ITC INFOTECH

Business-friendly Solutions

International Standards & Models

Quality Certification Program

Section 1.2 : General Awareness Session

Table of Contents

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Objectives

- **To familiarize with the terms and concepts of the following:**
  1. **An introduction to standards and models**
  2. **Benefits of standards and models**
  3. **Vocabulary of International Standards and Models**
  4. **ISO 9001 standard**
  5. **Introduction to CMMi v1.3**
  6. **Six Sigma Methodology**
  7. **ISO 20000**
  8. **ISO 27001**
  9. **ITIL**
  10. **IEEE Standards**

Definition of Standard

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- A definition or format approved by a recognized standards organization or accepted as a de facto standard by the industry.
- Standards exist for programming languages, operating systems, data formats, communications protocols, and electrical interfaces.
- Some of the common standards are set by one of the following organizations:
  - ANSI (American National Standards Institute)
  - ITU (International Telecommunication Union)
  - IEEE (Institute of Electrical and Electronic Engineers)
  - ISO (International Organization for Standardization)
  - VESA (Video Electronics Standards Association)
  - IEC (International Electrotechnical Commission)
  - EN (European Standards)
  - BSI (British Standards)

Why use Standards & Models?

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- To adopt best practices, discipline
- For a Systematic approach to work
- To Reduce cost of rework and improve productivity
- To Improve employee involvement, morale and work culture
- For international recognition of quality and export worthiness

Why use Standards & Models?

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- **A Model is used**
  - **To help set process improvement objectives and priorities, improve processes, and provide guidance for ensuring stable, capable, and mature processes**
  - **As a guide for improvement of organizational processes**

List of Standards & Models

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- **ISO 9001:2008 : It specifies the requirements for a quality management system**
- **ISO 20000 : It promotes the adoption of an integrated process approach to effectively deliver managed services to meet business and customer requirements.**
- **ISO 27001 (BS7799) : Information Security Management System based on British Standard BS 7799 (now known as ISO 27001).**
- **ITIL : Information Technology Infrastructure Library (ITIL) framework essentially defines how to organize the system and network management departments within individual organizations.**
- **SEI – CMMI : The Capability Maturity Model Integration, developed by Software Engineering Institute.**
- **Six Sigma : Business Improvement methodology / A philosophy focusing on reducing the process variation / Focuses on eliminating defects through practices that emphasize understanding, measuring and improving processes**

Brief on ISO Standard

- **What does the term "ISO" stand for?**
  - **The term ISO stands for the International Organization for Standardization.**
  - **‘ISO’ in Greek means ‘equal’, and ISO tries to convey the idea of equality - the idea that standards are developed to place organizations on an equal footing.**
- **Does the ISO 9001 standard apply to any organization?**
  - **It applies to all kinds of organizations - product or service oriented.**
  - **It's a generic process standard and works the same in all cases.**

ISO 9001 : 2008

Details of the Standard

- This standard specifies requirements for a quality management system
- The organizations must meet the requirements of this standard in order to achieve certification
- Many organizations are implementing ISO 9001:2008 QMS standard without obtaining its certification
- Needs to demonstrate the ability to consistently meet customer requirements
- Enhance customer satisfaction
  - Effective application of the (quality) system
  - Continuous improvement using measurements

ISO 9001:2008

8 Quality Management Principles

ISO 9001:2008 QMS standard is built on the below 8 quality management principles

- **Customer Focus**
  - Understand current and future needs and expectations of customers for products, delivery, price, dependability etc
- **Leadership**
  - Leaders establish unity of purpose and direction of the organization
  - Leadership in organization should create and maintain the internal environment in which people can become fully involved in achieving the organization's objectives
- **Involvement of People**
  - People at all level are essence of an organization
  - Quality happens through people
- **Process Approach**
  - A desired result can be achieved more efficiently when all related resources and activities are managed as a process

ISO 9001:2008

8 Quality Management Principles

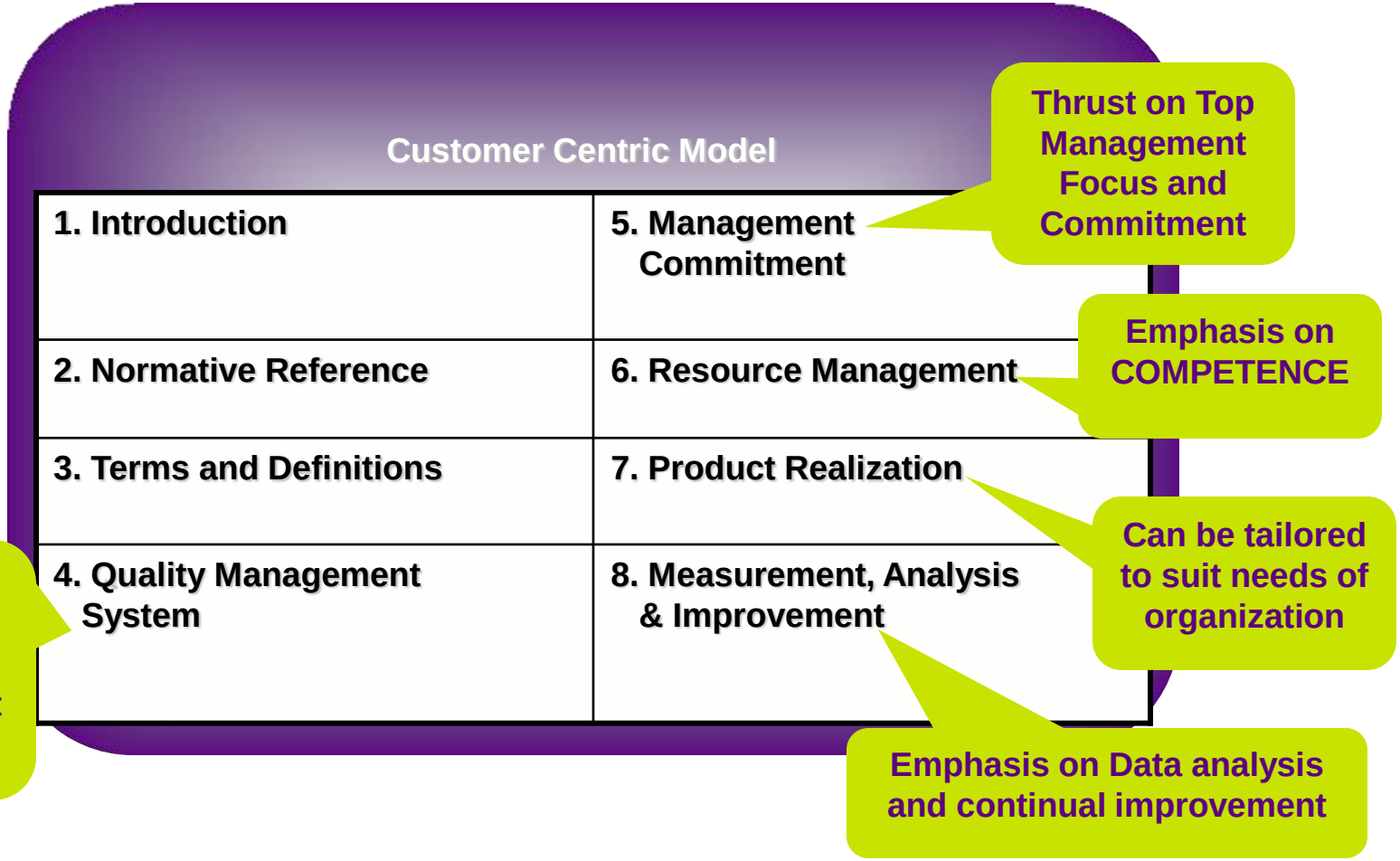
- **System Approach to Management**
  - A system contains various interrelated processes
  - Identify, understand and manage a system of interrelated processes for a given objective
  - A system approach to management improves organization's effectiveness and efficiency

- **Continual Improvement**
  - Improvement never end s and continual improvement should be the permanent objective of an organization
  - It's necessary for consistent growth of an organization

- **Factual Approach to Decision-Making**
  - Effective decisions are based on analysis of data and information

- **Mutually Beneficial Supplier Relationships**
  - An organization and its supplies are interdependent
  - A mutually beneficial relationship between the organization and its suppliers enhances the ability to both to create value to each other.

ISO 9001:2008
An Overview



- Clauses 1-3 are generic in nature and clauses 4-8 cover the actual QMS requirements of ISO 9001:2008 standard

Benefits of ISO 9001:2008 Certification

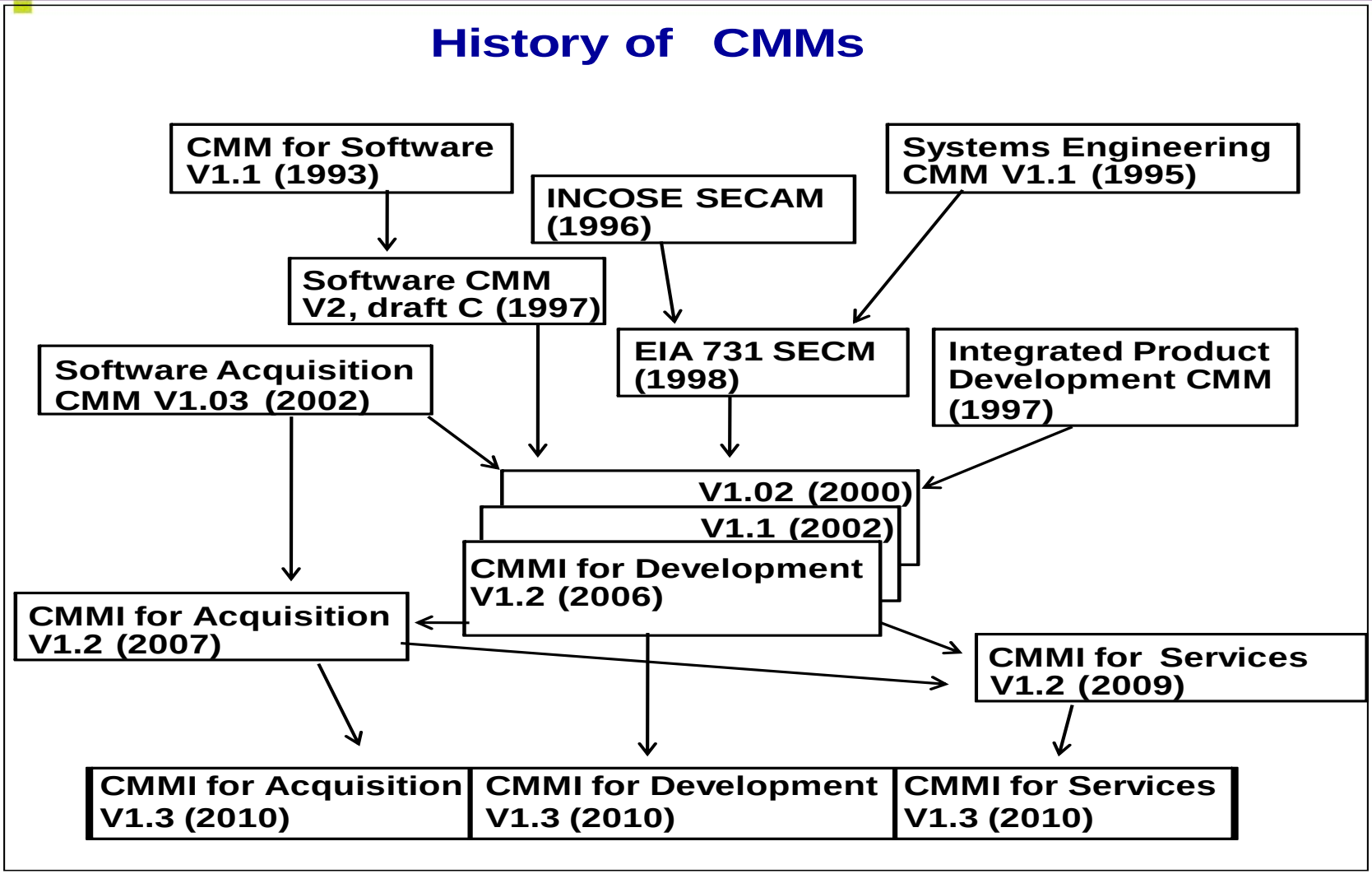
- Internal operational efficiency
- Lower production costs because of fewer nonconforming products, less rework, lowered rejection rates, streamlined processes and fewer mistakes.
- Access to new markets
- Some markets require ISO 9001 Registration, some markets favor companies with ISO 9000 Registration
- Customer request
- Many organizations are asked by a customer to obtain registration as a requirement to continue or to start doing business with them.

Brief on CMMi Model

- The abbreviation ‘CMMi’ stands for Capability Maturity Model Integration, developed by Software Engineering Institute.
- CMMI is a model that contains the essential elements of effective processes for one or more disciplines and describes an evolutionary improvement path from ad hoc, immature processes to disciplined, mature processes with improved quality and effectiveness.
- CMMi models are collections of best practices that help organizations to improve their processes.
- It is a process improvement approach that provides organizations with the essential elements of effective processes.
- It is used to guide process improvement across a project, a division, or an entire organization.
- It helps to integrate traditionally separate organizational functions, set process improvement goals and priorities.

