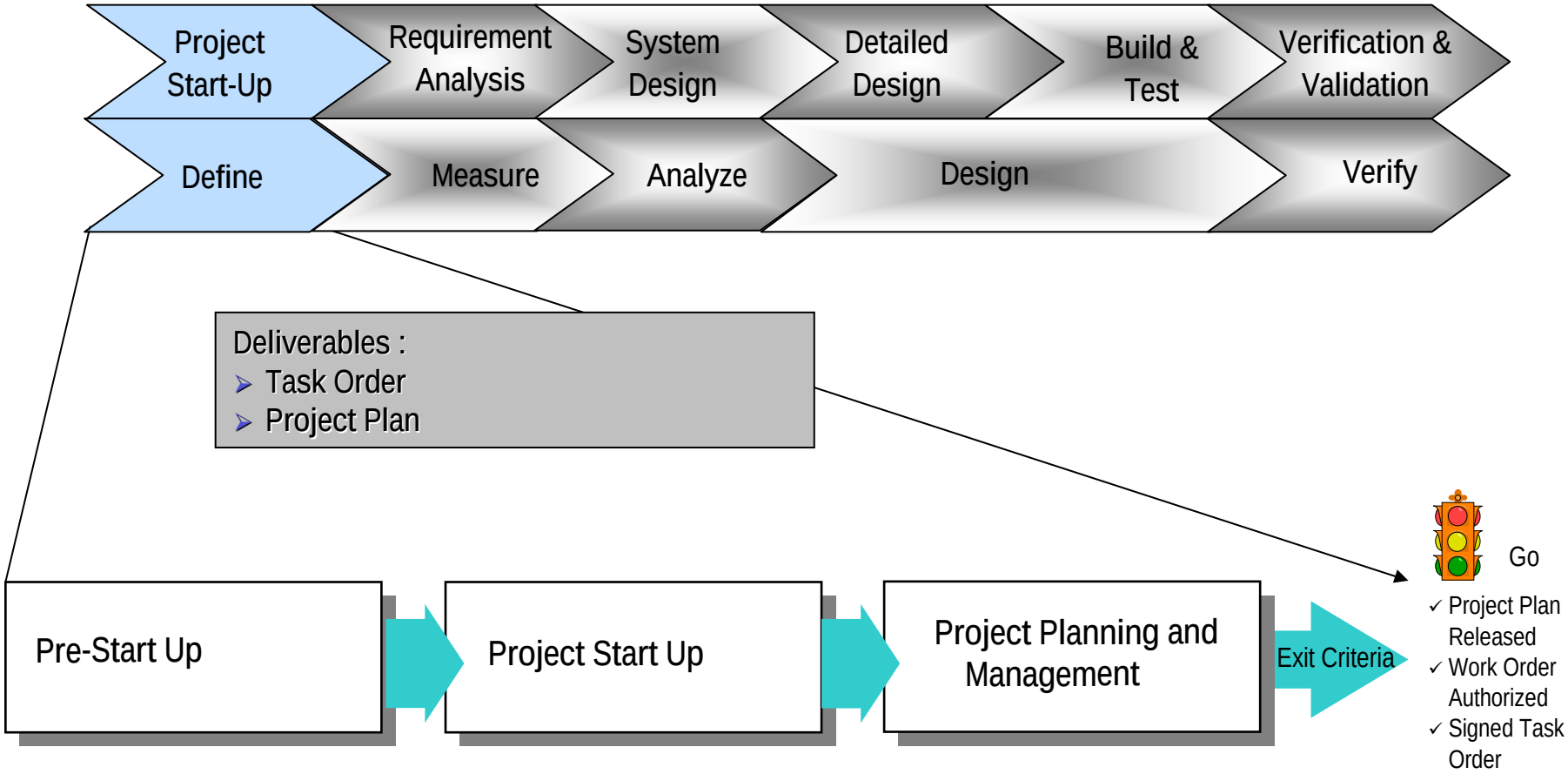
A tool to identify failure modes of a process or product, estimate the risks (severity, occurrence and detection) and prioritize actions to be taken

How it is relevant?

