

# TOTAL QUALITY MANAGEMENT

# Total Quality Management

## UNIT I INTRODUCTION TO QUALITY MANAGEMENT

Definitions – TOM framework, benefits, awareness and obstacles. Quality – vision, mission and policy statements. Customer Focus – customer perception of quality, Translating needs into requirements, customer retention. Dimensions of product and service quality. Cost of quality

### Total Quality Management

#### Introduction to Quality

- Conformance to Specifications
- Technique to guarantee survival in world class competition
- Sustained Performance and Customer Responsiveness ( Microsoft)
- Thus Quality is “ The ability of a product or service to meet the customer needs.”

#### Definitions – Quality

- Deming : Quality is a predictable degree of uniformity and dependability, at low cost and suited to the market.
- Juran : Quality is fitness for use.
- Taguchi : Quality is the (minimum)loss imparted by a product to society from the time the product is shipped.
- Feigenbaum :Quality is, a way of managing the organization.
- Philip Crosby : Quality is conformance to requirements.
- ISO definition of quality is as follow  
“Quality is the totality of characteristics of an entity that bear on its ability to satisfy stated and implied needs.”

Quality can be quantified as follows

$$Q = P / E$$

Where Q is quality

P is Performance

E is Expectations

$Q > 1$  then the quality of the product is good

#### Total Quality Management (TQM)- Definitions

- Total -- Made up of the whole.
- Quality – Degree of excellence a product or services provides.( Quality gurus definition)
- Management – Act , Art , or manner of handling, controlling , directing, etc.  
TQM is the art of managing the whole to achieve excellence.

#### ISO -

**Total Quality Management (TQM)** is the management approach of an organization, centered on quality, based on the participation of all its members and aiming at long term success through customer satisfaction and benefits to all members of the organization and society.

#### Indian Statistical Institute –

TQM is the integrated organizational approach in delighting customers both internal and external by meeting their expectations on a continuous basis through everyone involved with the organization working on continuous improvements in all products, services and process along with proper problem solving methodology

#### Characteristics of TQM

1. TQM is customer oriented
2. TQM is long term commitment for continuous improvement of all process
3. TQM is team work
4. TQM requires the leadership of the top management and continuous involvement.
5. TQM is a strategy of continuous improving performance at all levels and in all areas of responsibility.

#### 6 Basic Concepts of TQM

- Top Management commitment – Participation, Complete involvement and communication of the TQM Programme.
- Focus on customer – Achieving Cust Satisfaction is the heart of TQM.
- Effective involvement and utilization of the entire work force – “Principle of employees involvement ”or “ Respect for People” Each person is responsible for the quality of the work they do.
- Continuous Improvement : TQM is based on progress and improvement. It is the way to make better use of the company 's total quality resources.
- Treat suppliers as partners
- Establishing performance measures for the processes:
  - Quantitative data to measure to the continuous quality improvement.
  - Performance measures like Productivity, sales turnover, Absenteeism, customer satisfaction etc.

#### Dimensions of TQM

- Manufacturing Dimensions
  - Performance
  - Features
  - Reliability
  - Conformance
  - Durability
  - Serviceability
  - Aesthetics
  - Perceived quality

- **Performance**
  - Primary product characteristics or the attributes of the product such as brightness
- **Features**
  - Secondary characteristics of the Product, added features Remote control.
- **Conformance**
  - Meeting the specifications or industry standards.
- **Reliability**
  - Consistency of the performance over time, average for a unit to stop functioning (fail)
- **Durability**
  - Useful life, includes repair.
- **Service**
  - Resolution of the problems and complaints ease of repair.
- **Response**
  - Human to human interface such as courtesy of the dealer.
- **Aesthetics**
  - Sensory characteristics such as exterior finish.
- **Reputation**
  - Past performance and other intangibles such as being ranked first
- **Service Dimensions**
  - Reliability
  - Responsiveness
  - Competence
  - Access
  - Courtesy
  - Communication
  - Creditability
  - Understanding
  - Security
  - Tangibles
- **Reliability**
  - Consistency of performer and dependability. Ability to perform the promised service dependably and accurately
- **Responsiveness**
  - Willingness or readiness to help and provide prompt service
- **Competence**
  - Possession of skills and knowledge required to perform the service.
- **Access**
  - Approachability and ease of contact.
- **Courtesy**
  - Politeness, Respect, Consideration, clean and neat appearances. Caring and individualized attention.
- **Communication & Understanding**

- Education and informing customers in language they can understand, listening to customers.
- **Credibility**
  - Trustworthiness, belief, Dependability.
- **Security**
  - Freedom from danger and risk. Providing assurance.
- **Tangibles**
  - The physical evidence of service. Physical facilities, equipment and appearance of personnel

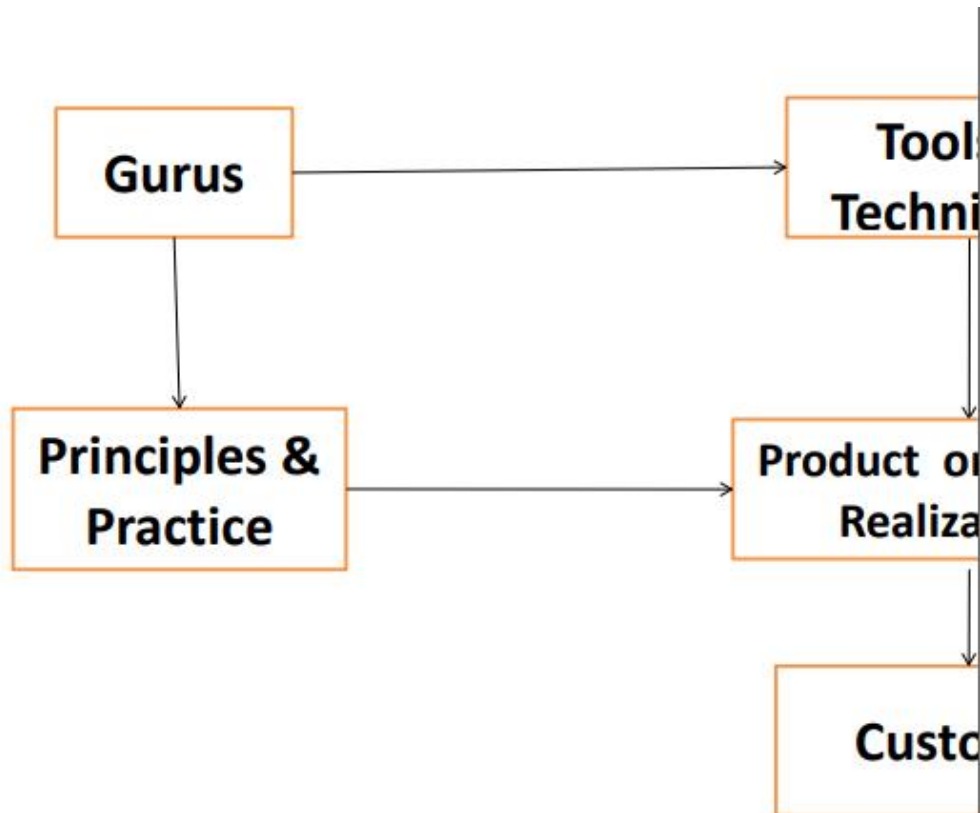
#### Benefits of TQM

Tangible Benefits	Intangible Benefits
Improved Product Quality	Improved Employee Participation
Improved Productivity	Improved team work
Reduced quality costs	Improved Working relationships
Increased market and customers	Improved Customer satisfaction
Increased profitability	Better company image
Reduced employee grievances	Enhancement of job interest
	Enhanced problem solving capacity

#### Obstacles to TQM

- Lack of Management commitment
- Inability to change organizational culture
- Improper Planning
- Lack of continuous training and Education
- Incompatible organizational structure and isolated individuals and departments
- Ineffective measurement techniques and lack of access to data and results
- Paying inadequate attention to internal and external customers
- Inadequate use of empowerment and teamwork
- Failure to continually improve

#### Frame Work of TQM



### Quality statements

Three elements of quality statements.