CMMi

History of CMMs



CMMi

The CMMi framework

- **The CMMi Framework is the structure that organizes the components used in generating models, training materials and appraisal methods**

- **The components in CMMI Framework are organized into groupings called constellations.**

- **Three constellations have been commissioned by CMMI steering group**

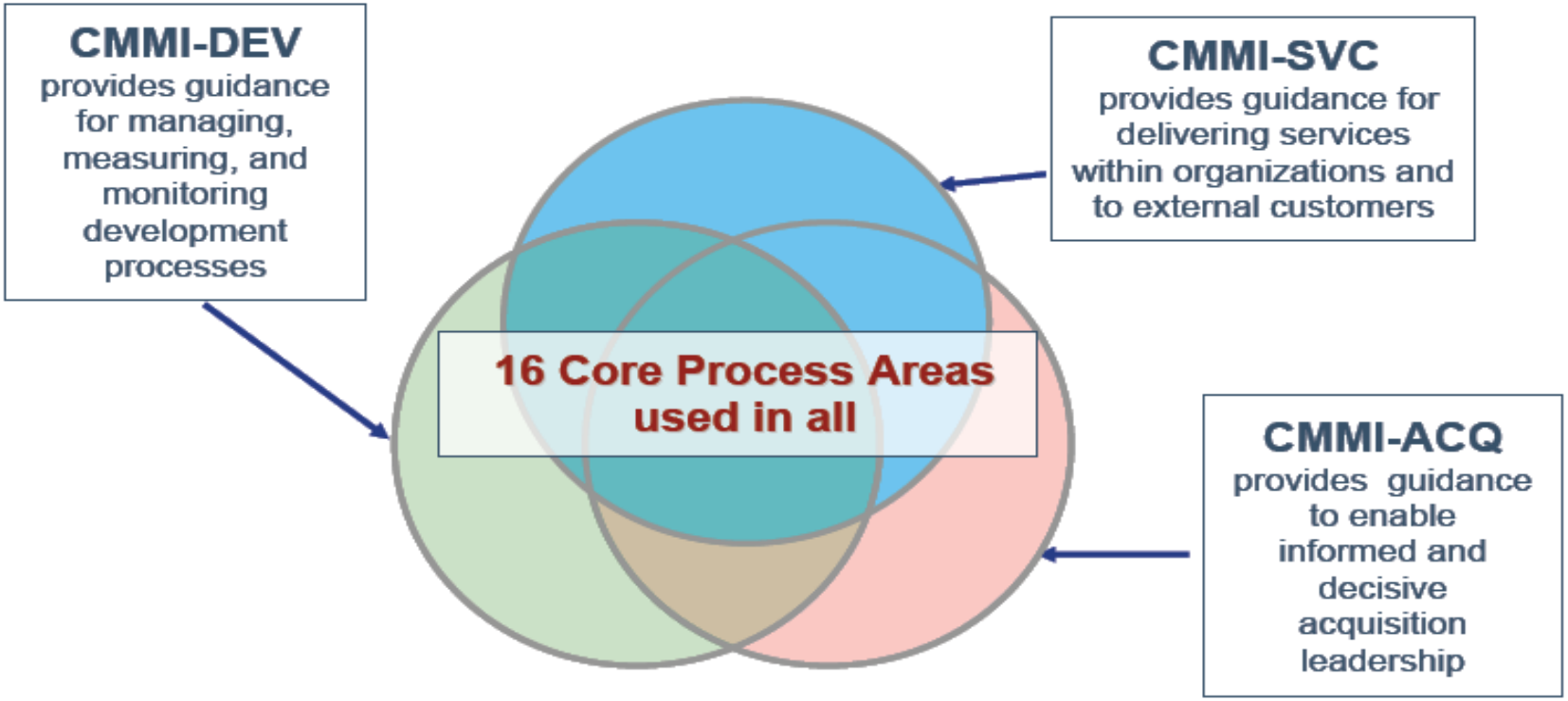
  - **CMMi for Development (CMMI-DEV)**
  - **CMMi for Services (CMMI-SVC)**
  - **CMMi for Acquisition (CMMI-ACQ)**

CMMi

CMMi Constellations

- CMMi for Development (CMMi-DEV) provides a comprehensive integrated set of guidelines for developing products and services
- CMMi for Services (CMMi-SVC) provides a comprehensive integrated set of guidelines for providing superior services
- CMMi for Acquisition (CMMi-ACQ) provides a comprehensive integrated set of guidelines for acquiring products or services
- The current version for all the above three constellations is 1.3

Three Complementary Constellations



CMMi

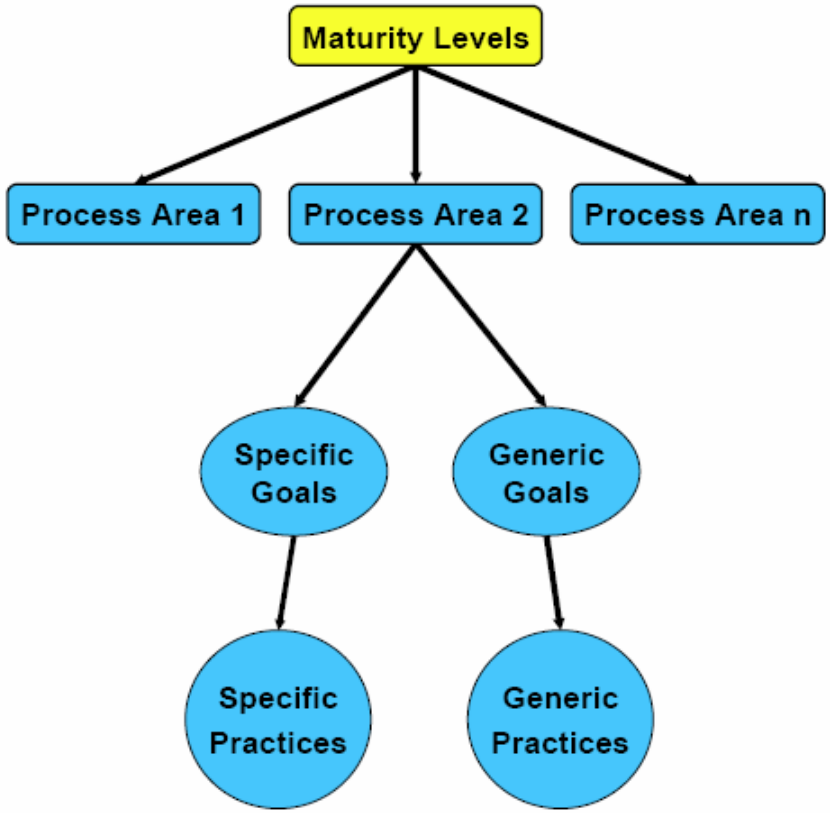
Representations of CMMi

- **There are two representations focused by CMMi:**
  - **Staged Representation**
    - **It looks at it from capability point of view.**
    - **It groups process areas into 5 maturity levels**
  - **Continuous Representation**
    - **It looks at it from the maturity point of view**
    - **It defines capability levels within each profile.**

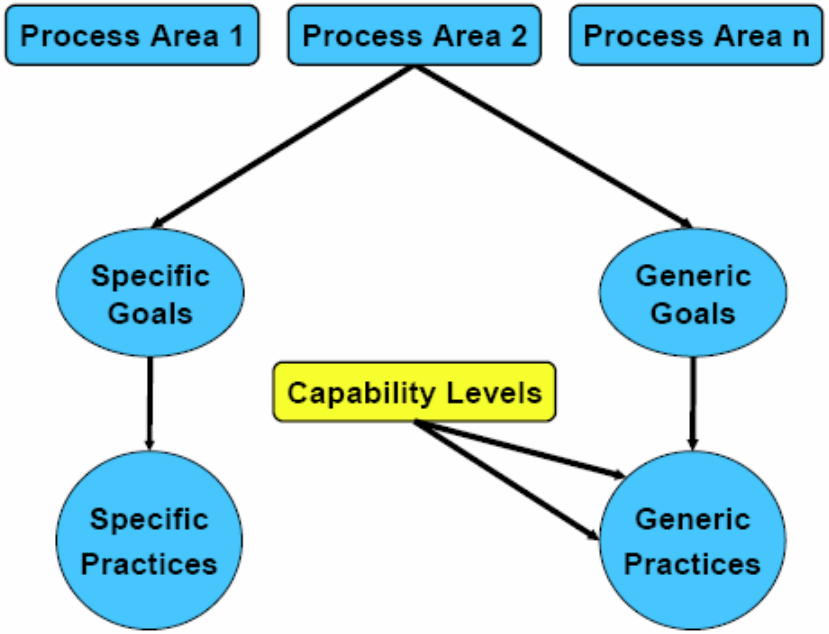
CMMi

CMMi Model Structure

Staged representation



Continuous representation



CMMi
Practice Concept

- A practice is an action to be performed in order to achieve goals of a Process Area
- CMMI contains two types of practices:
  - Specific Practices
  - Generic Practices

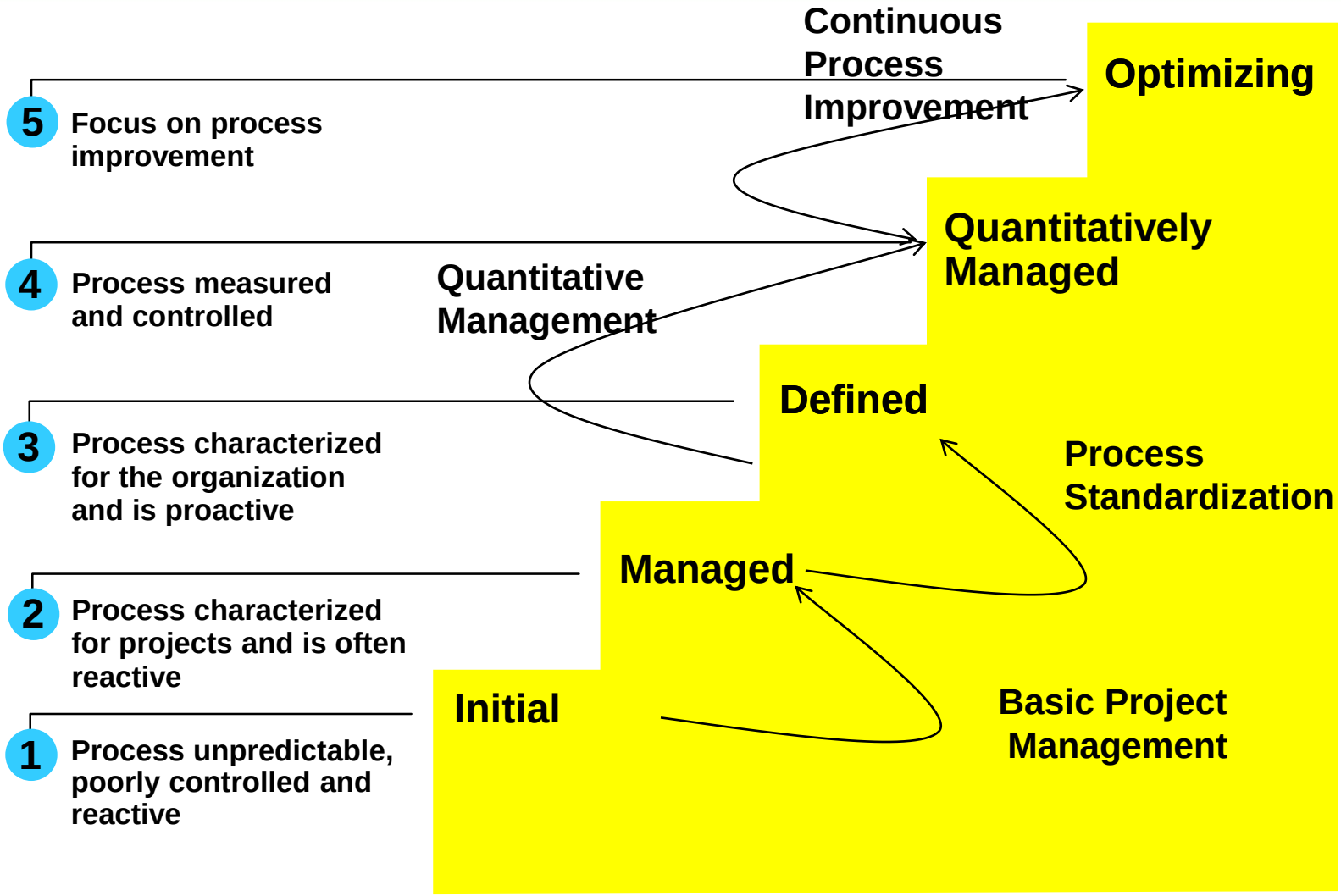
- A **specific practice** is the description of an activity that is considered important in achieving the associated specific goal.
- **Generic practices** are called “generic” because the same practice applies to multiple process areas.

CMMi
Goal Concept

- **A goal is a high level outcome to be achieved by effective implementation of practices**
- **There are two kinds of goals in each PA:**
  - Specific Goals
  - Generic Goals
- **A specific goal describes the unique characteristics that must be present to satisfy the process area. A specific goal is a required model component and is used in appraisals to help determine whether a process area is satisfied.**
- **A generic goal describes the characteristics that must be present to institutionalize the processes that implement a process area.**

CMMi

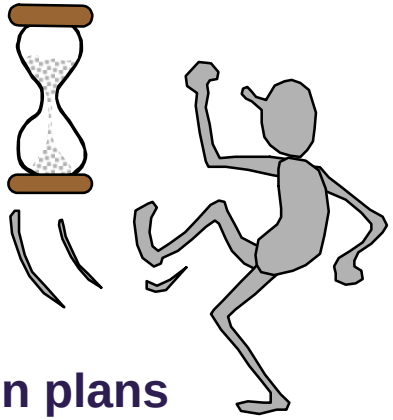
Maturity Levels



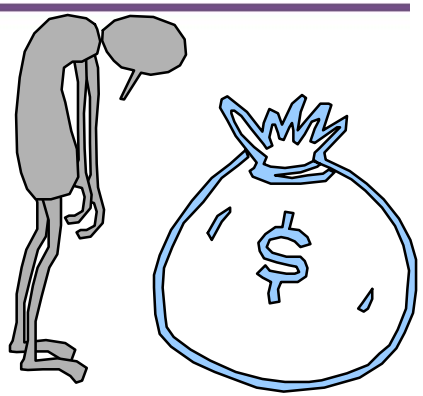
CMMi Maturity Levels

1 – INITIAL LEVEL

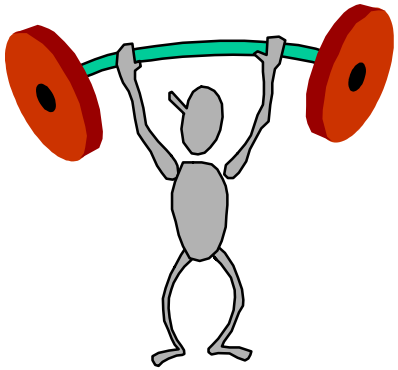
over commitment



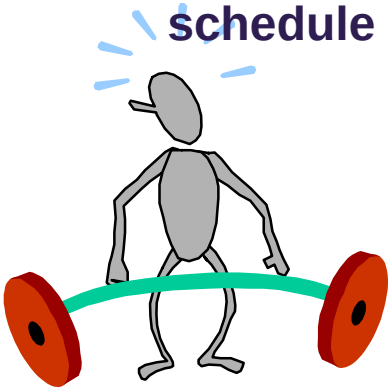
abandon plans and procedures



product may work but exceed budget and schedule



success depends on competence and heroics of individuals



not repeatable

CMMi Maturity Levels

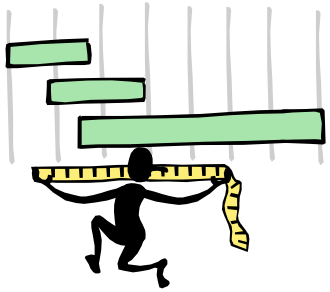
2 – MANAGED LEVEL

Basic Project Management

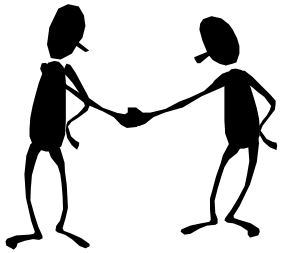
realistic commitments

standards defined and followed

control integrity of work products



track cost, schedule and functionality



effective relationships with subcontractors

CMMi Maturity Levels

3 – DEFINED LEVEL

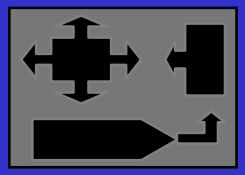
Coordination
Between groups

Tailoring

software project

Project's standard
software process

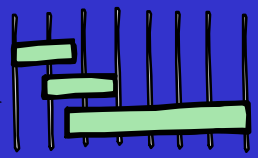
organisation's standard
software process