FMEA helps in achieving the specific goals of Risk Management PA as it:

- identifies potential failure modes and rates the severity of their effect
- offers an objective evaluation of the occurrence of causes and the ability to detect when those causes occur
- ranks the order of potential product and process deficiencies
- focuses on eliminating product and process concerns

Integrating Six Sigma with iQMS - Project Start Up



Six Sigma Tools

COPIS
Project Charter
MGPP

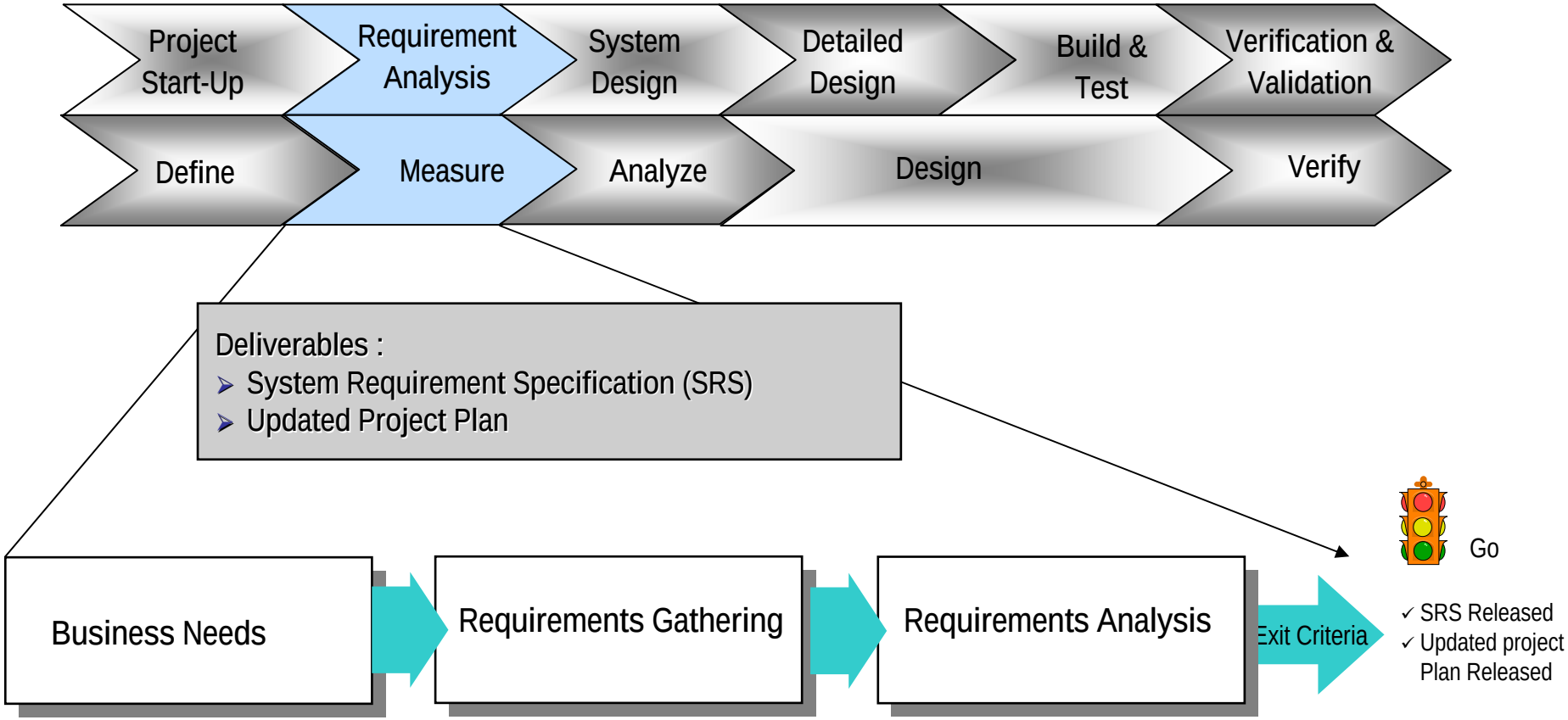
Templates

Project Plan Template
Status report Template
Project Monitoring Review Report Template