- Vision statement
- Mission statement
- Quality Policy statement

### **Vision statement**

It is the short declaration of what an organization aspires to be tomorrow

Eg: To continuously enrich knowledge base for practioners in mobility industry and institutions in the service of humanity.(Society of Automotive Engineers.

### **Mission statement**

It describes the functions of the organization. The mission statement answers the following question

1. Who we are ?
2. Who are the customers?
3. And how we do it?

Eg Mission statement of ITC ltd:

- Concern for the ultimate customers- millions of customers
- Concern for the intermediate customers- the trade
- Concern for the suppliers – the sources of raw materials and ancillaries

### **Quality Policy Statement**

It's a guide for everyone in the organization as to how they provide products and service to the customers.

It is written by the CEO with the feedback from the workforce and be approved by the quality council

Eg : Quality policy of Xerox Company.

Xerox is a quality company. Quality is the basic business principle for Xerox. Quality means providing our external and internal customers with innovative products and services that fully satisfy their requirements. Quality is the job of every employee.

### Cost Of Quality.

The Value of Quality must be based on its ability to contribute to profits. Quality related cost are the cost incurred by an organization to ensure that the products / services it provides conform to customer requirements .

### Definition:

Quality cost are defined as those costs associated with the non-achievement of products / service quality as defined by the requirements established by the organization and its contract with the customer.

Quality cost is the cost of poor products or services.

When Quality Cost is too high, It is sign of management ineffectiveness, which affects the organization competitive position.

#### Prevention cost:

*" The cost that are incurred on preventing a quality problem from arising."*

- Marketing / Customer/ User
- Product / Service / Design Development
- Purchasing
- Operations
- Quality Administration

#### Appraisal Cost:

*" The Cost incurred in assessing that the products / services conform to the requirements"*

- Purchasing Appraisal Cost
- Operation ( Manufacturing or Service ) Appraisal Cost
- External Appraisal Cost
- Review of test and inspection data:
- Miscellaneous quality evaluation:

#### Internal Failure Cost :

*" Cost arise due to internal failures."*

- Product or Service Design Failure Cost:
- Purchasing failure cost
- Operations cost

#### External Failure Cost

The cost incurred due to the non conformance of the products or services after delivery of products to the customer.

#### Quality Improvement Strategy:

1. Project team:
2. Reduce the Failure cost:
3. Prevention of quality cost.
4. Reducing appraisal cost.

#### Quality cost report

Quality cost control is the quality cost report sent by the accounting department provisions are made for each cost element .By comparing cost data with the historical ones a certain amount of control can be exercised.

#### Analysis

##### Trend Analysis

#### Characteristic of Trend Analysis

##### Pareto Analysis

It is method of classifying items, events or activities according to the relative importance.

A Pareto Diagram is a diagnostic tool commonly used for separating the vital few causes the account for a dominant share of quality loss.

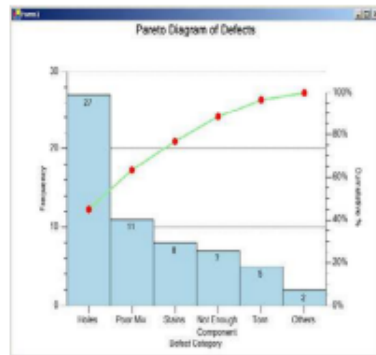
It was named after Wilfredo pareto who devised the tool.

It is based on the Pareto Principle , Which states that a few of defects accounts for the most of the effects.

It is otherwise called as 80/20 rule or ABC analysis .It means only 20%of defects amounts to 80% of its effects.

#### Construction of the Pareto Diagram

1. Obtain the data.
2. Arrange them in ascending order.( largest to smallest).
3. Calculate the percentages
4. Compute the cumulative percentages
5. Draw the bar chart with two vertical axes
6. Draw the bar above each item represents the causes of each categories
7. Plot the cumulative percentage line.



### **Customer Focus**

Customer is the King.

“Quality what the customer wants” It emphasis on the customer.

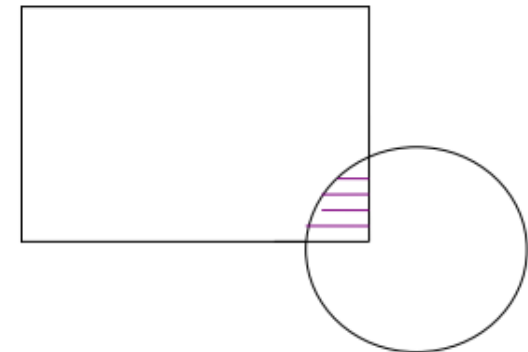
Customer satisfaction must be the primary goal of any organization , therefore it is essential that every employee in the organization understands the importance of the customer. A satisfied customer will led to increased profits.

### **Customer satisfaction Model:**

Customer satisfaction is not an objective but a feeling or attitude. Since it is subjective it is not easy to measure.

There are so many facets to a customer experience with a product and service that need to be measured individually to get the accurate picture of customer satisfaction.

Customer Satisfaction Model – Teboul



### **Customers:**

1. The most important people in the business
2. Not dependent on the organization, The organization depends on them
3. People who come with their needs
4. Deserve the most courteous and attentive treatment.

### **Types of Customers:**

1. Internal customers
2. External customers

### **Internal Customers :**

1. The customers inside the organization
2. The flow of work, product and service in the organization, Each department is dependent on one and another.
3. Every person in a process is considered as the customer of the other preceding operation.

### **External Customers**

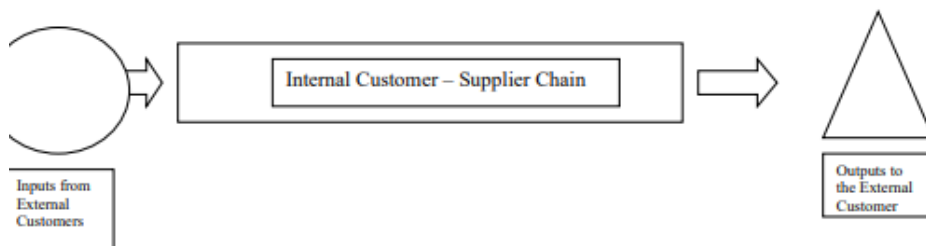
The customers outside the organization.

- Uses the product or service
- Who purchase the product



- Who influence the sale of the Product or services.

#### **Customer Supplier Chain:**



#### **Customer Complaints:**

Customer Satisfaction analysis helps the organization in the following ways:

- A totally satisfied customer contributes to revenue of the company.
- A totally dissatisfied customer decrease revenue

#### **Customer Feedback :**

Customer feedback is required for the following reasons

1. To discover customer dissatisfaction
2. To identify the customer needs
3. To discover relative priorities of quality
4. To compare performance with competition
5. To determine opportunities for improvement.

#### **Tools of Customer Complaints:**

Customer feedback has to been given importance it drives to the new product development. Help in identifying and analyzing the errors ,

- Comment card
- Customer Questionnaire
- Focus Groups

- Customer Visit
- Report Card
- Internet & Computers
- Employee Feedback.
- Mass customization

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## **UNIT II PRINCIPLES AND PHILOSOPHIES OF QUALITY MANAGEMENT**

Overview of the contributions of Deming, Juran Crosby, Masaaki Imai, Feigenbaum, Ishikawa, Taguchi techniques – introduction, loss function, parameter and tolerance design, signal to noise ratio. Concepts of Quality circle, Japanese 5S principles and 8D methodology.

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### **DEMING CONTRIBUTIONS AND PRINCIPLES**

#### **PRINCIPLES OF QUALITY**

William Edwards Deming (October 14, 1900 – December 20, 1993) was an [American statistician, professor, author, lecturer](#) and [consultant](#). He is perhaps best known for his work in [Japan](#). There, from 1950 onward, he taught top management how to improve design , product quality, testing and sales through various methods, including the application of statistical methods.

Definition

- *"Quality is a predictable degree of uniformity and dependability, at low cost and suited to the market."*

Dr. W. Deming Edwards Father of Japanese Quality Revolution and have approached the quality management problem from the statistician perspective.