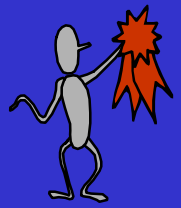
software
engineering
processes

Process Assets
& Metrics

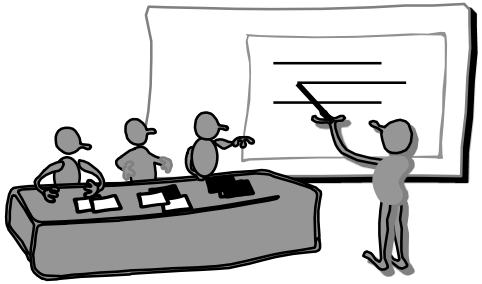
organisational
Responsibility for
Process Improvement



software
management
processes



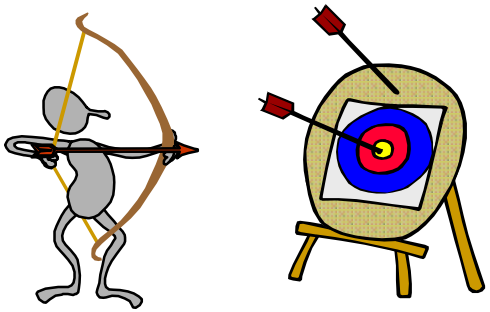
best practices



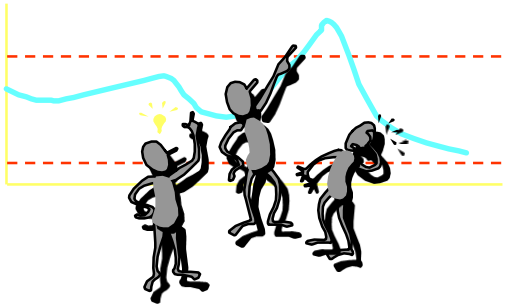
organisation wide
training program

CMMi Maturity Levels

4 – QUANTITATIVELY MANAGED LEVEL

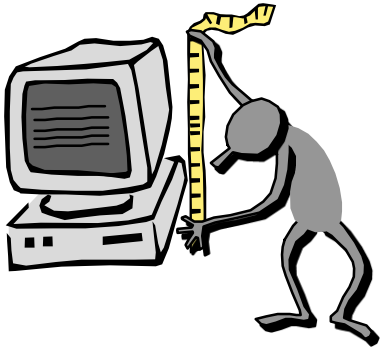


The organisation and projects set quantitative quality goals



Address Special Causes of Variance

For processes

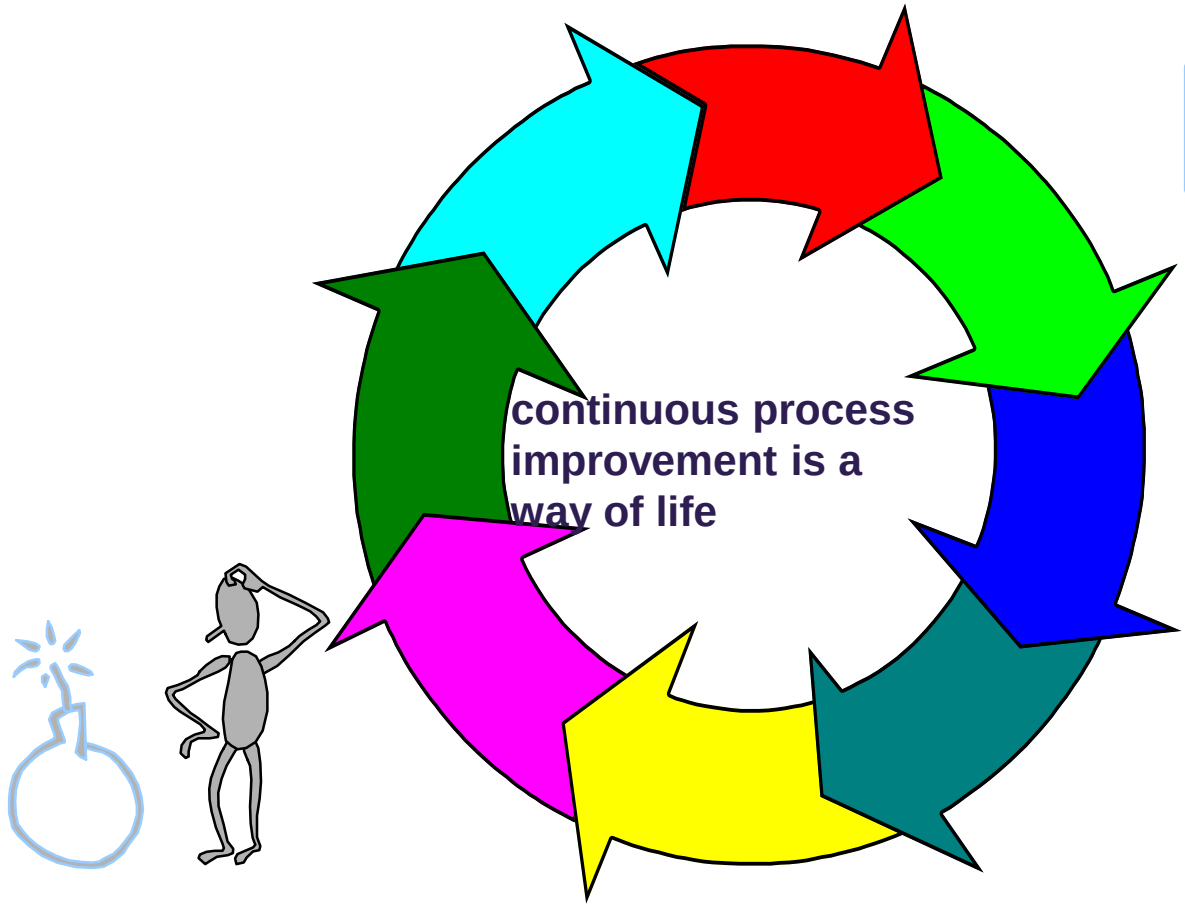


Predictable, Superior Quality Products Developed

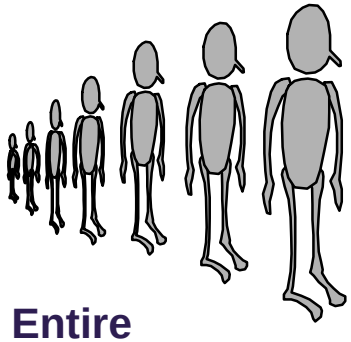
For products

CMMi Maturity Levels

5 – OPTIMIZING LEVEL



cost / benefit analysis of new technologies



Entire Organization is involved

analysis of weaknesses and defects to prevent recurrence

CMMi-DEV Process Area Categories

CMMi – Dev v1.3 has got 22 Process Areas (PAs), 3 generic goals and 48 specific goals

ML	Engineering	Project Management	Process Management	Support
5			Organizational Performance Management	Causal Analysis and Resolution
4		Quantitative Project Management	Organizational Process Performance	
3	Validation Verification Product Integration Technical Solution Req. Development	Risk Management IPM	Organizational Training OPD OPF	Decision Analysis and Resolution
2		Supplier Agreement & Mgmt. Project Monitoring & Ctrl. Project Planning Requirement Mgmt.		Configuration Mgmt. PPQA MA

CMMi

Process Areas - Maturity Level Wise

Level 2	Level 3	Level 4	Level 5
✓Requirements Management (REQM) ✓Project Planning (PP) ✓Project Monitoring and Control (PMC) ✓Supplier Agreement Management (SAM) ✓Measurement & Analysis (MA) ✓Process and Product Quality Assurance (PPQA) ✓Configuration Management (CM)	✓Requirements Development (RD) ✓Technical Solution (TS) ✓Product Integration (PI) ✓Verification (VER) ✓Validation (VAL) ✓Organizational Process Focus (OPF) ✓Organizational Process Definition (OPD) ✓Organizational Training (OT) ✓Integrated Project Management (IPM) ✓Risk Management (RSKM) ✓Decision Analysis and Resolution (DAR)	✓Quantitative Project Management (QPM) ✓Organizational Process Performance (OPP)	✓Organizational Performance Management(OPM) ✓Causal Analysis and Resolution (CAR)

CMMi

Process Areas – Category Wise

Engineering

- Requirements Development
- Technical Solution
- Product Integration
- Verification
- Validation

Project Management

- Requirements Management
- Project Planning
- Risk Management
- Integrated Project Management
- Project Monitoring and Control
- Quantitative Project Management
- Supplier Agreement Management

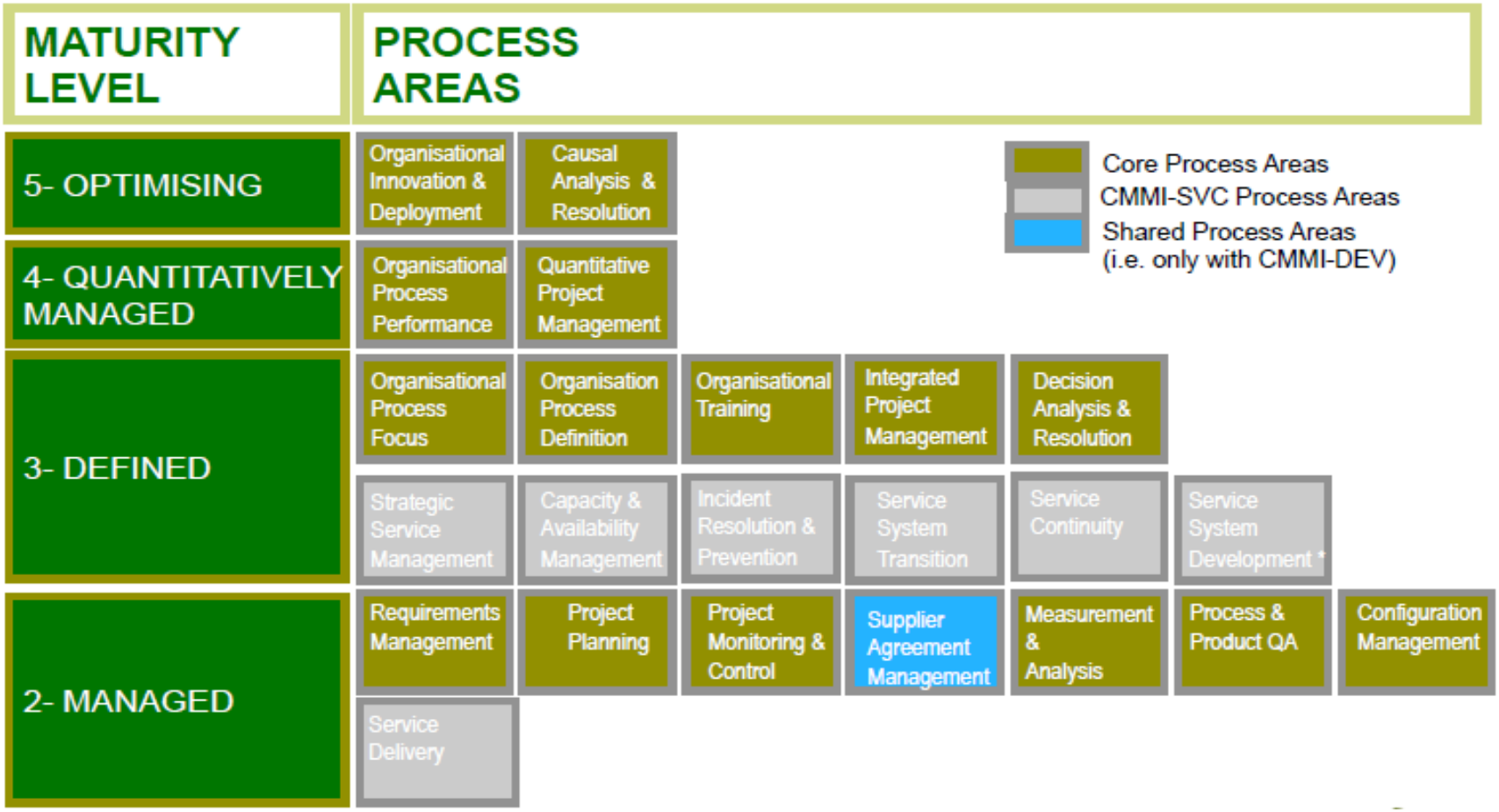
Support

- Configuration Management
- Measurement and Analysis
- Process and Product Quality Assurance
- Decision Analysis and Resolution
- Causal Analysis and Resolution

Process

- Organizational Process Definition
- Organizational Process Focus
- Organizational Training
- Organizational Process Performance
- Organizational Innovation and Deployment

The CMMI-SVC Model



Benefits of CMMi

- **CMMi best practices enable organizations to do the following:**
  - **more explicitly link management and engineering activities to their business objectives**
  - **expand the scope of and visibility into the product lifecycle and engineering activities to ensure that the product or service meets customer expectations**
  - **incorporate lessons learned from additional areas of best practice (e.g., measurement, risk management, and supplier management)**
  - **implement more robust high-maturity practices**
  - **address additional organizational functions critical to their products and services**
  - **more fully comply with relevant ISO standards**

ISO 9001:2008 – CMMi V1.3 Mapping

Clause No.	ISO 9001:2008	CMMi V1.3
4.0	Quality Management System	OPF, OPD, PP, PPQA, CM, SAM
5.0	Management Responsibility	OPF, OPD, RD, PMC, OPP, QPM
6.0	Resource Management	OT
7.0	Product Realization	RM, RD, TS, PI, MA, QPM, VER, VAL, OPD, PP, PMC, IPM, CM, SAM
8.0	Measurement, Analysis & Improvement	PMC, PPQA, MA, CM, RM, RD, SAM, OPF, VER, VAL, OID, OPP, QPM, CAR

Six Sigma

What is Six Sigma?