Checklists

Project Start Up Checklist
Review Report for Contract
Project Plan Review Checklist

Integrating Six Sigma with iQMS - Requirement Analysis



Six Sigma Tools

Affinity Diagram
QFD
CTQ Drill Down Tree

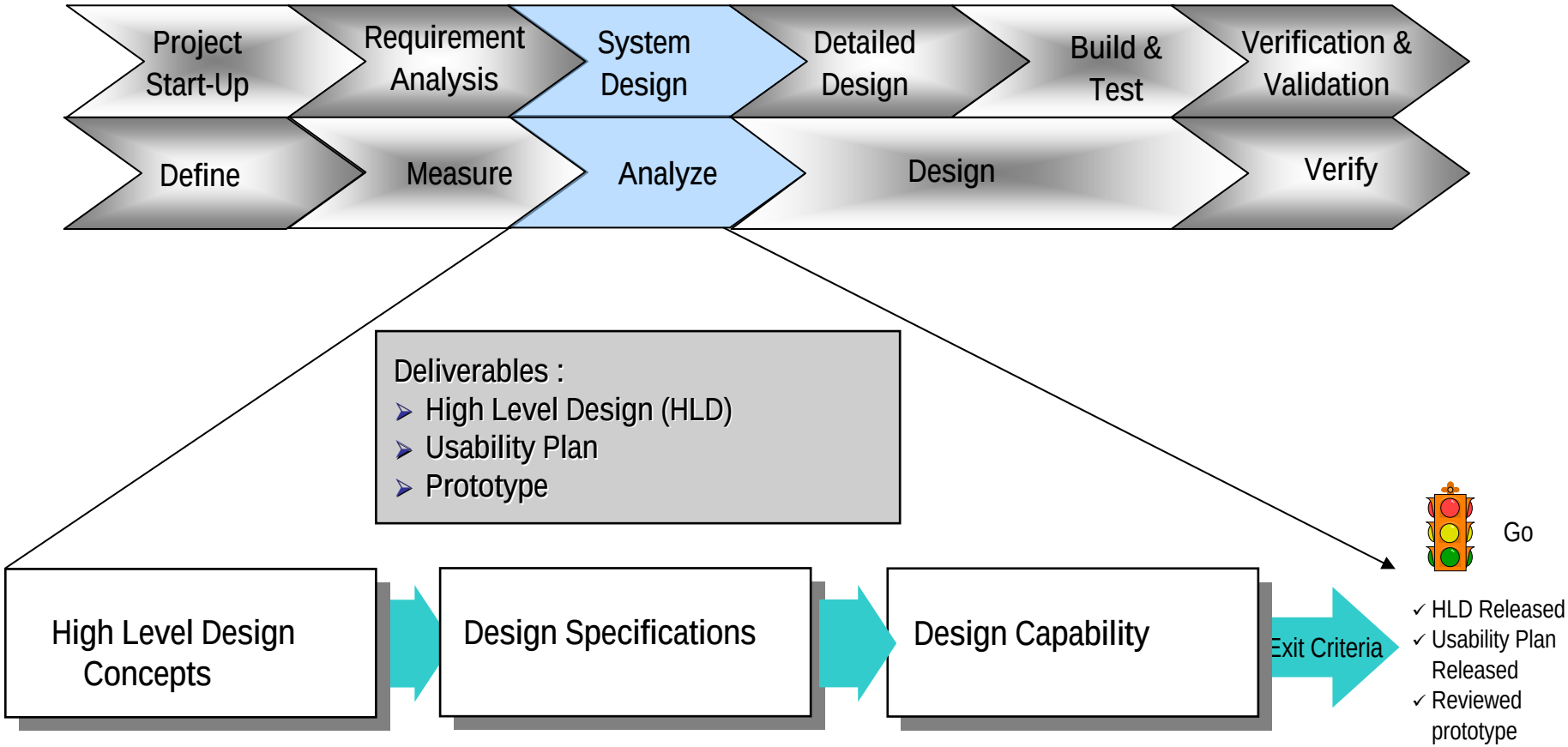
Templates

Traceability Matrix Template
System Requirement Specifications Template

Standards and Checklists

Requirements Standards

Integrating Six Sigma with iQMS - System Design