Dr. W. Deming Edwards Contributions

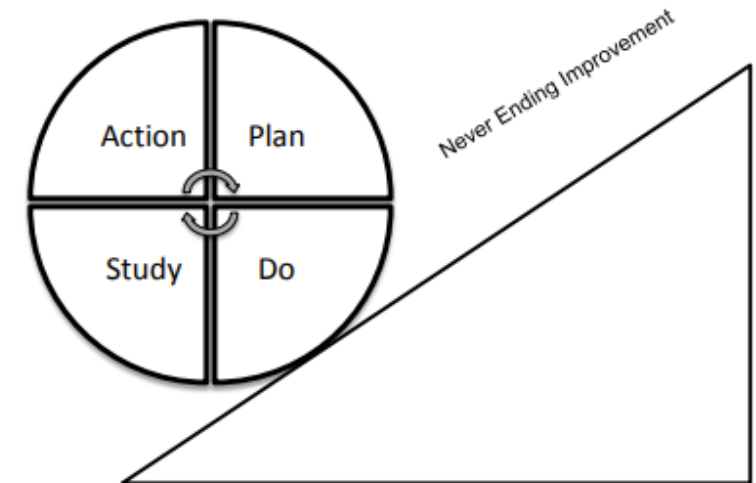
- Deming 14 Principles
- PDCA Cycle
- Seven Deadly Diseases
- System of Profound Knowledge.

#### 14 Principles

1. Create and publish the Aims and Purpose of the organization
2. Learn the new philosophy
3. Understand the purpose of inspection
4. Stop awarding business based on price alone.
5. Improve constantly and forever the system
6. Institute Training
7. Teach and Institute Leadership
8. Drive out fear, create trust, and create a climate for Innovation
9. Optimize the efforts of Teams, Groups, and Staff areas.
10. Eliminate Exhortations for work force
11. a. Eliminate numerical quotas for the work force.
11. b. Eliminate Management by objective
12. Remove Barriers that rob people of pride of workmanship
13. Encourage Education and self improvement for everyone
14. Take action to accomplish the transformation.

#### PDSA CYCLE:

The basic PDSA cycle was first developed by Shewhart and then it was modified by Deming. It is effective improvement technique.



It was popularized by Edward Deming hence it is called as Deming Wheel.

- PDSA stands for Plan, Do, Study and Act. It is model for testing ideas that may create improvement.

#### 7 deadly disease of Management

1. Lack of consistency
2. Emphasis on short term profits
3. Reliance on performance appraisal and merits
4. Reliance on the financial figures
5. Staff mobility
6. Excessive medical cost
7. Excessive legal cost

#### System of Profound Knowledge

- Appreciation for a system
- Knowledge of statistical theory
- Theory of Knowledge
- Knowledge of psychology



- Concerns with the product life cycle
- Journey begins from the *symptoms to cause*
- Journey from *cause to remedy*

#### Philip Crosby

- ❖ Crosby is an American quality gurus
- ❖ His best known for the concepts of “Zero defects” and “Do it the right first time”.

#### Crosby contributions

- Four absolutes of Quality
- Fourteen steps for Quality Improvement
- Crosby's Quality vaccine.

#### Crosby's Absolutes for quality Improvement

1. First Absolute : The definition of quality is conformance to requirements, not goodness.
2. Second Absolute : The system for causing quality is preventive not appraisal.
3. Third Absolute : The performance standard must be zero defects, “not that close enough”.
4. Fourth Absolute : The measurement of quality is the price of non conformance, not indexes.

#### Crosby's 14 steps of Quality Improvement

Step 1	Establish and ensure management commitment.
Step 2	Form the Quality improvement team for quality improvement process planning and administration.
Step 3	Establish Quality Measurements
Step 4	Evaluate the cost of quality and explain its use as management tool to measure waste.
Step 5	Raise quality awareness among all employees.
Step 6	Take actions to correct problems identified through previous steps
Step 7	Establish a zero defects committee and programme.
Step 8	Train supervisors and managers on their role and responsibilities in Quality improvement process.
Step 9	Hold a zero defects day to reaffirm management commitment.

Step 10	Encourage individuals and groups to set improvement goals.
Step 11	Obstacle reporting (communicate to the management any obstacle they take in attaining their improvement goals).
Step 12	Recognize and appreciate all participants
Step 13	Establish quality council to discuss quality matters on regular basis.
Step 14	Do it all over again to demonstrate that the improvement process never ends.

#### Crosby's Quality Vaccine

- Integrity
- Systems
- Communication
- Operations
- Policies

#### Masaaki Imai:

- Imai was a Japanese quality guru.

#### Kaizen Definition

- The Kaizen philosophy is drawn from the Japanese word “ Kai ” which means “continuous” and “ Zen ” meaning “improvement” or “wisdom”.
- Kaizen management philosophy, therefore, is defined as making “continuous improvement”—slow, incremental but constant.
  - Kaizen Events - to simplify a process, eliminating waste, creating space.
- Principles of materials handling and use of one-piece flow.
- Documentation of standard operating procedures.
- Five s's for workplace
- Visual management by means of visual displays that everyone in the plant can use for better communication.
- JIT / KANBAN

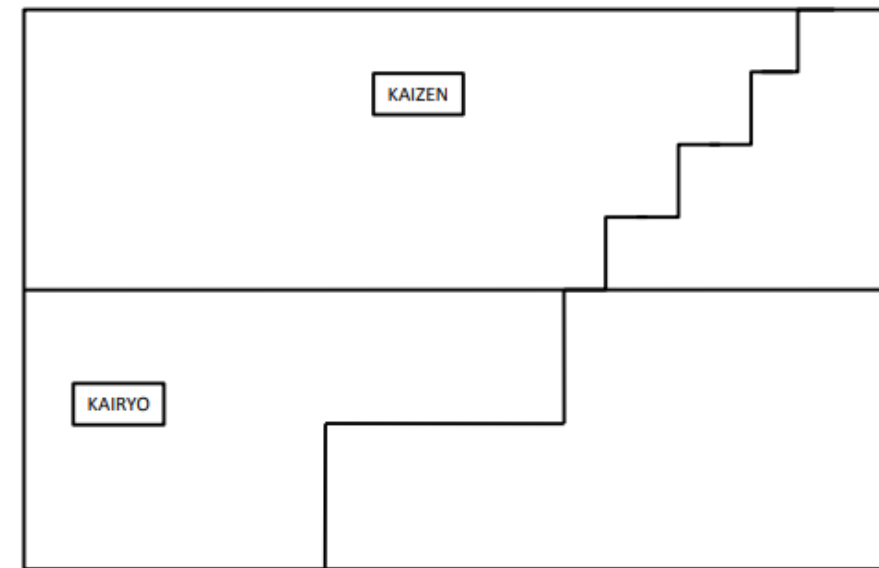
- It strives to minimize inventory and eliminate wasteful activities by producing the right part in the right place at the right time.

- Poka – Yoke
  - To prevent and detect errors
- Team dynamics
  - Problem solving , communications skills and conflict resolution.

#### Benefits of Kaizen

- Kaizen Reduces Waste in areas such as inventory, waiting times, transportation, worker motion, employee skills, over production, excess quality and in processes.
- Kaizen Improves space utilization, product quality, use of capital, communications, production capacity and employee retention.
- Kaizen Provides immediate results. Instead of focusing on large, capital intensive improvements, Kaizen focuses on creative investments that continually solve large numbers of small problems.

Comparison between Kaizen & Kairyo



#### Kaoru Ishikawa

- 1939 – received his doctorate of philosophy in chemical engineering from the University of Tokyo.

#### Ishikawa Contribution

- Company wide Quality
- Quality Circle
- Cause and Effect Diagram.

#### Company Wide Quality

- Ishikawa built on the Feigenbaum concept of Total Quality and suggested that all employees have greater role to play.
- As every department of an organization can affect quality.
- Effects of Company Wide Quality Control, He brings out the benefits of Company wide Quality control.