1. Six Sigma is a powerful approach to improving processes to do things better, faster, and at lower cost. It can be applied to every facet of business, from production, to human resources, to order entry, to technical support.
2. Six Sigma uses a specific philosophy, measure, and methodology to provide tangible savings that are directly traceable to the bottom line.
3. It corresponds to 3.4 defects per every million opportunities (DPMO).
4. In other words, it corresponds to the process being 99.99966% defect-free.

What is Six Sigma Philosophy?

1. Understanding customers' priority
2. Assessing current performance
3. Leveraging facts and data
4. Sustaining improvement

Six Sigma

Some of the Six Sigma Methodologies?

1. **DMAIC:**
   - Define
   - Measure
   - Analyse
   - Improve
   - Control
2. **DMADV**
   - Define
   - Measure
   - Analyse
   - Design
   - Verify)
3. **DFSS**
   - Design for Six Sigma

Some Common Myths on Six Sigma

MYTH	ACTUAL
Six Sigma is about Statistics.	A tool for improvement.
Six Sigma is a quality program like ISO and CMM.	An improvement methodology or Business Management System.
Six Sigma is appropriate for manufacturing processes.	Applicable for any type of process.
To attain Six Sigma – need to strive for 3.4 defects per million opportunities.	To define a standard measurement to achieve improvement, but not to attain Six Sigma.
Does an organization get certified?	Individuals practicing Six Sigma get certified and not organizations.

ISO 20000

What is ISO/IEC 20000 Standard?

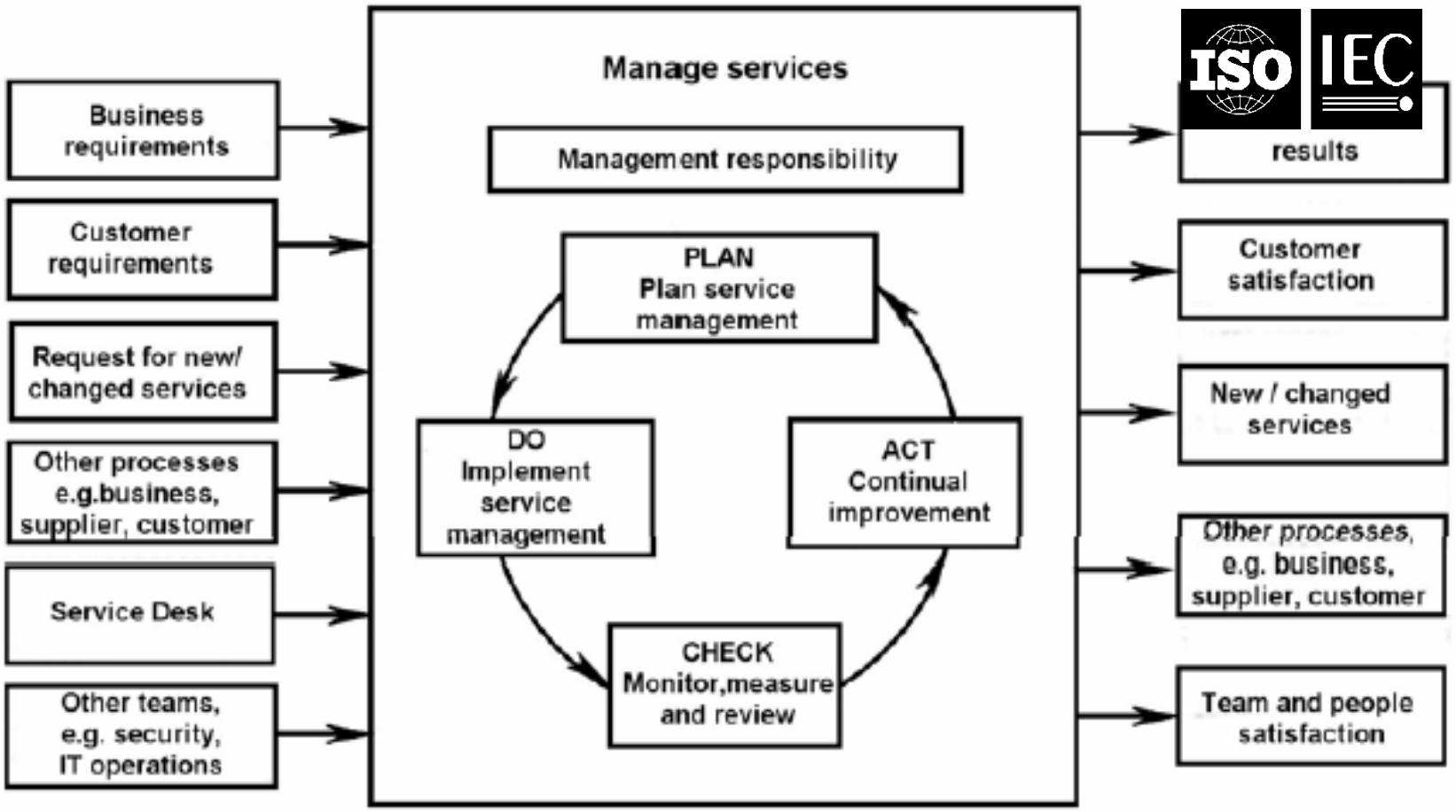
- ISO (the International Organization for Standardization) and IEC (the International Electro Technical Commission) form the specialized system for worldwide standardization.
- In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.
- The main task of the joint technical committee is to prepare International Standards.
- ISO/IEC 20000 is an international IT Service Management Standard.
- ISO/IEC 20000 publication has two parts:
  - Part 1 – Specification
  - Part 2 – Code of Practice

Brief on ISO 20000 Standard

- **It promotes the adoption of an integrated process approach to effectively deliver managed services to meet the business and customer requirements. It comprises ten sections:**
  - ***Section 1:*** **Scope of the Standard**
  - ***Section 2:*** **Definitions**
  - ***Section 3:*** **Management Responsibility**
  - ***Section 4:*** **Planning and implementing service management**
  - ***Section 5:*** **Planning and implementing new or changed services**
  - ***Section 6:*** **Service delivery processes**
  - ***Section 7:*** **Relationship processes**
  - ***Section 8:*** **Resolution processes**
  - ***Section 9:*** **Control Processes**
  - ***Section 10:*** **Release process**

ISO 20000

- **What would ISO 20000 Address?**



What is ITIL?

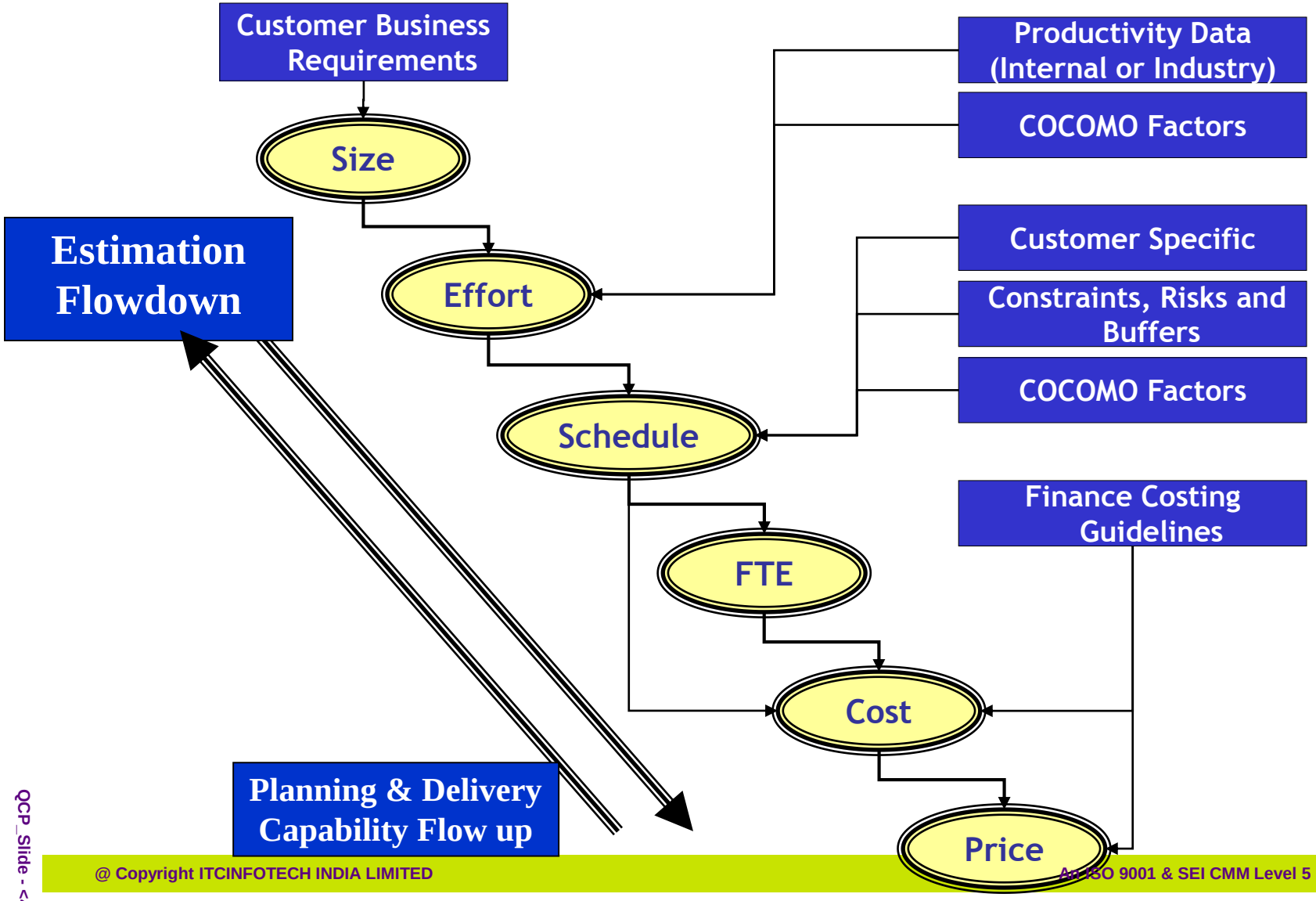
- ITIL stands for Information Technology Infrastructure Library (current version is 3);
- A best practice framework developed in UK to to facilitate the delivery of high quality IT services;
- The only comprehensive, publicly available guidance on IT service provision;
- It is descriptive and not prescriptive, as it states what to do, not how to do it;
- Offers certifications for consultants and practitioners;
- The framework has 10 basic elements.
- Is under constant development by expert IT practitioners around the world.

- **Why ITIL?**
  - **Results in controlling rising IT costs and budgets involved in managing IT.**
  - **Brings business and management point of view to traditionally technical, inward focusing IT.**
  - **A process driven approach to address all vital areas relating to operational aspects of IT**
  - **Delivery and measurement of IT Services in business terms.**
  - **Sensitive to business environment and business needs.**

IEEE Standards

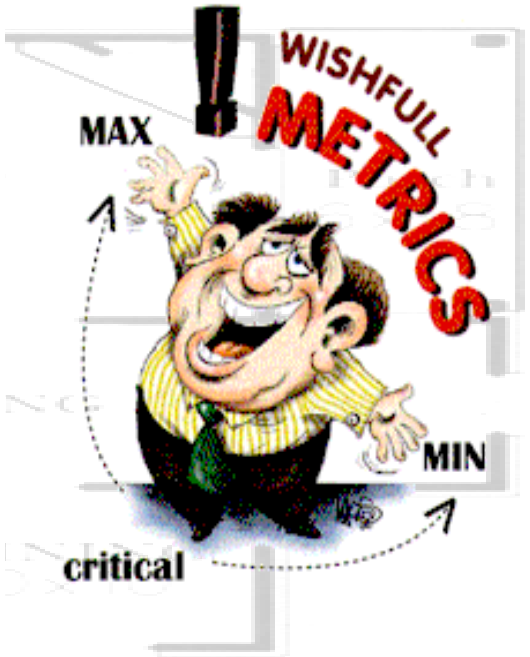
- **What are IEEE Standards for Software Engineering?**
  - **There are 40 standards that comprise IEEE software engineering standards.**
  - **IEEE Software Engineering standards are used throughout industry to maximize software development investments.**
  - **It covers software engineering terminology, processes, tools, reuse, project management, plans, documentation and measurement.**
  - **IEEE Software Engineering standards are implemented in an array of disciplines, including: Computer science, Quality management, Project management, Systems Engineering, Dependability and Safety.**
  - **It may be adopted in totality or in part by interested organizations.**

Estimation Value-Chain



Size Metrics

- **Which of the following are Software size measures?**
  - ✗ **10 Person Years**
  - ✗ **US$1.5 M**
  - ✓ **100 programs**
  - ✓ **1000 KLOC of VB and 1000 lines of J2EE –**
  - ✗ **10 calendar months elapsed time**
  - ✓ **Function Points (Functional Size)**
  - ✓ **Use Case Points**



Software Size Measures

- KLOC (Kilo lines of code)
- IFPUG Function Points (Based on Allen Albrecht's work)
- COSMIC FFP
- Use Case Points

- Industry Standard
  - IFPUG (International Function Point Users Group) FP – Well documented & Clearly defined Rules

Effort Estimation Methods

- Expert Judgment
- Activity Based
- Analogy based
- Simple Estimating relationship
- Parametric / Algorithmic