Six Sigma Tools

Use Cases
Structure Diagrams
Pugh Matrix
Risk assessment

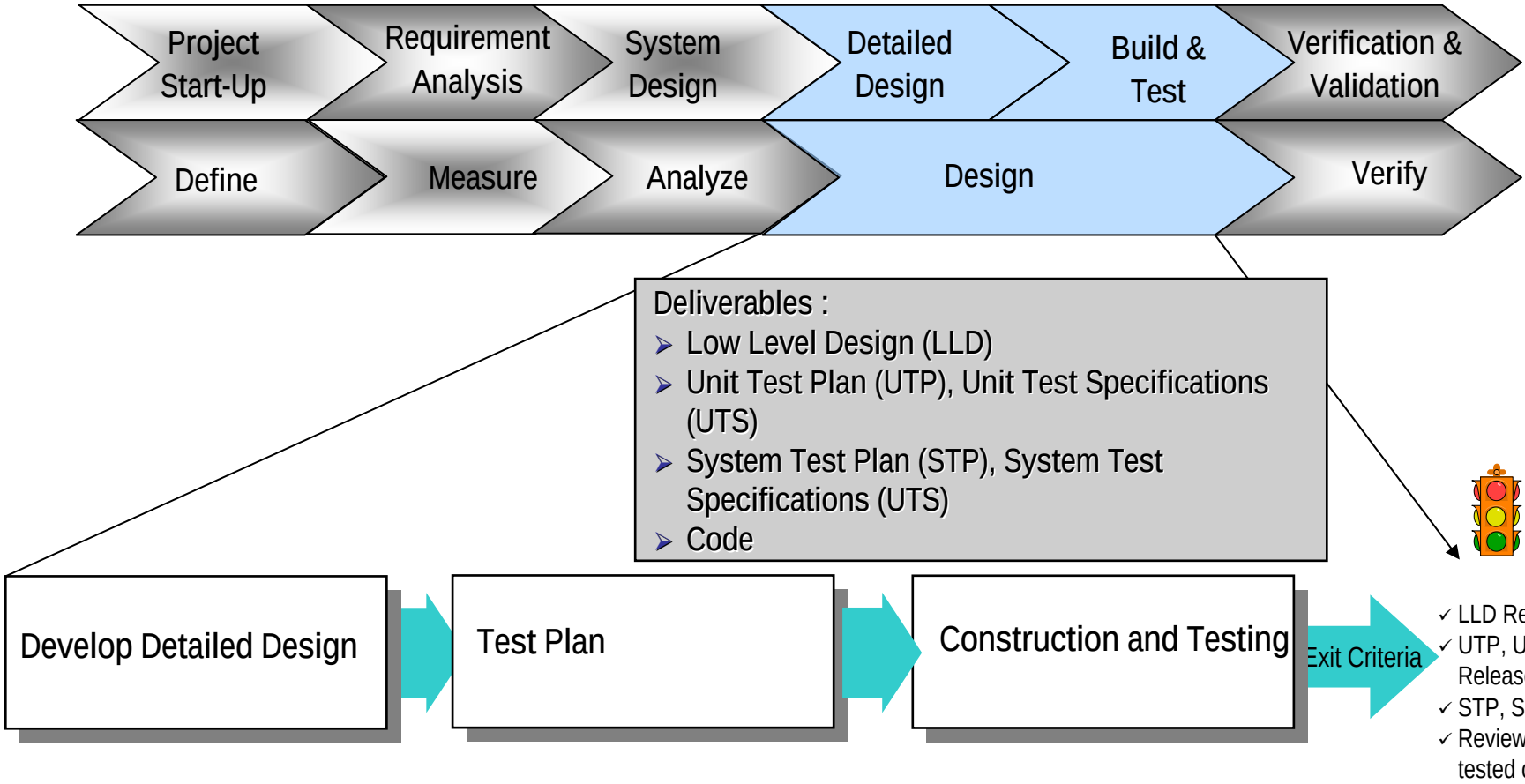
Templates

Traceability Matrix Template
Design Template

Standards & Checklists

Standards for Design

Integrating Six Sigma with iQMS - Design, Build & Test



Six Sigma Tools

Control Impact Matrix
Cost Benefit Analysis
Design of Experiments
Simulation and Modeling
FMEA
Validation Plans