#### Benefits of Company Wide Quality

- Reduced Defects

- Improved Product quality
- Quality improvement becomes the norm
- Increased Reliability
- Reduced cost
- Increased Quality of Production.
- Waste is identified and reduced.
- Rework is identified and reduced.
- Improved techniques are established and continuously improved.
- Inspection and after-the-fact expenses are increased.
- Contracts are rationalized.
- Sales and market opportunities are increased.
- Company reputation is increased.
- Interdepartmental barriers are broken down and communication becomes easier.
- False and inaccurate data is reduced.
- Meetings are more effective and focused.
- Repairs and maintenance are rationalized.
- Improvement in human relations.
- Company loyalty is increased.

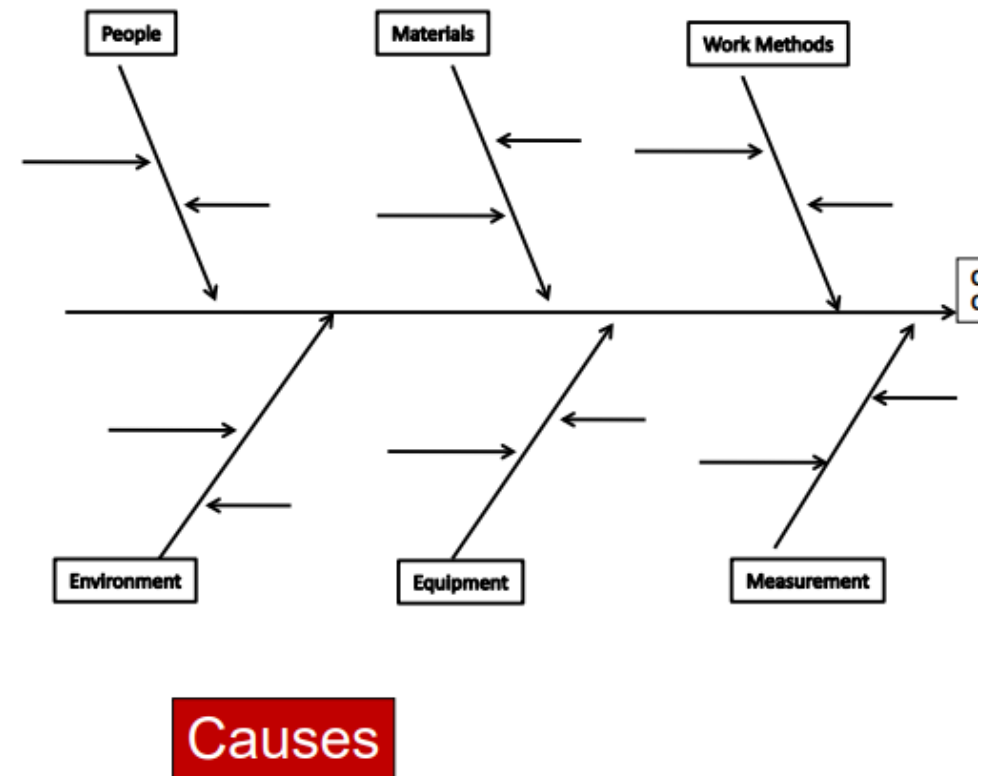
#### Cause and Effect Diagram

- It is graphical- tabular chart to list and analyze the potential causes of a given problem.
- The diagram consist of the central stem leading to the effect with the multiple branches coming off the stem listing the various groups of possible causes of problem.

#### Construction of Cause and effect Diagram

- Define the effect clearly and concisely.
- Mark the short description of effect in a box. Then draw a line from this box towards left.
- List down all possible minor and major causes through brainstorming sessions
- Mark the major causes on the branches and minor causes on sub branches .
- Look for possible solutions
- Introduce the changes

## Fish Bone Diagram



#### Armand Feigenbaum

- 1951 – Feigenbaum originated the concept of total quality control in his book Total Quality Control. The book has been translated into many languages.
- The founder and president of General System Co., an international engineering company that designs and implements total quality systems.

He defined Total Quality Control as follows:

“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.”

#### Crucial elements of Total Quality

- The elements of total quality to enable a totally customer focus (internal and external)
- Quality is the customers perception of what quality is, not what a company thinks it is.
- Quality and cost are the same not different.
- Quality is an individual and team commitment.
- Quality and innovation are interrelated and mutually beneficial.
- Managing Quality is managing the business.
- Quality is a principal.
- Quality is not a temporary or quick fix but a continuous process of improvement.
- Productivity gained by cost effective demonstrably beneficial Quality investment.
- Implement Quality by encompassing suppliers and customers in the system.

#### Taguchi techniques:

- ❖ Taguchi methods are the statistical methods developed by Genichi Taguchi to improve the quality manufactured goods.
- ❖ Taguchi's significant Contributions to Quality Management include:
  - ❑ Taguchi Loss Function
  - ❑ The Philosophy of off-line Quality control.

#### Taguchi Loss function:

Taguchi has defined as the loss imparted to the society from the time a product is shipped. Societal losses include

- Failure to meet customer requirements
- Failure to ideal performance and
- Harmful side effects

#### Loss – to – Society Concept :

This concept can be explained with examples :

##### 1) Production of large Vinyl covers

- The process is just capable of meeting specifications (USL and LSL) , However it is on target.
- To reduce its production cost the organization decided to shift the target closer to LSL.
- This resulted in substantial improvement by lowering the cost to the organization, however the vinyl was not strong it caused substantial loss to the society. The company lost its reputation

##### 2) Hitting the target documented by Sony.

Assuming the target was correct, the losses of the concern are those caused by a product critical performance characteristics deviating from the target. The design and specifications were identical , U.S. customers preferred the color density of shipped TV sets produced by Sony – Japan over those produced by Sony - USA. Its clear that customers perceived quality as meeting the target rather than just meeting the specifications.

The Quadratic loss function is described by an equation / Nominal-the-Best.

$$L = k(y - \tau)^2$$

L = Cost incurred as quality deviates from the target.

y = performance characteristic

$\tau$  = Target

k = Quality loss coefficient.

The loss coefficient is determined by setting  $\Delta = (y - \tau)$ , the deviation from the target. When  $\Delta$  is at the USL or LSL, the loss to the customer of repairing or discarding the product is \$A. Thus,

$$k = A / (y - \tau)^2 = A/\Delta^2$$

#### Taguchi's philosophy of off-line quality control:

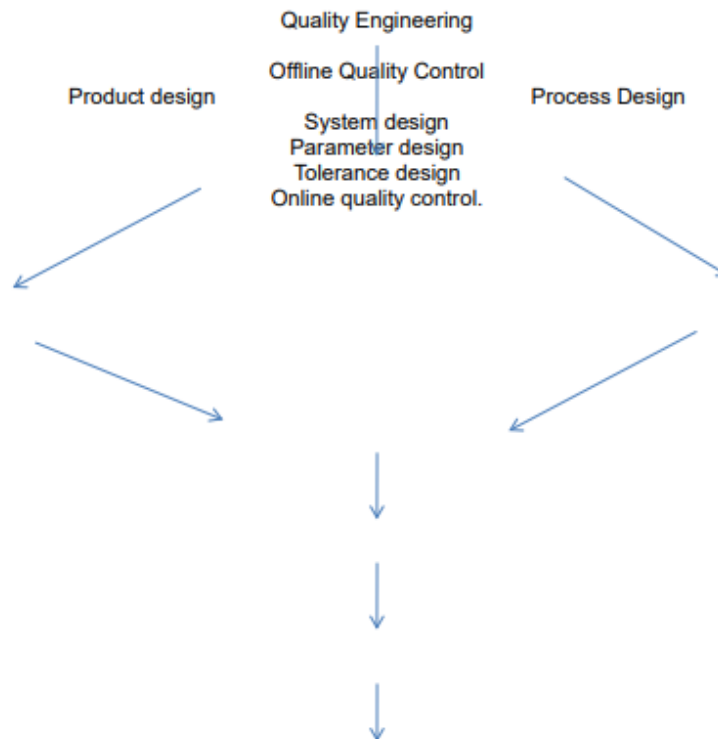
Second contribution relates to the design of products. There are the two causes of the variation in products design characteristics and “Noise”.