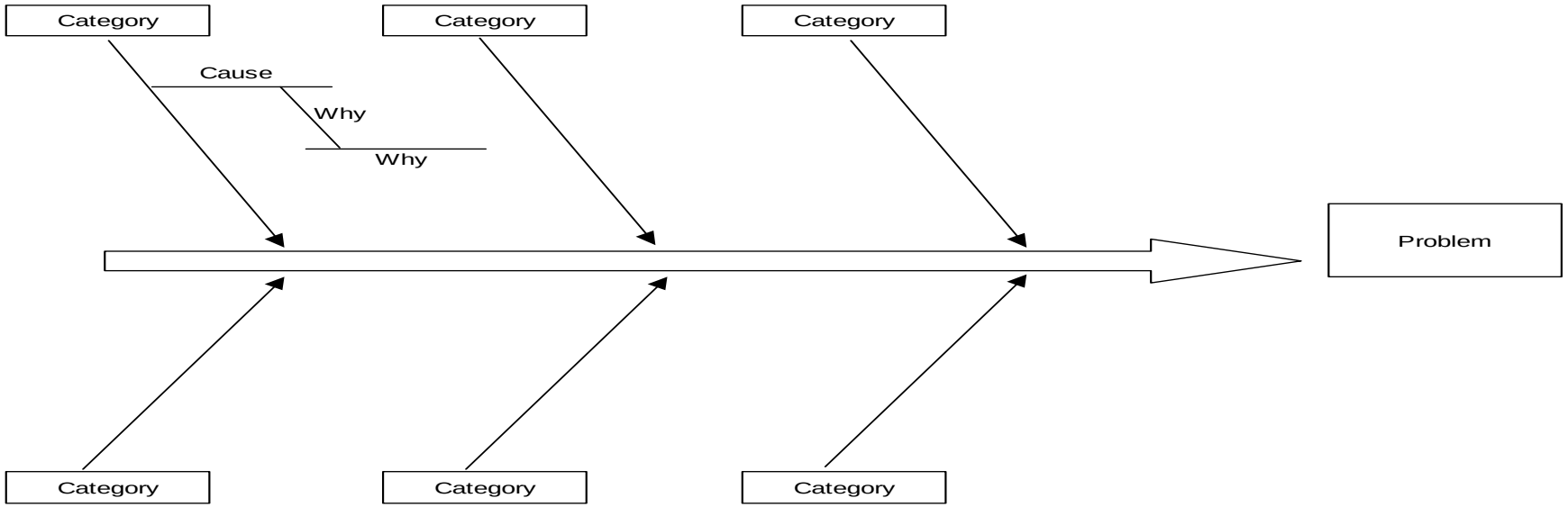
Schedule Estimation Models

- Capers Jones
- Putnam Software Lifecycle Estimation
- COCOMO & COCOMO II [Boehm]
- Victor Basili
- NASA

Seven Basic Quality Tools

Cause & Effect Diagram

- **Cause & Effect Diagram**
  - **To investigate and list down the cause and effect relationship of the problem under investigation**
  - **Associate multiple possible causes with a single effect**
  - **Helps analyze problems all the way down to the root cause**



Seven Basic Quality Tools

Flow Charts / Check sheets

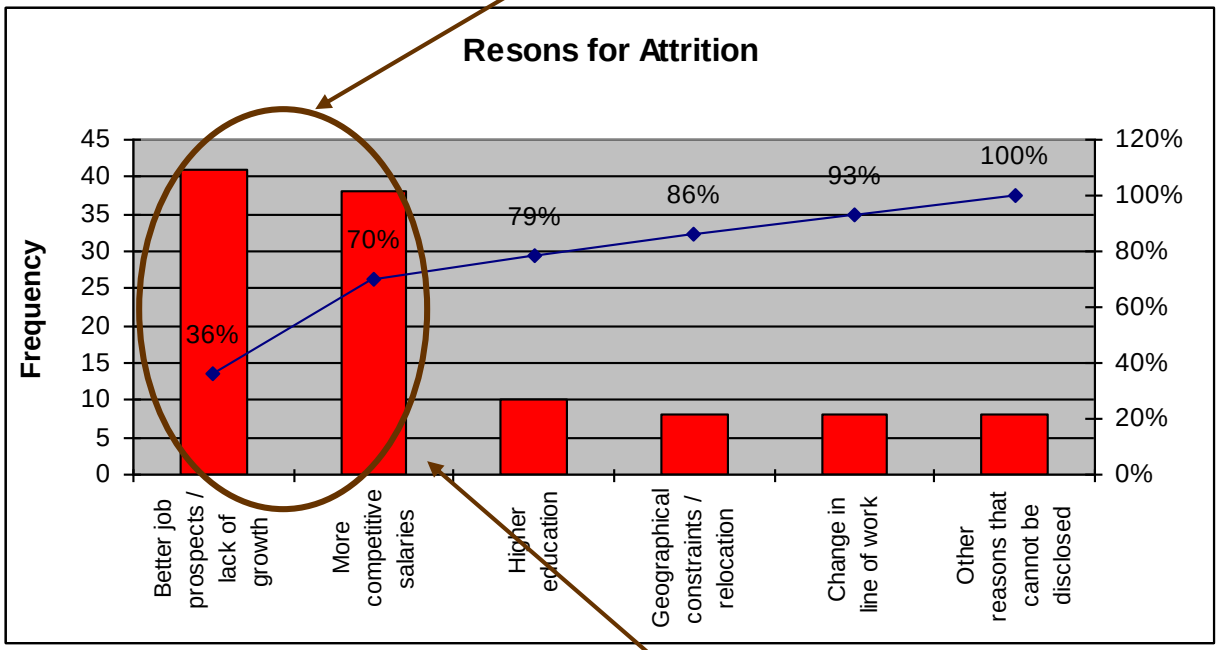
- Flowcharts
  - A pictorial step-by-step representation of a process
  - Allows a team to identify the actual flow or sequence of events in a process that any product or service follows
  - Helps understand the sequence and logic of the flow of activities and decision in the process
  - Always look at the process from the Customer's point of view
    - **Use the COPIS thumb rule to create process flowchart**
      - C: Customer
      - O: Output
      - P: Process
      - I: Input
      - S: Supplier
- Checksheets

Seven Basic Quality Tools

Pareto Chart

- Used to identify and separate the most vital (frequently occurring) problems from the trivial (rarely occurring)
- Works on the basis of the 80-20 Rule

Tallest Bars indicate those 'Vital Few' problem categories that cause most of the breakdowns. Here, 70% of the problems are caused by just 2 problem categories



The 'vital' 2 problem categories that have been identified here can either be subject to process improvement directly, or further analyses can be done to determine root causes (if any)

Seven Basic Quality Tools

Histograms

- Summarizes data from a process that has been collected over a period of time, and graphically present its frequency distribution in bar form
- Indicates whether a process is within defined specifications
- Indicates the spread (standard deviation) and the central tendency (mean) of the data
- Confirms if distribution is “normal” with bell shaped curve
- Confirms the result of process improvement

Defined By Customer:

Target= 9 = Ideal Lead Time

USL (Upper Specification Limit) = 17 (SLA)

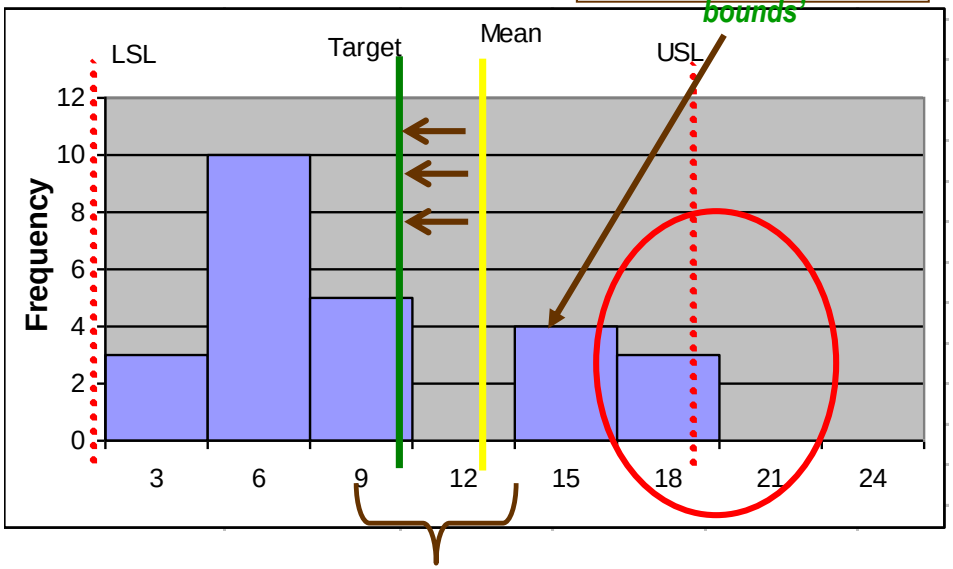
LSL (Lower Specification Limit) = 0 (def)

Calculated from Data:

Mean = 11.28

Std. Dev. = 6.59

Data points that are beyond the customer specs. Indicates a process that is ‘out of bounds’

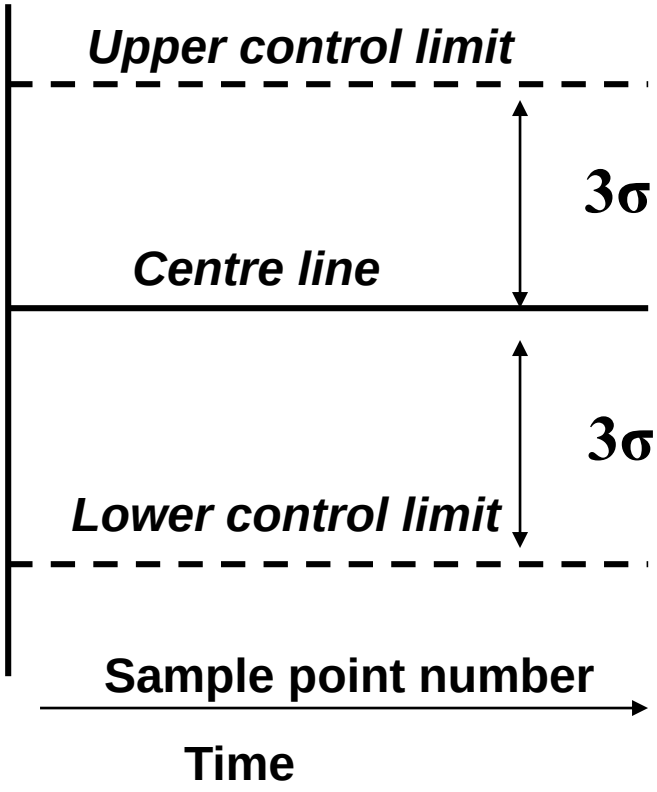


Variation between the mean and the target indicates the gap to be bridged

Seven Basic Quality Tools

Control Charts

- Control Charts
  - Used to determine process stability and predictable performance
  - A control chart consists of:
  - A centre line corresponding to the mean value of the characteristic corresponding to an in-control state
  - An Upper Control Limit (UCL)
  - A Lower Control Limit (LCL)



Seven Basic Quality Tools

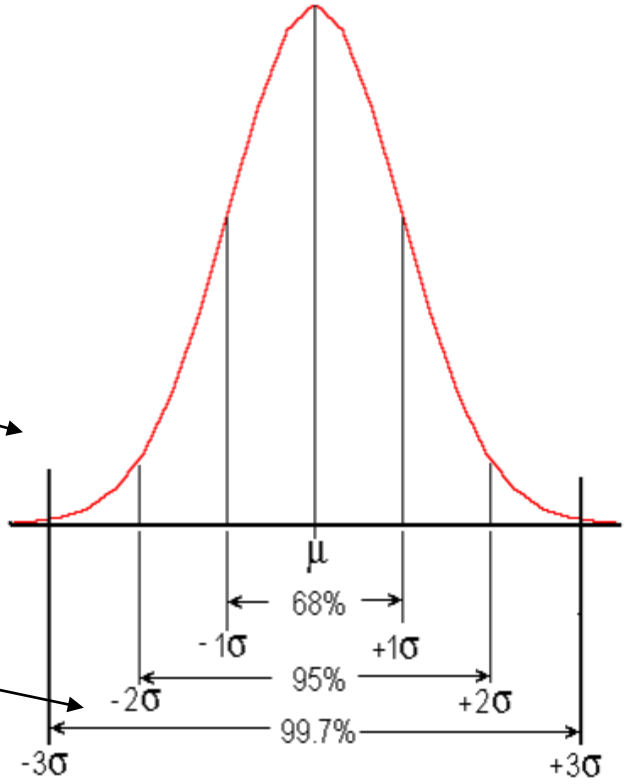
Control Charts

- Control Charts – Understanding Normal Distribution

Add up about 30 of most things and you start to be "normal"

Normal distributions are divide up into 3 standard deviations on each side of the mean

Once you are that, you know a lot about what is going on



Seven Basic Quality Tools

Control Charts

- Summary of Typical Special Cause Criteria

Rule 1 – One point more than 3 standard deviations from centerline

Rule 2 – 2 out of 3 points > 2 standard deviations from centerline (same side)

Rule 3 – 4 out of 5 points > 1 standard deviations from centerline (same side)

Rule 4 – 7 points in a row on same side of centerline

Rule 5 – 6 points in a row, all increasing or all decreasing

Rule 6 – 14 points in a row, alternating up and down

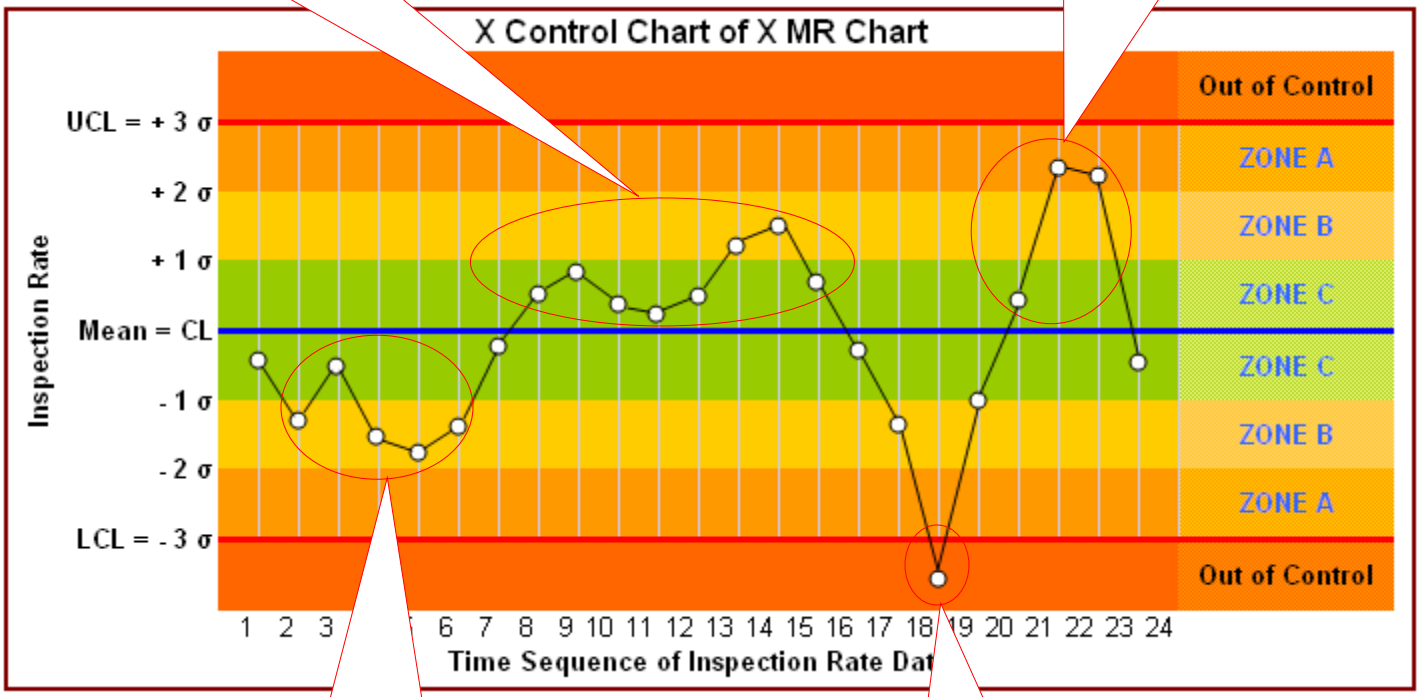
Rule 7 – 15 points in a row within 1 standard deviation from centerline (either side)