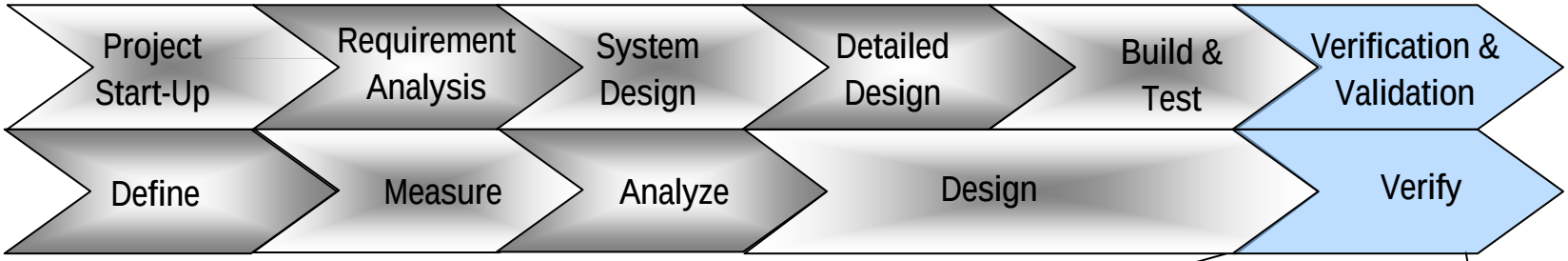
Templates

Traceability Matrix Template
Low Level Design Template
Test Plan Template

Standards and Checklists

Standards for Design
Coding Standards
Code Review Checklists
Final Inspection Checklist

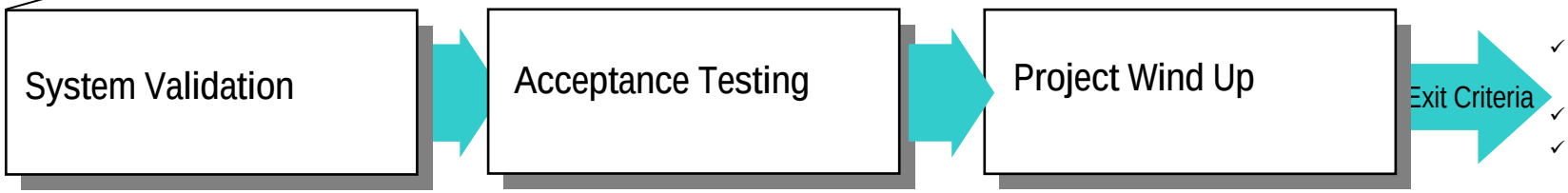
Integrating Six Sigma with iQMS - Verification & Validation



Deliverables :

- **Acceptance letter from Client**
- **Client Feedback**
- **Project Wind-up Note**