Noise arises due to variation in operating environment and human errors

Reducing such noise can be done through

- System Design:** properly designing the product and process
- Parameter Design :** Identifying the key process variables that affect variation and then establishing levels for these parameters which will minimize the variation.
- Tolerance Design:** Identifying the components that contribute most to variations in the final product and then setting appropriate tolerance for these components.

#### Stages of Quality Control



### System Design:

System design involves using engineering and scientific knowledge to create an initial product prototype

### Parameter Design

Parameter Design involves determining the specifications settings for product and process parameters in terms of nominal values so that the final product will be less sensitive to changes in environmental conditions and other uncontrollable factors.

Factors can be divided into two:

Controllable (or design) factors:

Uncontrollable factors:

### Orthogonal Arrays:

The key is to achieve a robust design, the ability to determine optimum levels for the control factors. This best achieved by an efficient design.

Taguchi has developed a series of design utilizing orthogonal arrays handling a large number of factors and less quantifying likely interactions and optimizing the factor levels.

### Signal to Noise Ratio:

The purpose of the Taguchi analysis is to determine optimum control factors levels for the product or process to be on target and to minimize the variation about the target.

$$S/N \text{ ratio} = 10 \log (\bar{y}^2 / \sigma^2)$$

Where  $\bar{y}$  and  $\sigma$  are the mean and S.D of (n) observation respectively.

### Tolerance Design

Tolerance design is employed to reduce variation by tightening the tolerance on those factors shown to have large impact on variation.

## 8D PROBLEM-SOLVING METHODOLOGY

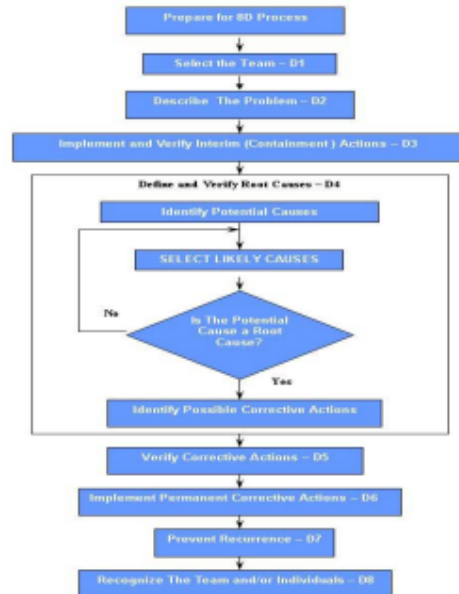
8D is a problem-solving methodology for product and process improvement.

### Eight Disciplines

- Use Team Approach
- Describe the Problem
- Implement and Verify Short-Term Corrective Actions
- Define and Verify Root Causes
- Verify Corrective Actions
- Implement Permanent Corrective Actions
- Prevent Recurrence
- Congratulate Your Team

Benefits of 8 D methodology:

1. It provides the Systematic approach for analyzing problems and identifying real root causes
2. It enables effective containment actions and also implements permanent solutions to prevent recurrence of problem



### 5's House Keeping

- To establish and maintain a productive and quality environment in an organization.

5 's was invented in Japan

Japanese Term	English Equivalent
SEIRI	Tidiness
SEITON	Orderliness

SEISO	Cleanliness
SEIKETSU	Standardizing
SHITSUKE	Discipline

### Objective of 5'S

- To create a neat and clean work place.
- To systemize day to day working
- To improve work efficiency.

### SEIRI : Clearing and sorting

*Remove the clutter and avoid accidents*

- To identify and sort all the items that is necessary and unnecessary items and discard all the unnecessary items.
- Develop a clear and well understood policy of disposal of broken, not repairable or unwanted items.

### SEITON: Arranging

*A Place for everything and everything in its place*

- To arrange everything in the proper order so that it can be easily picked up for use.
- In stores
- On shop floor
- In the office

### SEISO :Cleanliness

*Clean and healthy place eliminates waste*

- To sweep the workplace thoroughly so that there is no dust, oil etc.
- Sweeping inside the lines of people working is the responsibility

### SEIKETSU : Standardizing

*Standards improve reliability and consistency*

- Maintaining the high standards of workplace organization and house keeping at all times.
- Establish standards.



### SHITSUKE : Discipline

*Walk the talk : Action speaks louder than the words*

- Self discipline.
- All the employees must be trained in all aspects.

Relationship between various 5S



### Factors in implementing 5's

1. Participation by all:
2. Top management commitment:
3. Should be self sustaining:
4. Review the programmes

### Benefits in implementing 5'S

1. Work place becomes clean and better organized
2. Results in good company and generates more business
3. Shop floor and office operations become easier and safer.
4. People become disciplined.
5. Contribute to productivity quality and employee morale.
6. Better quality awareness.

### Quality Circle

Quality circle is a group of workforce members usually from within same area or similar works, who volunteer to meet weekly to address quality problems that occur within their work area.

### Objectives of Quality Circle:

- Supportive atmosphere which encompass the active involvement of employees in all aspects of the work process.
- Improve quality

### Characteristics of Quality Circle:

- 1) Maximum number of employees in any quality circle is between 6-12.
- 2) QC should have a homogenous group where participation members must be from within the same department or work area.
- 3) Two types of problem
  - a. Personal well being of the worker, working conditions, housekeeping.
  - b. Well being of the company quality and productivity work related problems.
- 4) Members should be trained in statistical and other problem solving tools so that they can identify, analyze and resolve work related problems.

### Structure of Quality Circle:



#### Steps of Problem Solving in QC:

- Step 1 : Problem Identification and selection of a problem
- Step 2 : Analysis of the problem
- Step 3 : Development of many solutions
- Step 4 : Selection of Best solution
- Step 5 : Presentation of the solution
- Step 6 : Implementation of the solution

#### Benefits of QC:

- Quality circles effects on individual characteristics
- QC effects on individual's relationships with the others
- QC effects on workers and their attitudes toward the company.

#### Limitations of QC:

- Participations is not always voluntary in all cases
- Participation fades away if it lacks of top management support
- No involvement of trade unions

#### Successfully implementation of QC programmes :

1. Visible support and commitment from the managers at every level and direct involvement by the managers.
2. Clear idea of an organization as to why QC was introduced
3. Support from the Trade Unions
4. Appointment of the enthusiastic and committed facilitators

#### Improvement Strategies:

There are four improvement strategies, choosing the right strategy for the right situation is critical. It is also true that proper integration of the strategies will produce never ending improvement.

- **Repair:**
- **Refinement**
- **Renovation**
- **Reinvention**

#### Types of Problems

- Performance problems
  - Existing system is not performing satisfactorily.
- Design problems
  - New or improved design.

Compliance  
Unstructured  
Efficiency  
Process Design  
Product Design

### UNIT III STATISTICAL PROCESS CONTROL AND PROCESS CAPABILITY

Meaning and significance of statistical process control (SPC) – construction of control charts for variables and attributed. Process capability – meaning, significance and measurement – Six sigma concepts of process capability. Reliability concepts – definitions, reliability in series and parallel, product life characteristics curve. Total productive maintenance (TMP) – relevance to TQM, Terotechnology. Business process re-engineering (BPR) – principles, applications, reengineering process, benefits and limitations.

#### Maintenance

- Maintenance is defined as the “management, Control, Execution and quality assurance of activities which ensure the achievement of optimum availability and performance of plant in order to meet business objectives”

#### Total Productive Maintenance (TPM)

- TPM is the systematic execution of maintenance by all employees.
- TPM is the manufacturing led activity that emphasis on the “Continuous improvement” Philosophy.

#### Objectives of TPM

- To improve effectiveness
- To achieve Autonomous maintenance
- To plan maintenance
- To train all staff in relevant skills

#### Types of maintenance

##### Breakdown Maintenance:

##### Preventive maintenance

##### Detective maintenance

#### Concept of TPM

- To create an environment wherein everyone feels that it is his/her responsibility to keep the equipment running & productive.
- Everyone is responsible for maintenance
- Show interest in data concerning, utilization & efficiency
- Everyone understands that zero breakdowns, zero defects & maximum productivity are goals.