Rule 8 – 8 points in a row > 1 standard deviation from centerline (either side)

Seven Basic Quality Tools

Control Charts

- Ap… …rt rules



Rule 4: 7 consecutive points on one side of CL

Rule 2: 2 out of 3 consecutive data points in Zone A

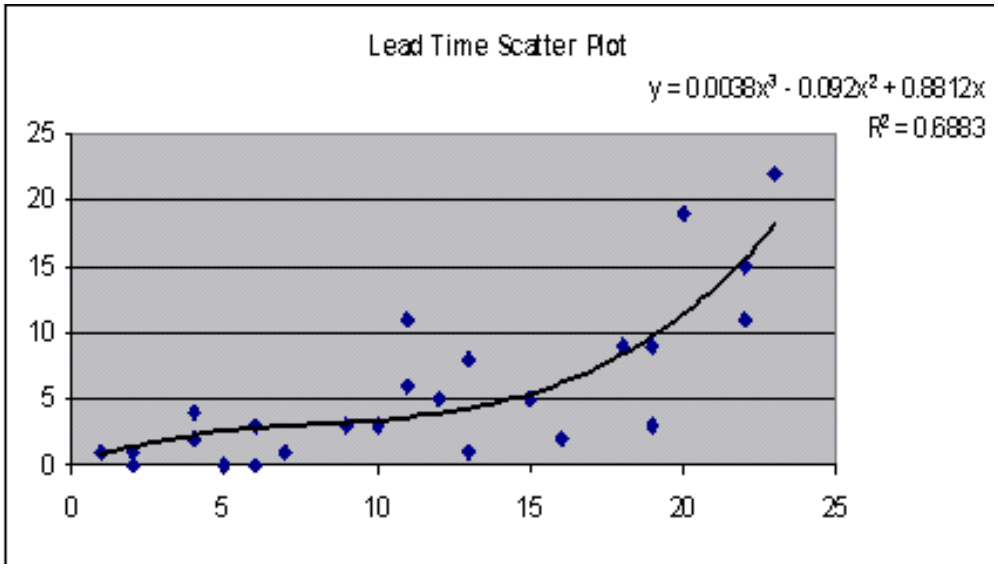
Rule 3: 4 out of 5 consecutive data points in Zone B

Rule 1: A point out of 3 sigma region

Seven Basic Quality Tools

Scatter Diagrams

- Scatter Diagrams
  - To study and identify the possible relationship between the changes observed in two different sets of variables.
  - To verify if there is relation ship between cause and effect with facts.
  - To estimate the strength and nature of relationship between two sets of data
  - The closer the points hugs the diagonal line, the more closely there is a one to one relationship



x = Months of Experience; y = Lead Time to complete a request

Given 'Experience in months', the equation can be used to determine the time it would take to complete a request (or vice-versa)

R^2 = 0.6883; R = 0.8296, which indicates a moderate correlation between 'Experience' and the 'Lead Time' taken to service a request

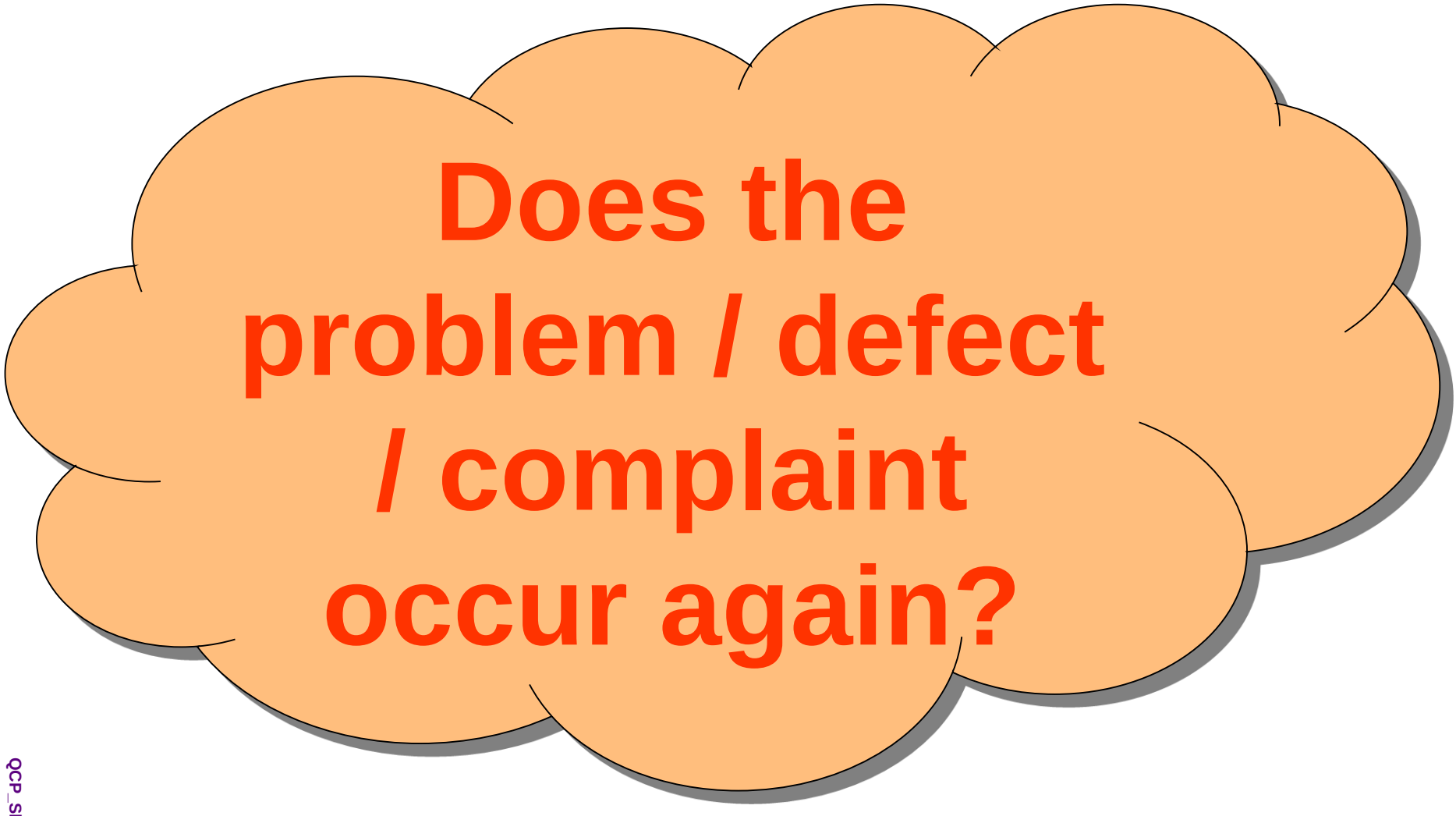
Root Cause Analysis (RCA)

Introduction

Root Cause Analysis (RCA)
Introduction

Root Cause Analysis (RCA)

Introduction



Root Cause Analysis (RCA)

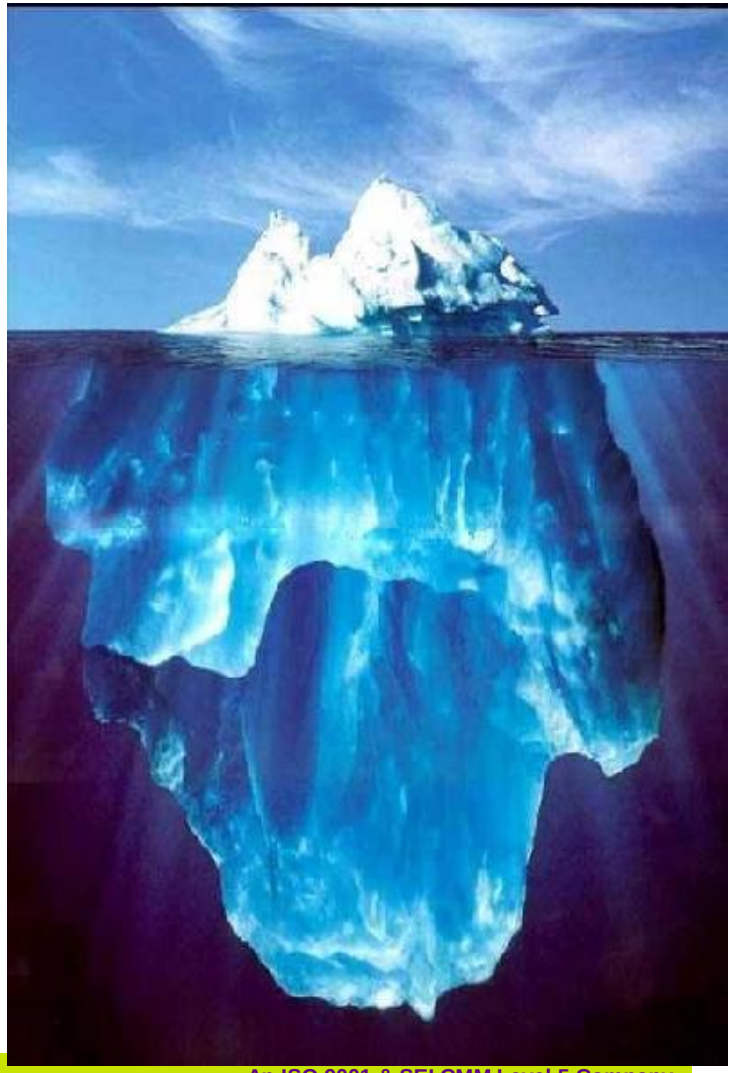
Introduction

Why?

Root Cause Analysis (RCA)

Introduction

Because only the SYMPTOMS have been addressed, not the Underlying CAUSE



Root Cause Analysis

What is Root Cause?

- The deepest underlying cause, or causes of positive or negative symptoms within any process, which if dissolved, would result in elimination or substantial reduction of the symptom
- The causal or contributing factors that, if corrected, would prevent recurrence of the identified problem
- The "factor" that caused a problem or defect and should be permanently eliminated through process improvement
- The factor that sets in motion the cause and effect chain that creates a problem
- The "true" reason that contributed to the creation of a problem, defect or nonconformance

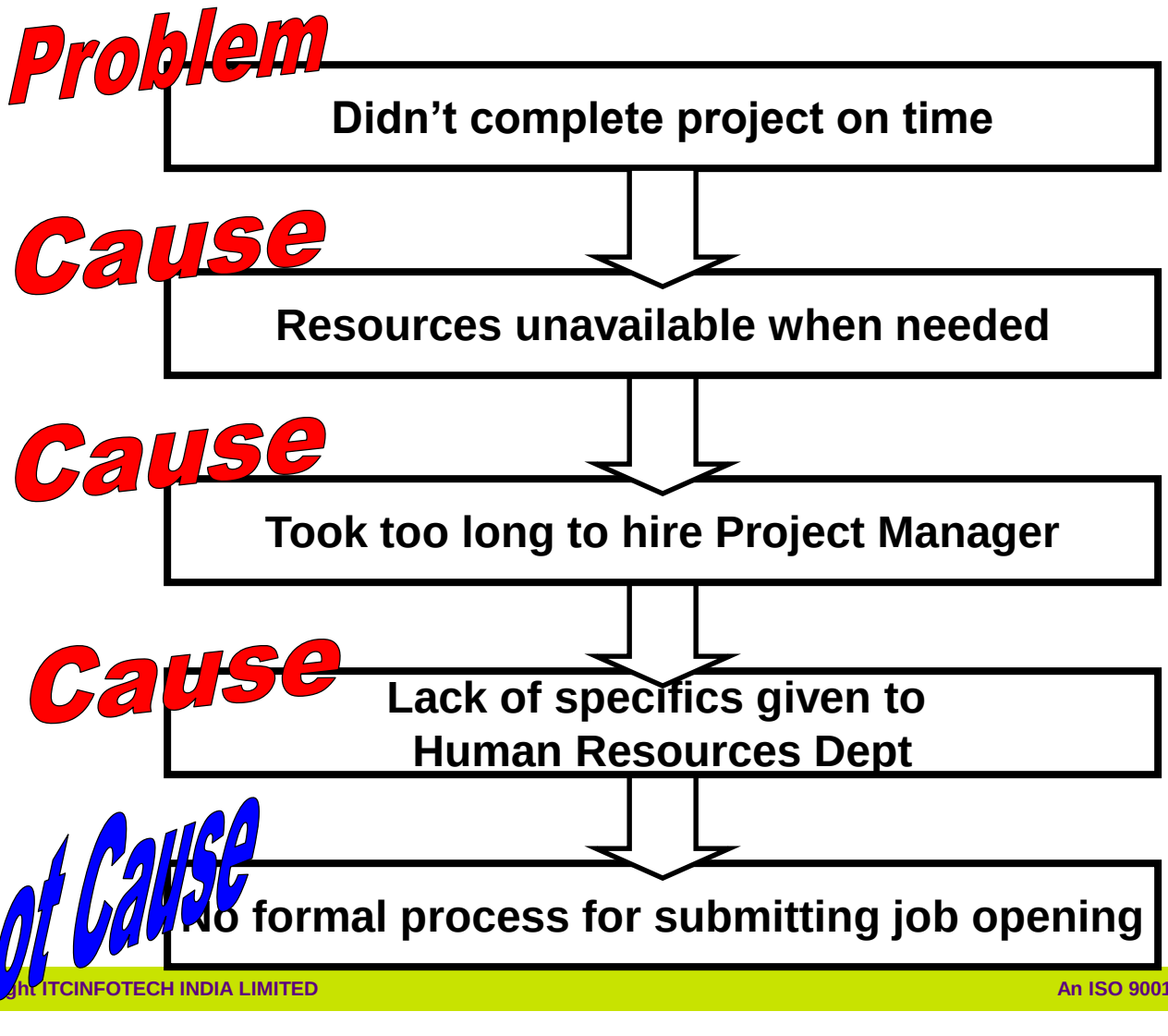
Root Cause Analysis
What is RCA?