Stop



- ✓ Client acceptance letter
- ✓ Client Feedback
- ✓ Project wind-up activities completed

Six Sigma Tools

Risk Management
FMEA
Control Charts
Process Management Charts

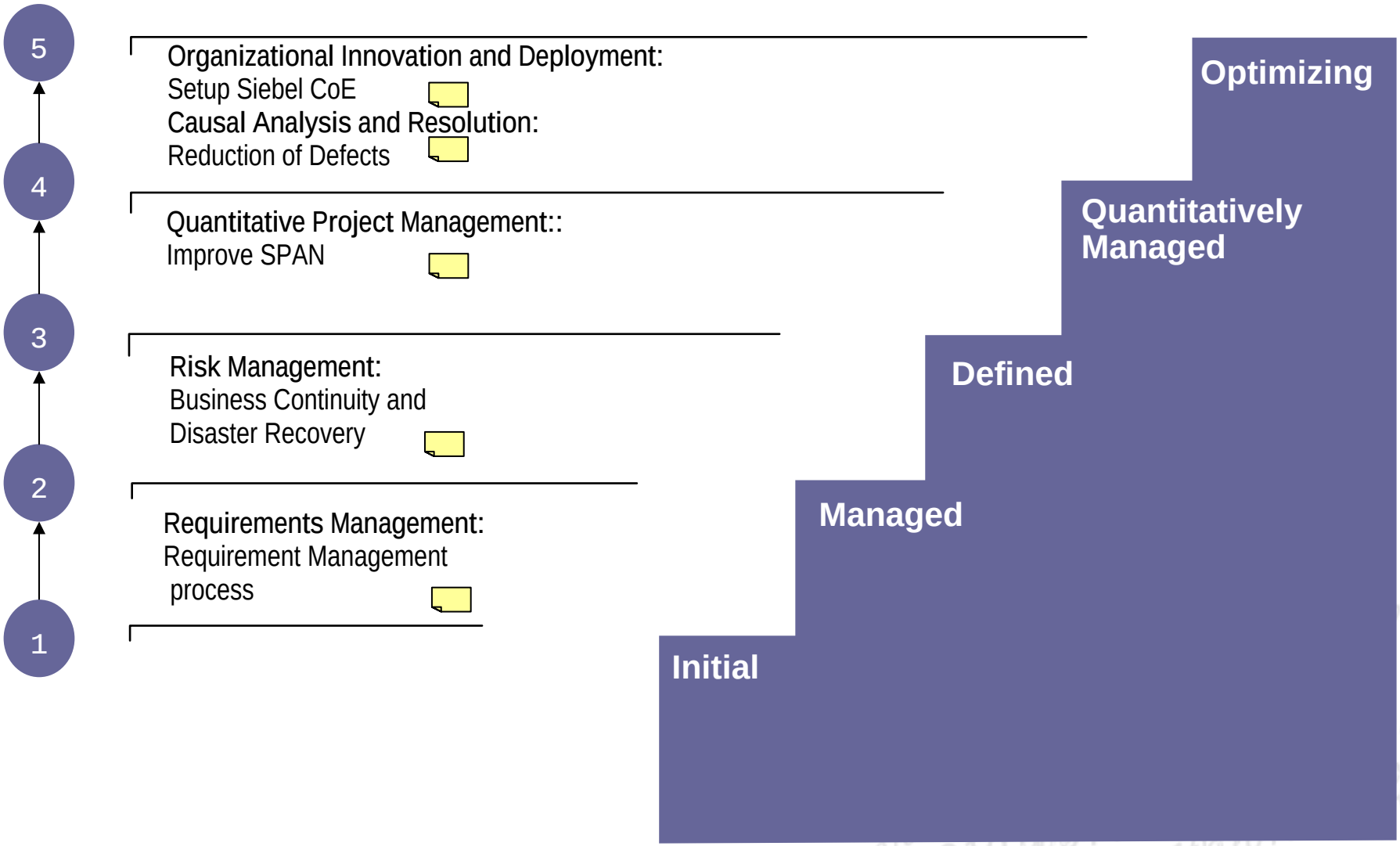
Templates

Traceability Matrix Template
Wind Up Note Template
Client Feedback Template

Standards and Checklists

Standards for Testing
Branch Metrics Standards

Six Sigma Sickle : Harvesting for Success

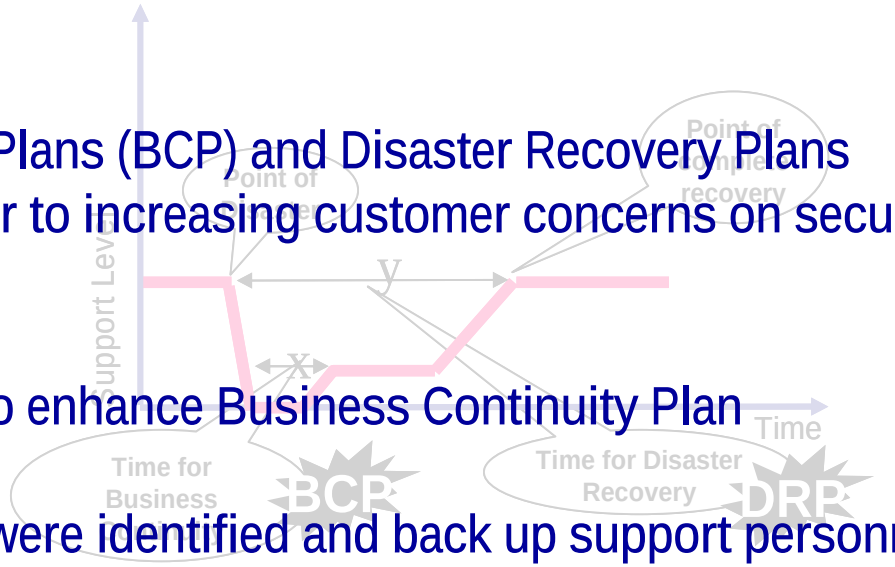


Requirements Process– Requirements Management

- The Data-Dynamics group at offsite was receiving Requirements via emails or tele-cons and keeping track of requirements/designs docs/modification histories was a huge challenge
- Six Sigma DMADV rigor was used to identify stakeholder needs
- Requirements Management system was developed as part of the improvement
- Actual results from the collected data after the implementation of the monitoring system indicated 100% efficiency in requirement management

Business Continuity and Disaster Recovery: Risk Management

- Existing Business Continuity Plans (BCP) and Disaster Recovery Plans (DRP) were inadequate to cater to increasing customer concerns on security and continuity
- Six Sigma DMAIC rigor used to enhance Business Continuity Plan
- Mission Critical applications were identified and back up support personnel created at alternate locations
- BCP and DRP made mandatory part of Risk Management for every maintenance project



Reduction of Defects – Causal Analysis and Resolution

- A high level study of operational metrics in Defect Tracker indicated that roughly 50% of the cases reported were either defects in delivery or production problem and the cycle time for fixing defects was unpredictable
- Causal Analysis techniques were used to identify vital causes and solutions to address them were identified using Six Sigma rigor
- A dedicated Quality Assurance Group and a separate group for defect change requests was setup within the project team
- Customer signed off savings of USD 125,000 incurred through the improvements

Improvements across the board.

Net Revenues signed off by Customer: $125,000

Setup Siebel CoE – Organizational Innovation and Deployment

PA- Organizational Innovation and Deployment:

To select and deploy incremental and innovative improvements that measurably improve the organization's processes and technologies. The improvements support the organization's quality and process-performance objectives as derived from the organization's business objectives

Define:

Problem Statement:

In the past due to lack of Siebel skilled resources, Customer had to use high cost to the team thru external resources at phenomenal costs. Additional resources were added on "Time and Material" basis and the prior Customer Siebel team had little or no Offshore leverage.