- It takes at least two years to set a effective TPM system in place
- TPM activities are carried out in small tasks
- Every level in the overall organization must be represented by a team or more.
- It provides empowered teams
- It provides skill work force

#### 12 steps for TPM development

Preparation Stage:	Step 1	Announce top management about the decision to introduce TPM
	Step 2	Launch education & campaign to introduce TPM
	Step 3	Create organization to promote teams
	Step 4	Establish basic policies & goals
	Step 5	Formulate policies & goals
Pre Implementation Stage	Step 6	Hold TPM
TPM Implementation Stage	Step 7	Improve effectiveness of each piece of equipment.
	Step 8	Develop maintenance program
	Step 9	Develop a scheduled maintenance program for the maintenance department
	Step 10	Conduct training to improve skills
	Step 11	Develop early equipment management programme
Stabilization Stage	Step 12	Perfect TPM implementation

#### Benefits of TPM

1. Increased equipment productivity
2. Improved equipment reliability
3. Reduced equipment downtime
4. Increased plant capacity
5. Lower maintenance & production costs

#### 6 Big Losses:

Breakdown	Long Interruptions, Expensive Repairs
Setup and Changeover	Taking much longer than method
Idling and minor Stoppages	Hard to quantify
Reduced Speed	Equipment cycle time have gradually deteriorated
Defects and rework	Quality losses and unhappy customers
Startup loss	Too long to get to steady state after change.

**Formula to calculate Overall equipment Effectiveness:**

**Break down & Setup and changeover**

$$\text{Availability} = \frac{\text{Loading time} - \text{Downtime}}{\text{Loading (operating) time}} * 100$$

**Idling and Minor stoppages & Reduced Speed**

$$\text{Performance Efficiency} = \frac{\text{Theoretical Cycle time per unit} * \text{No. of Units}}{\text{Operating time} - \text{Down time}} * 100$$

**Defects and rework & Start up loss**

$$\text{Rate of Quality} = \frac{\text{Produced Quantity} - \text{Defect Quantity}}{\text{Produced Quantity}} * 100$$

$$\text{Overall equipment Effectiveness} \left\{ = \text{Availability} * \text{Rate of Quality} * \text{Performance Efficiency} \right.$$

**Terotechnology (new technology)**

- Integration of interrelated activities is described as terotechnology
- Terotechnology is to extend the operational life & increase the efficiency of equipment & machinery

**Business process Reengineering (BPR)**

**What is business process**

- A business process may be defined as a series of steps designed to produce a product or a services.
- Process are generally identified in terms of beginning & end points, & organizations units involved particularly the customer units.

**What to reengineer**

- Reengineering should focus on process & not about the organization.
- Reengineering is otherwise called as

**Business process Reengineering (BPR)**

- BPR is defined as rethinking, redesigning of business process to achieve improvements, performances, quality, services & speed.
- BPR is clearly not for companies who want a 10% improvement.

Difference	TQM	BPR
Level of change	Incremental (some)	Radical (most important)
Starting point	Existing process	Clean schedule
Frequency of change	One time/ Continuous	One time
Time required	Short	Long
Participation	Bottom -top	Top – down
Scope	Narrow	Broad
Risk	Moderate	High
Enabler	Statistical control	Information technology
Type of change	Cultural (education)	Structure (organization)

**BPR Methodology**

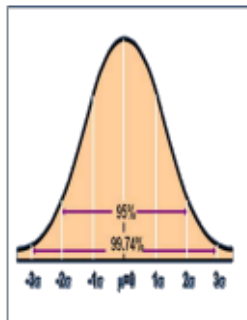
- BPR employs a structured methodology that reduces work process & provides costs performances for improvements
- Application of new technology practices will enable improvement in organizations
- Functional & cross functional processes are evaluated through workflow analysis

- A measure of central tendency of a distribution is a numerical value that describes the central position of data.
- There are three Measures of Central Tendency
  - Mean
  - Median
  - Mode

#### Population & Sampling

- Population
  - Any collection of Individuals or of their attributes or of results of Operations
  - A population or universe can be defined as an unknown pattern of variation from which known sample has been drawn.
- Sample
  - A part selected from the population.
  - A sample selected resemble or represent the population

#### Normal Distribution



Specified Limits	Percent of total Area within the Specified limits
$X + 0.6745 \sigma$	50.00
$X + \sigma$	68.26
$X + 2 \sigma$	95
$X + 3 \sigma$	99

#### Variations

- No Two objects are identical.
- When the Variations are small
  - It may appear that items are identical.
- Four Sources Of Variation:
  - Process, Materials, Operators & Miscellaneous factors.

#### Types of Variations

- Assignable causes of Variation
- Chance (Random ) Cause of Variation

#### Control Charts

- A graph that establishes control limits of a process
- Control limits
  - upper and lower bands of a control chart

#### Types of charts

- Attributes
  - p-chart
  - c-chart
  - $\mu$ chart
- Variables
  - range (R-chart)
  - mean ( $\bar{x}$  – chart)

#### Where to Use Control Charts

- Process has a tendency to go out of control
- Process is particularly harmful and costly if it goes out of control

#### What Does a Control Chart Do?

- Focuses attention on detecting and monitoring process variation over time;
- Distinguishes *special* from *common* causes of variation, as a guide to local or management action;
- Serves as a tool for ongoing control of a process;
- Helps improve a process to perform consistently and predictably for higher quality, lower cost, and higher effective capacity;
- Provides a common language for discussing process performance.

#### Six Sigma Concept

- It is methodology provides the techniques and tools to improve the capability and reduce defects in any process.
- Six sigma strives for perfection “It allows for only 3.4 defects per million opportunities (or 99.999666 percent accuracy)”
- Developed by Bill Smith at Motorola in 1987

#### Six Sigma Definitions



- Business Definition
  - ✓ A break through strategy to significantly improve customer satisfaction and shareholder value by reducing variability in every aspect of business.

#### **Project Phases Six Sigma Methodology**

- Define
- Measure
- Analyse
- Improve
- Control

#### **Benefits of Six Sigma:**

- Generates sustained success
- Sets performance goal for everyone
- Enhances value for customers;

Quality functions development (QFD) – Benefits, Voice of customer, information organization, House of quality (HOQ), building a HOQ, QFD process. Failure mode effect analysis (FMEA) – requirements of reliability, failure rate, FMEA stages, design, process and documentation. Seven old (statistical) tools. Seven new management tools. Bench marking and POKA YOKE.

#### **Unit – 4**

#### **FMEA**

- Failure Mode and Effects Analysis (FMEA) is a systematic team driven approach that identifies potential failure modes in a system, product, or manufacturing / assembly operation caused by either design or manufacturing / assembly process deficiencies.
- FMEA is a tool used to prevent problems from occurring.

Reliability Engineering is concerned with the design, Manufacture and assurance of products having high reliability.

#### **Types of FMEA**

- *System - focuses on global system functions*
- *Design - focuses on components and subsystems*
- *Process - focuses on manufacturing and assembly processes*
- *Service - focuses on service functions*
- *Software - focuses on software functions*

#### **Stages of FMEA**

1. Specifying Possibilities
2. Quantifying Risk
3. Correcting High Risk Causes
4. Re- Evaluation of Risk.

#### **FMEA Document**

FMEA Number
-------------



Item
Designing Responsibility
Prepared by
Model Number / Year
Key Date
FMEA date
Core Team
Item / Function
Potential Failure Mode
Potential Effects of Failure
Severity
Classification (CLASS)
Potential Causes / Mechanism of Failure
Occurrence
Current design Controls
Detection
RPN
Recommended actions
Responsibility
Target Completion date
Actions taken

#### **Process FMEA**

- It is similar to design FMEA.
- Analytical technique utilized by a Manufacturing Responsible Engineering Team
- It is the means to address the potential failure modes and their associated causes.
- It includes all the concerns from all the involved teams.
- Helps to overcome the weakness in the process.