- **Root Cause Analysis is a process of:**

  - Identifying an incident
  - Analyzing the selected incident
  - Defining the root cause
  - defining and Implementing the actions required to eliminate the root cause
  - Validating that the corrective action prevented recurrence of problem

Root Cause Analysis

What is RCA?



Root Cause Analysis

Correction…Corrective Action…Preventive Action

	Non Conformity	Correction	Corrective Action	Preventive Action
Definition	Any deviation from the plan to execution (provided if the plan is approved by Quality group)	Action taken to correct the particular incidence of non-conformity	Action taken to eliminate the cause of non-conformities in order to prevent recurrence	Action taken to eliminate the cause of potential non-conformities in order to prevent their occurrence
Example	Code review reports for XYZ module are not available	If code review reports for a module xyz are not available in a project, then, completing the code reviews and preparing the code review reports would amount to correction	if the cause of not having prepared the code review reports is because the current team developing that module is not trained in the QMS, then providing QMS training to the team shall prevent recurrence of this non-conformity	If a new team member joins the project, providing him/her QMS training shall prevent occurrence of the potential non-conformity Preventive action may include raising a QMS improvement form for prevention of occurrence of such Non conformances in future

Root Cause Analysis
Why RCA?

- Helps reduce the problem recurrence
- Reduce rework, retest, re-inspect, poor quality costs, etc…
  - Problems are prevented upfront
  - Communication improves between groups and
  - Process cycle times improve (no/less rework loops)
- Conserves scarce resources
- Provides rationale for strategy selection
- Problems are not repeated

Helps save time and money!

Root Cause Analysis

When to perform RCA?

Do all the problems encountered need Root Cause Analysis?

Root Cause Analysis
When to perform RCA?

Consider following parameters before selecting any problem for doing causal analysis

- Chronic – a continuing problem
- Vital Few – Significant Impact on company
- Size – Manageable problem < 12 months
- Measurable – impact must be measured
- Urgency – how urgent is the problem to the organization
- Risk – What are the risks
- Resistance to change – How high is the resistance to change

Root Cause Analysis

When to perform RCA?

There is an incident like:

- Customer complaints
- Customer reported defects
- Missed deliveries
- Internal or customer escalations
- Low customer satisfaction ratings
- Audit findings (major and minor)
- A pattern of similar incidents is detected
- Out of control process
- Any other incident which require formal analysis to help project save money!

Root Cause Analysis

Trigger Points for RCA

Deviation from commitments related to:

- **Effort**
- **Schedules**
- **Defects**
- **Service Level Agreements**

Complaints from the customer

Similar problems occurs repeatedly

Ineffective processes – Reviews / Estimations / Planning

Process non-conformance

Risk Analysis during risk identification process

Issues / Concerns

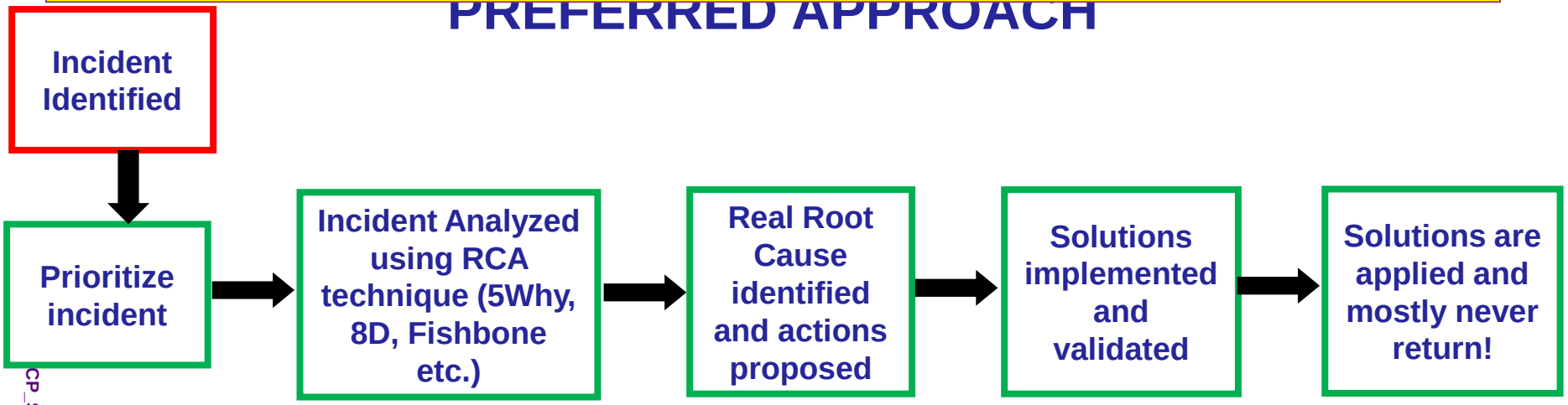
Root Cause Analysis

How is it different?

USUAL APPROACH

In many traditional analysis, the most visible causal factor is given all the attention

PREFERRED APPROACH



Root Cause Analysis

The car that hated Vanilla Ice-cream

"This is the third time that I have written to you. I don't blame you for not answering my first letter as I must have sounded crazy.

In our family, we have a tradition of having ice cream for dessert after dinner each night. Every night, after we've eaten, we vote on which kind of ice cream to have – and I drive down to our local store to buy it. I recently purchased a new Pontiac car and since then I've had a problem when I go to the ice cream store. Every time I buy vanilla ice cream and go back to my car it won't start. If I buy any other type it starts first time. I realize this sounds insane but it's true.

Please help me understand what it is that makes my Pontiac car fail to start when I purchase vanilla ice cream and easy to start with any other type."

Root Cause Analysis

The car that hated Vanilla Ice-cream

- *An engineer met the man just after dinner time – and the two drove to the ice cream store. That night, the vote had been for vanilla ice cream – and just as the man had said, the car wouldn't start. Bemused, the engineer returned the following night – and the night after that. The car started first time – the votes had been for chocolate on the first night, and strawberry the second night. The fourth night, the choice was again for vanilla – and the car failed to start.*
- *The engineer now realized that there was a problem that needed identification and fixing. He started to log what happened from the moment they arrived at the store – arrival time, time taken to make the purchase, and several other factors. Soon he had a clue – purchases of vanilla ice cream took less time than the other flavors. The reason was that the freezer containing vanilla ice cream was at the front of the store near a quick purchase till, while other flavors were at the back and required lining up to get checked out. Quickly the engineer realized that this was the answer to the problem – not the ice cream flavor, but the time required. When purchasing vanilla ice cream there was a **vapour lock** which prevented the car restarting. With the other flavors, there was sufficient time for the engine to cool down, allowing vapor to dissipate and the car to restart.*

Root Cause Analysis
Tools – Cause and Effect Diagram

- **A Cause-Effect (also called "Ishikawa" or "Fishbone") Diagram is a graphical method for presenting and sorting ideas about the causes of issues or problems.**

- **It is used to:**
  - Brainstorm possible causes of an incident
  - Organize and sort ideas about causes contributing to a particular incident
  - Gather and group ideas
  - Encourage creativity
  - Breakdown communication barriers
  - Encourage "ownership" of ideas

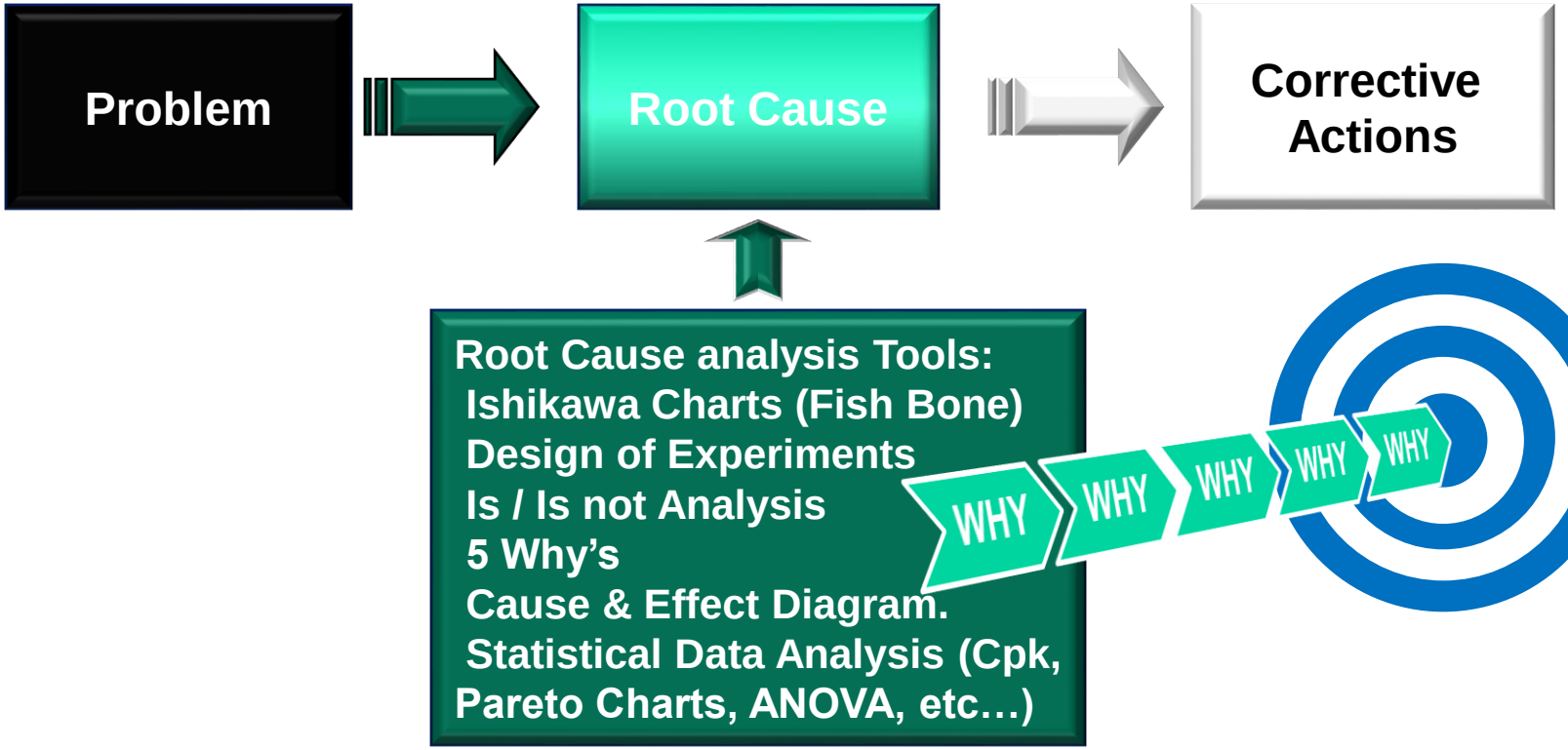
- **A Cause-Effect Diagram is typically generated in a group meeting.**

Root Cause Analysis
Technique – 5 Why's

- Five Why's approach uses a systematic questionnaire technique to search for one or several root causes that ultimately identify the reason why a problem was originated.
  - Ask "Why?" five times
  - Stop when the corrective actions do not change
  - Stop when the answers become less important
  - Stop when the root cause condition is isolated
- The First Why – A concise sentence that plainly explains the reason
- The Second Why - A more concise explanation to support the first statement
- The Third Why - Third why is critical for a successful transition between the obvious and the not so obvious. Visualize the process and narrow down the most likely sources for the incident to occur.
- The Fourth Why - Clear thought process from preconceived explanations. You may have two or more different avenues to explore now, explore them all.
- The Fifth Why - When teams finally get to the fifth why, it is likely that they have found a systemic cause. Most of the problems in the process can be traced to them.
- If you have reached the fifth why and you are still dealing with process related cause(s), you may still need one or two more whys to deep dive into the systemic cause.

Root Cause Analysis
Technique – 5 Why's

Five why's is a Root Cause Analysis Tool. Not a problem solving technique. The outcome of a 5 Why's analysis is one or several root causes that ultimately identify the reason why a problem was originated.



Root Cause Analysis
Tools – 8D

- 8D stands for 8 Disciplines.
- It incorporates important aspects of problem investigation and management into a single structured and systematic process.
- It fulfils three functions which complement one another:
  - A process for solving problems
  - A standardized method
  - A form of reporting
- The 8 Disciplines are:
  - Discipline 1 – Build The Team
  - Discipline 2 – Describe the Problem
  - Discipline 3 – Implement a Temporary Fix
  - Discipline 4 – Eliminate Root Cause
  - Discipline 5 – Verify Corrective Action
  - Discipline 6 – Implement Permanent Fix
  - Discipline 7 – Stop It Happening Again
  - Discipline 8 – Celebrate Success

Root Cause Analysis

How does a complete RCA look like?

- **The Complete Root Cause Analysis must be:**
- **Internally Consistent - involving of those who are most familiar with the situation and as impartial as possible**
- **Thorough - analysis of underlying cause and effect systems through a series of *why* questions at each level. Identifies changes that need to be made to system**
- **Credible - include participation by the leadership of the organization & those most closely involved in the processes & systems**

Root Cause Analysis
Concluding it all

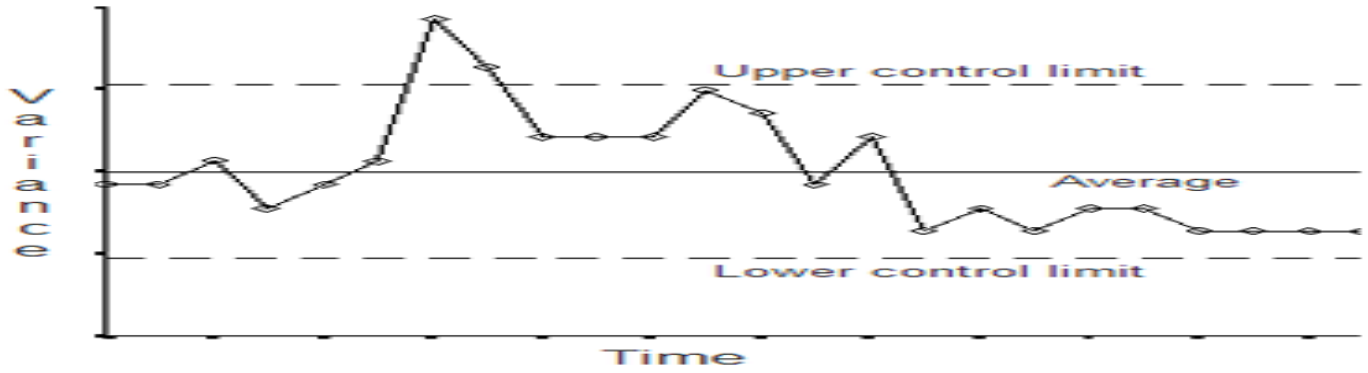
- One problem may have more than one root cause
- One root cause may be contributing to many problems
- When the root cause is not addressed, expect the problem to reoccur
- Prevention is the key!