Goal Statement :

Establish a high performance Siebel CoE for Customer [illegible] using "Fixed Price" pricing model and achieving high offshore leverage.

MGPP:

Phase 1: Setting up CoE [illegible] 1 successful Siebel Release in 3 months.

Phase 2: On-[illegible] deployed, ODC team Siebel Certified, SLAs defined and reported

Measure:

Customers Satisfaction

- Technology Team
- Business [illegible] Super Users
- Sales Representatives (End Users / *Daily Siebel User)*

CBM was used to prioritize CTQs

Measures of Success:

- Compliance of the SLA between ODC Support team and IT Team
- Customer satisfaction index as expected
- Siebel Application performance meets SLAs with End Users

Analyze:

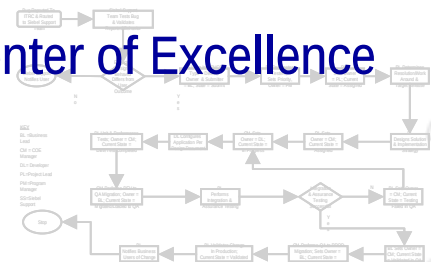
- High Level Process Map was prepared
- Scorecard developed to monitor the CoE

"Quarterly Tracking Sheet"

Activities	Responsibility	Jan-Nov 01 (Baseline)	Dec-01	Q1 - 02 Planned	Q1 - 02 Actual	Q2 - 02 Planned	Q2 - 02 Actual	Q3 - 02 Planned	Q3 - 02 Actual	Q4 - 02 Planned	Q4 - 02 Actual
Business	GE	100%		100%		100%		95%		90%	
	CoE - ON	0%		0%		0%		5%		10%	
	CoE - OFF	0%		0%		0%		0%		0%	
Requirements	GE	0%		0%		0%		10%		25%	
	CoE - ON	0%		0%		0%		10%		25%	
	CoE - OFF	0%		0%		0%		0%		0%	
Design	GE	70%		70%		50%		25%		25%	
	CoE - ON	30%		30%		40%		50%		50%	
	CoE - OFF	0%		0%		10%		25%		25%	
Development	GE	20%		0%		0%		0%		0%	
	CoE - ON	80%		75%		40%		25%		25%	
	CoE - OFF	0%		25%		60%		75%		75%	
Testing	GE	50%		50%		50%		25%		25%	
	CoE - ON	50%		35%		25%		50%		25%	
	CoE - OFF	0%		15%		25%		25%		50%	
Deployment	GE	100%		75%		50%		50%		50%	
	CoE - ON	0%		25%		50%		50%		50%	
	CoE - OFF							0%		0%	
Knowledge Transfer	GE		50%								
	CoE - ON		50%								
	CoE - OFF		0%								
Documentation	GE	75%	50%	50%		33%		33%		33%	
	CoE - ON	10%	50%	35%		33%		33%		33%	
	CoE - OFF	0%		15%		33%		33%		33%	
R&D / analysis	GE										
	CoE - ON										
Escalated	CoE - ON										
Support issues	CoE - OFF										
Resources	GE	4	5	6		6		6		6	
	CoE - ON	2	6	4		2		2		2	
	CoE - OFF	1	0	2		4		3		3	

Design:

PVCS Tracker – process flow



Verify:

FTR and OTD SLAs met by the ODC Team

Benefits sign-off by Customer Quality Leader

Cost Savings: (Contractor) – (Fixed Price Cost)

(US $) 791,250 – 210,000 = 581,250

- Due to shortage of Siebel skilled resources, Customer had to use high cost alternatives
- Using Six Sigma DMADV rigor a Siebel Center of Excellence was developed at GDC
- Members of the CoE were deployed for the customer projects
- Customer signed off savings of USD 581,250 incurred through the improvements
- Achieved First Time Right and On Time Delivery by the Center of Excellence team

For questions contact

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