#### **Benefits of FMEA**

1. Having a systematic review of the component failure modes.
2. Determining the effects of failures
3. Determine those parts of the product or the process whose failure will have critical effects on product or process.
4. Calculating the probabilities of failure in assemblies, subassemblies, products and processes.
5. Establishing test program requirements to determine failure mode.
6. Establishing test program requirements to verify the empirical reliability predictions.

#### **QUALITY FUNCTION DEPLOYMENT**

- It is the Systematic & Organized approach of taking customer needs and demands into consideration while designing new products and services.
- It focuses on the “Voice of the Customer”, It is otherwise called as the “Customer Driven Engineering”
- It translates the voice of customer into the technical and functional requirements at every stage of the design and manufacture.

#### **Definition**

- “A system for translating consumer requirements into appropriate requirements at every stage from research through product design and development , to manufacture , distribution , installation and marketing, sales and service.”

#### **Objectives of QFD**

- To identify the voice of customer and than use the technical knowledge to develop products which satisfy customers .
- To help the organization and analysis of all the information associated with the project.

#### **House of Quality**

##### **Basic Structure of House of Quality**

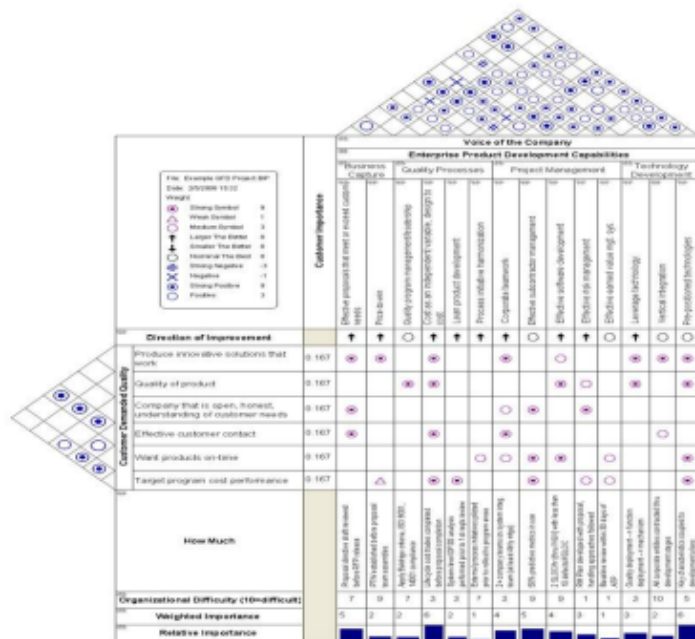
- Customer requirements .
- Prioritized Customer requirements
- Technical Descriptors
- Relationship Matrix
- Trade off Matrix
- Prioritized Technical Descriptors

#### **QFD Methodology :**

- **Step 1: List of customer Requirements (WHAT s)**
- **Step 2 : List of Technical Descriptors (HOW s)**
- **Step 3 : Develop a relationship Matrix Between What’s and How’s**
- **Step 4: Develop an interrelationship Matrix between HOW ’s**
- **Step 5: Competitive Assessments**
- **Step 6: Develop Prioritized Customer requirements**
- **Step 7: Develop Prioritized Technical Descriptors**

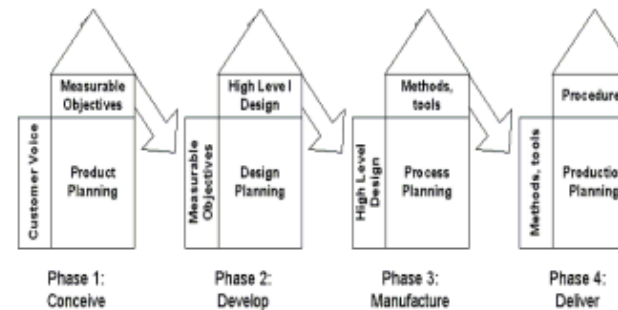
House of quality helps in analyzing

- Customer requirement
- How does it relate to the proposed new product
- Competitive product compare to that of the input and output requirements.



## QFD Process

- Quality Function Deployment (QFD) is a Requirements Engineering approach that focuses on quality. It was originated in Japan in the manufacturing industry. It is a means of producing technical requirements from the customer requirements in the production and development of a product. The main focus of attention in QFD is the House of Quality (HOQ) in group sessions.
- QFD is made up of four different phases that depend on each other, i.e. iterations: Product Planning, Parts Deployment, Process and Control Planning, and Production Planning.



- Product Planning
- Part Development
- Process Planning
- Production Planning

## Benefits of QFD

- Improved communication and sharing of information within a cross-functional team charged with developing a new product.
  - marketing, sales, service, distribution, product engineering, process engineering, procurement, and production
- Identification of 'Loopholes' in the current knowledge of the design team
- Support for understanding, consensus, and decision making, especially when complex relationships and trade-offs are involved
- Creation of an informational base which is valuable for repeated cycles of product improvement

## Benchmarking

### Introduction

- Benchmarking is the process of identifying "best practice" in relation to both products (including) and the processes by which those products are created and delivered.
- The objective of benchmarking is to understand and evaluate the current position of a business or organization in relation to "best practice" and to identify areas and means of performance improvement.

### Definition

- American Productivity and Quality Center has defined the benchmarking as "the process of identifying, understanding, and adopting outstanding practices and process from the organization anywhere in the world to an organization to improve its performance."

Type
Strategic Benchmarking
Functional Benchmarking
Performance or Competitive Benchmarking
Process Benchmarking
Internal Benchmarking
External Benchmarking
International Benchmarking

#### **Benchmarking Process**

- There are five phases of benchmarking process
  - Planning
  - Analysis
  - Integration
  - Action
  - Maturity.

#### **Planning:**

Step 1: what to be benchmarked ?

Step 2 : To whom or what shall we compare.

Step 3 : Determine data collection method and collect data.

#### **Analysis**

Step 4 : Determine the current performance gap

Step 5 : Project performance Levels:

#### **Integration:**

Step 6 : Communicate benchmark findings and gain acceptance

Step 7 : Establish functional goals

#### **Action**

Step 8 : Develop action plans

Step 9 : Implement specific actions and monitor the progress.

#### **Step 10 :**

Recalibrate benchmarks

#### **Maturity**

Step 11 : Attain the leadership position

Step 12 : Integrate practices into process.

#### **Benefits of Benchmarking**

- Self assessment
- Accelerated growth rate
- Yield improvement
- Productivity enhancement
- Higher or improved return on investment
- Creating culture that values continuous improvement to achieve excellence
- Sharing best practices between the benchmarking partners

#### **Pitfalls of Benchmarking**

- It needs lots of commitment to succeed.
- Time consuming and expensive
- Comparing performance and process with “Best in Class” is important and should be done on “Continuous basis”

#### **Poka - Yoke**

- It is Japanese word, it means “mistake Proofing” or [fail-safing](#)"  
Shigeo Shingo defines Poka Yoke
- Poka : “Inadvertent Mistake that anyone can make”
- Yoke : “To prevent or Proof”

#### **Types of Errors**

- Processing Errors
- Setup error
- Missing part.
- Improper Part / item
- Operation error
- Measurement error

### Poka Yoke Approaches

#### Prevention based Poka Yoke

- Control Method
- Warning Method

#### Detection based Poka Yoke

There are three categories of detection based Poka Yoke

- Contact Method :
- Fixed Value Method :
- Motion Step Method

#### APICS Definition of Lean Manufacturing

*"A philosophy of production that emphasizes the minimization of the amount of all the resources (including time) used in the various activities of the enterprise. It involves:*

- ... identifying and eliminating non-value-adding activities,
- ... employing teams of multi-skilled workers,
- ... using highly flexible, automated machines "

#### Types of Waste

- overproduction
- inventory
- waiting
- motion
- transportation
- re-work
- over-processing

#### Seven Statistical Tools (Q7 Tools)

- Prof. Ishikawa proposed seven elemental (Q7) tools based on statistical tools
- It helps to facilitate successful accomplishments of quality improvement objectives.
- Seven tools of quality are :
  1. Check Sheets
  2. Cause & Effects diagrams
  3. Stratification analysis.
  4. Control charts
  5. Histograms
  6. Pareto diagram
  7. Scatter diagram

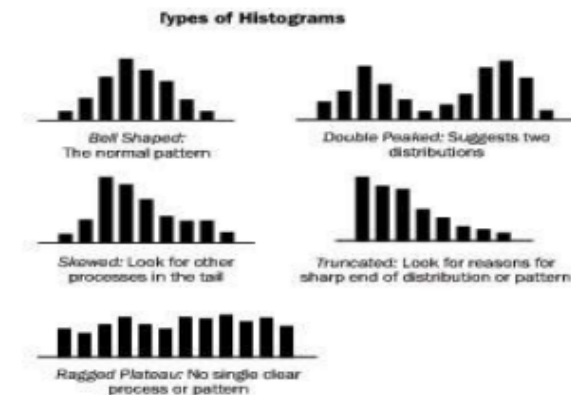
### Check sheets

- Check sheet also known as tally sheet, is a form for systematic data gathering and registering to get a clear view of the facts.
- It helps to indicate the frequency of a certain occurrence.