Quality Gurus

Walter. A. Shewhart	Walter Andrew Shewhart (Pronounced like "shoe-heart“) March 18, 1891 - March 11, 1967
W. Edwards Deming	William Edwards Deming October 14, 1900 – December 20, 1993
Joseph. M. Juran	Joseph Moses Juran December 24, 1904 – February 28, 2008
Shigeo Shingo	1909 - 1990
Armand V Feigenbaum	Armand Vallin Feigenbaum (Pronounced like “fay-ghen-bowm”) 1922
Kaoru Ishikawa	July 13, 1915 - April 16, 1989 (Pronounced like “cow-roo”)
Philips. B. Crosby	Philip Bayard Crosby (Pronounced like “cross – bee”) June 18, 1926 - August 18, 2001
Genichi Taguchi	January 1, 1924

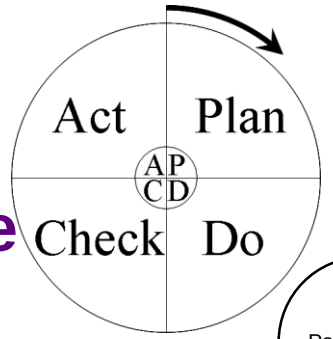
Quality Gurus - Walter. A. Shewhart

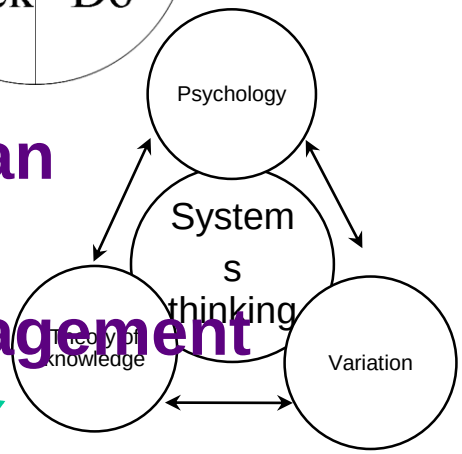
- Importance of reducing variation
- Framed *Assignable-cause* and *chance-cause* variation
- Introduced the *control chart* as a tool for distinguishing between the two

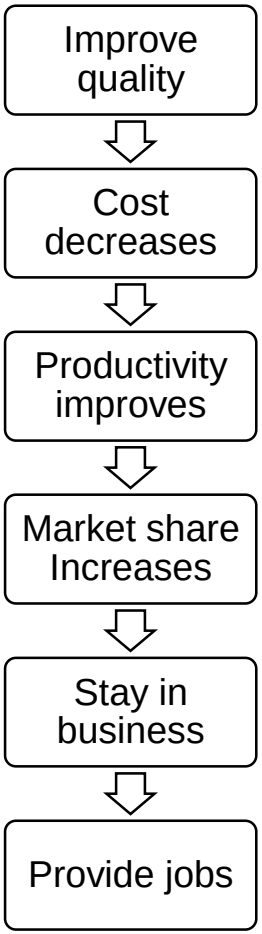


Quality Gurus - W. Edwards Deming

- **The Deming Cycle**
- **The 7 Point Action Plan**
- **The 14 points to management**
- **System of Profound Knowledge**
- **Chain reaction**

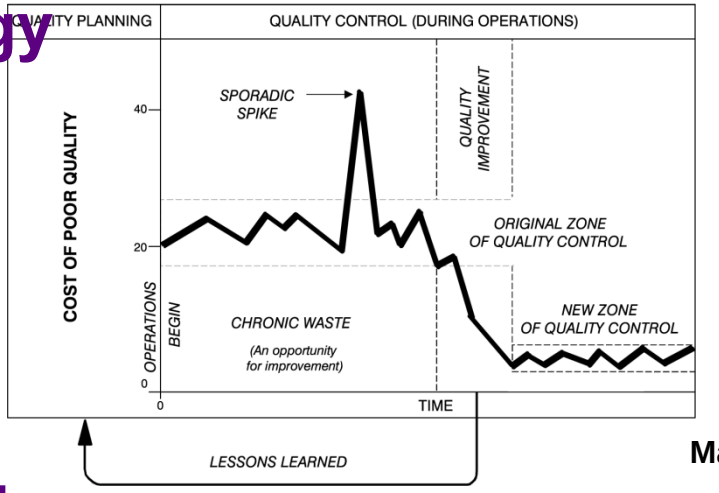




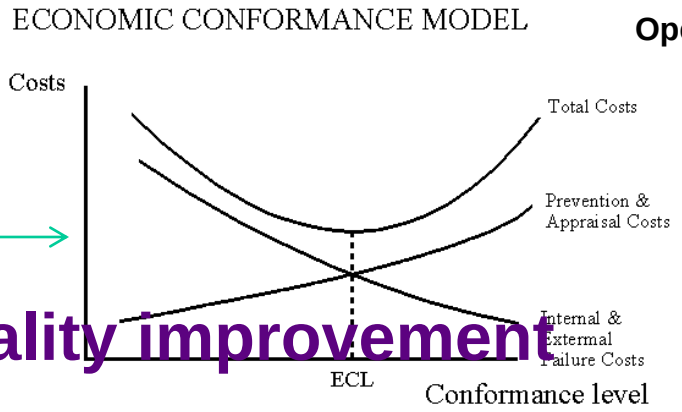


Quality Gurus - Joseph. M. Juran

- **Juran's Trilogy**

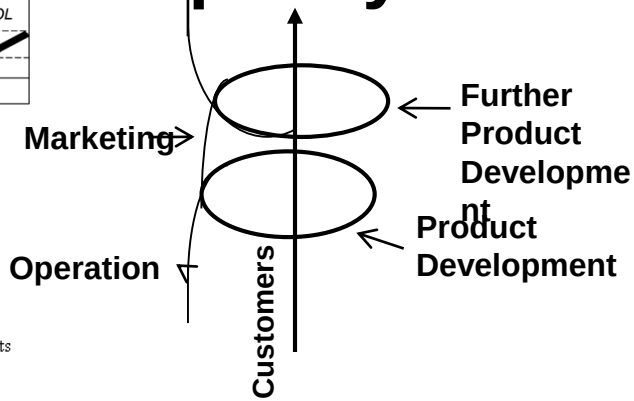


- **Cost of Quality**



- **10 steps to quality improvement**

➢ **Spiral of quality**



Shigeo Shingo

- **Poka-yoke**
- **Single Minute Exchange of Die (SMED) system**

Quality Gurus - Armand V Feigenbaum

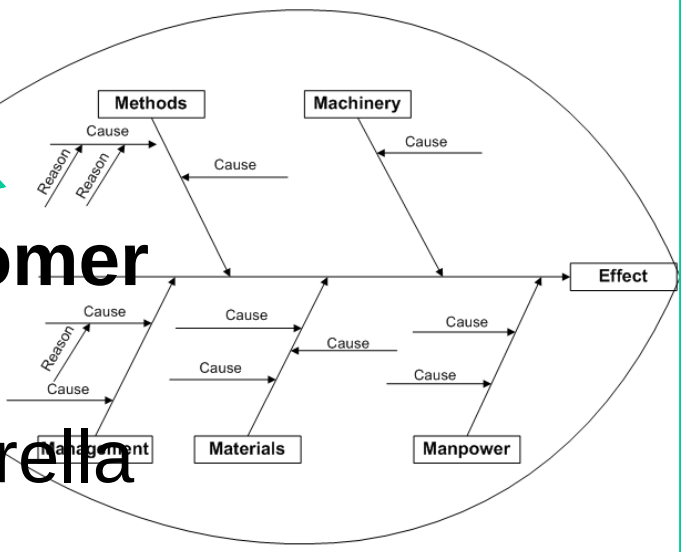
- **Defined TQ as :**

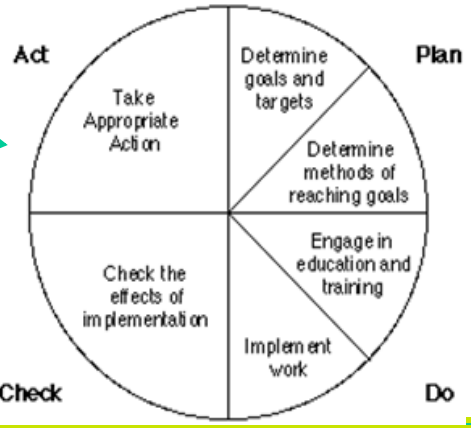
  "Total quality control is an effective system for integrating the quality development, quality maintenance, and quality improvement efforts of the various groups in an organization so as to enable production and service at the most economical levels which allow full customer satisfaction."

- **Concept of the "hidden plant"**

Quality Gurus - Kaoru Ishikawa

- **Cause &Effect Diagram**
- **Emphasized the Internal customer**
- Company-wide "**Ishikawa"** umbrella
- Expanded PDCA to 6-step cy





Quality Gurus - Philips. B. Crosby

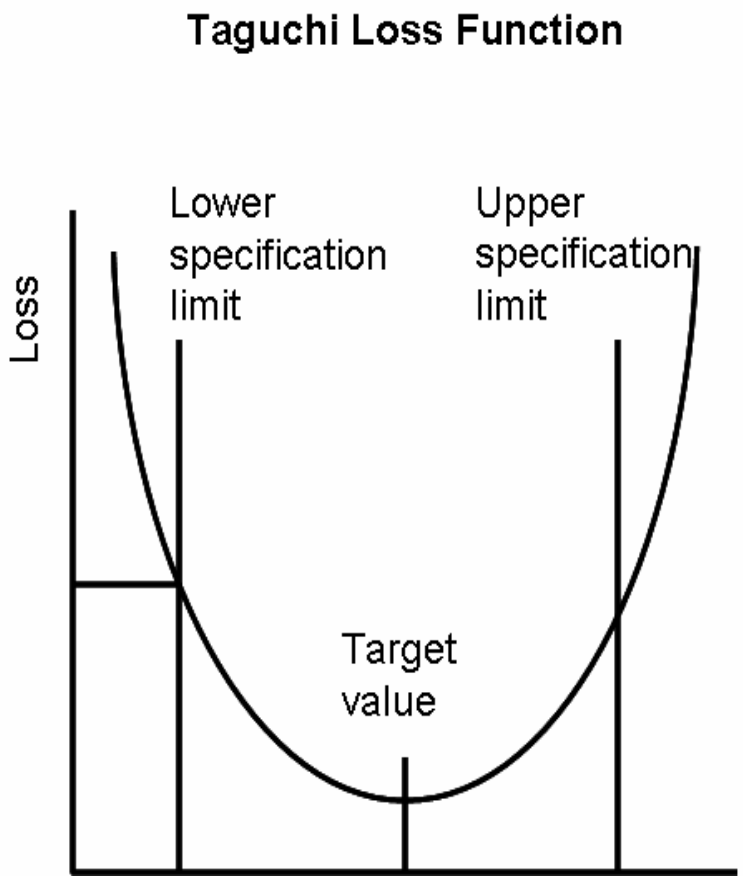
- **Defined quality as:**

  "Quality is free. It's not a gift, but it is free. What costs money are the unquality things – all the actions that involve not doing jobs right the first time"

- **Four Absolutes of Quality**
- **The 14 Steps to quality improvement**
- **The Crosby Vaccine**

Quality Gurus - Genichi Taguchi

- Taguchi's Product develop
- Taguchi Loss Function
- Design of experiments



Quality Gurus - Summary

Quality Guru	Possible Strengths	Perceived Weaknesses:
Joseph. M. Juran	• Concentration on genuine issues of management practice • A new understanding of the customer, referring to both internal and external customers • Management involvement and commitment	• The literature on motivation and leadership is not addressed • Workers' contributions are underrated • Methods are traditional, failing to address culture and politics • Most suitable for industrial and manufacturing sectors, limited application in service organisations • Juran is a practitioner, he deals best with the practice of quality, than the theory
Shigeo Shingo	• On-line real-time control • Poke-yoke emphasis effective control systems	• Source inspection only works effectively in manufacturing processes - not so for the service sector • Shingo says little about people other than that they are fallible
Armand V Feigenbaum	• A total or whole approach to quality control • Emphasis on the importance of management • Socio-technical systems thinking is taken into account • Participation is promoted • Reliance on statistics 'where appropriate' - selective about what it is useful to measure and when	• The work is systemic but not complementarist • The breadth of management theory is recognised but not unified • The political or coercive context is not addressed • Approach provides little value for service based organisations • As with deming what but not how
Kaoru Ishikawa	• Emphasis on participation • Variety of quantitative and qualitative methods • A whole system view • Qcc's are relevant to all sectors of the economy	• Fishbone diagrams are systematic but are not comprehensive for complex real time issues • QCCs depend upon management support - failure to listen to ideas • There is a failure to address coercive contexts blame culture of the west rather than opportunity to learn • No overarching methodology which integrates all the different strands of his thinking
Philips. B. Crosby	• Clarity • Recognition of worker participation • Rejection of a tangible quality problem, acceptance of the idea of solutions • Crosby's metaphors – vaccine; integrity; dedication to communication and customer satisfaction; company wide policies and operation which support the quality thrust and maturity • Crosby's motivational style	• Danger of misdirected effort from blaming workers (in question) • Emphasis on marketing more than recognition of barriers • The management and goal orientation of the 14 step programme as failing to free workers from externally generated goals • Potential for zero defects to be interpreted as zero risk • Ineffectiveness in coercive power structures • Charismatic/evangelical style - lack of substantial underpinning?
Genichi Taguchi	• Quality is a design requirement • The approach recognises the systemic impact of quality • It is a practical method for engineers (rather than statisticians) • It guides effective process control	• Usefulness is biased towards manufacturing • Guidance is not given on management or organisational issues • It places quality in the hands of the experts • It says nothing about people as social animals

Further Information

- **For further advanced reading the following sites can be checked:**
  - **IEEE Standards - https://sbwsweb.ieee.org/**
  - **Software Engineering Institute - http://www.sei.cmu.edu/**
  - **ISO 9001 - http://en.wikipedia.org/wiki/ISO_9000**
  - **ISO 20000 & ITIL - www.standardsglossary.com/isob.htm**
- **For QCP Test**
  - **It is an online exam with a duration of 30 mins. for the mandatory test of 50 Multiple Choice Questions and to qualify, one should accrue minimum 60 credit points from the overall test.**

All the Best!

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Business-friendly Solutions

Thank You