### Histogram

- Histogram is a bar diagram showing a distribution of variable quantities or characteristics.
- It is graphical display of the frequency distribution of the numerical data.
- It is displayed as a series of rectangles of equal width and varying heights.

#### Types of Histogram



#### Cause and Effect diagram

- It is graphical tabular chart to list and analyze the potential causes of a given problem.
- It is also called as .....
- It consist of the central stem leading to the effect with multiple branches coming off the stem listing the various groups of possible causes of the problem.

#### Pareto Diagram

- It is diagnostic tool commonly used for separating the vital few causes that account for a dominant share of quality loss.
- It was named after ..... (Italian economist)

- It is based on the *Pareto principle* which states that a few of the defects accounts for the most of the effects.
- Pareto analysis is also called as .....rule and .... Analysis. It means 20 % of problems defects account for the 80 % of the effects.

#### **Stratification Analysis**

- It is method of analysis of data by grouping it in different ways.
- Stratification means segregating a group of measurements, observations or any other data into several sub groups on the basis of certain characteristics.
- It is simple very effective quality control tool for improving the quality.

#### **Scatter Diagram**

- To depict the relationship between two variables.
- This diagram displays the paired data as a cloud of points.
- It consist of horizontal axis containing the measured values of one variable i.e (Cause) and other variable could be the effects.

#### **Control charts**

- It was invented by Walter A. Shewhart is the most widely used tool in SPC.
- It displays data taken over time and variation of data.
- It consist of the horizontal lines
  - CL
  - LCL
  - UCL.

#### **New Seven Management Tools**

1. Affinity Diagram
2. Relationship Diagram
3. Tree diagram
4. Matrix Diagram
5. PDPC (Process Decision Programme chart)
6. Arrow Diagram
7. Matrix Data analysis diagram.

#### **Affinity Diagram**

- “ It is tool to collect to large amount of verbal expression and organize them in groups according to natural relationships between individuals items ” .
- It is referred as “ *KJ diagram* “. After inventor Jiro Kawakita.

#### **Relationship Diagram**

- It is tool finding out causes to a problem.
- It not only clarifies the relationship between causes and effect but also between the various causes.
- It is graphical representation of all factors in a complicated problem , system or situation.

#### **Tree diagram**

- It is systematically breaks down a topic into its components elements and show the logical and sequential links between these elements
- It helps to develop a systematic , step by step , strategy to achieve an objective.

#### **Matrix Diagram**

- It is tool that is used to systematically organize information that must be compared on a variety of characteristics in order to make a comparison, selection or choice.
- It is referred to as ‘Quality table’

#### **PDPC (Process Decision Programme chart)**

- It is also known as the decision tree, is a planning tools to outline every conceivable and likely occurrence in any planning.
- It focuses on what can go wrong with one’s plan.
- It helps to anticipate undesirable occurrences.

#### **Arrow Diagram**

- It is graphic description of sequential steps that must be completed.
- The PERT (Program Evaluation and Review Technique) and CPM (Critical Path Method) are the best known arrow diagram.
- It is planning tools that determine critical path of process or a project.

#### **Matrix data analysis diagram**

- It is very much similar to that of the matrix diagram with a difference that numerical data is used instead of symbols indicating the existence and strength of relationship
- The only tools among the “New seven Management tools” which uses numerical data and produces numerical results.



## UNIT V QUALITY SYSTEMS ORGANIZING AND IMPLEMENTATION

Introduction to IS/ISO 9004:2000 – quality management systems – guidelines for performance improvements. Quality Audits. TQM culture, Leadership – quality council, employee involvement, motivation, empowerment, recognition and reward- Introduction to software quality.

### TQM Culture

It is advocating a total commitment to customer satisfaction through continuous improvement and innovation in all aspects of the business.

#### TQM Axioms

- Commitment :
- Scientific Knowledge:
- Involvement

Commitment



- , we can define the TQM as follows

- “TQM is a culture ; inherent in this culture is a total commitment to quality and an attitude expressed by everybody's involvement in the process of continuous improvement of products and services, through the use of innovative scientific methods.”

### Leadership

Leadership is the process of influencing others towards the accomplishment of goals . Leader triggers the will to do , show the direction and guide the group members towards the accomplishment of the company's goals.

- Peter Drucker , the eminent management thinker and write quotes
- “Leadership is lifting of man's visions to higher sights , the raising of man's performance to higher standard, the building of man's personality beyond its normal limitations. ”

### Characteristics of Quality Leaders

- Priority attention to the internal and external customers and their needs. Leaders place themselves in the customers shoes and services their needs.
- Empower rather than control, subordinates.
- Emphasize improvement rather than maintenance
- Emphasize on prevention

### Role of Senior Management

- To study and investigate the TQM concepts and issues.
- To set clear quality policies and provide challenging task.
- To establish “Priority of quality” and “Customer satisfaction” as the basic policy and determine the long term goals.

### Quality Council

- A **Quality Council** is a team to provide overall direction for achieving the total quality culture.

### Duties of Quality council

- To establish the core values and quality statements
- To establish the strategic long term plan with goals and annual quality improvement program with objectives.
- To plan the training and education programmes.

### Responsibilities of Quality council

- To develop two way trust



- To propose team requirements to the council
- To share council expectations with the team.
- To empower the team
- To brief the council on team progress.

#### Quality Management Systems

- The essence of the number of “quality” definitions is
  - to provide company’s operating system which promote conformance to specifications.

ISO defined the term quality system

*“The quality system are the organizational structure, responsibilities, procedures, process and resources for implementing quality management”*

- The system is well understood and effective.
- The products or services actually do satisfy customer expectations.

The emphasis is placed on problem- prevention rather than dependence on detection, after occurrence

- How – methods and process description
- Who – responsibilities and authorities
- When – records and evidence
- Where – identification and traceability

#### Elements of a Quality Management System

- Organizational Structure
- Responsibilities
- Methods
- Data Management
- Processes
- Resources
- Customer Satisfaction
- Continuous Improvement
- Monitoring

- Product Quality.

#### Reasons for implementing a Quality Systems

- Improve employee involvement
- Improve house keeping
- Improve decision making based on facts and data
- Improved customer satisfaction
- Improved safe working
- Reduced customer complaints
- Reduced inspection efforts
- Reduced quality cost.

#### ISO

- It was established in 1946 in Geneva, Switzerland.
- An association of National Standards Bodies of more than 150 Countries.
- The primary objective of ISO is coordination and unification of international standards.
- *ISO has developed over 18 000 International Standards on a variety of subjects and some 1100 new ISO standards are published every year.*
- It employs a system of technical committees, sub committees and working groups to develop international standards, It permits other international organization that develop standards to participate in its work by accepting them as liaison members
- BIS is the national standards body of India represented on ISO.

#### ISO 9001 is for **quality management**.

- **Quality** refers to all those features of a product (or service) which are required by the customer.
- **Quality management** means what the organization does to
  - ensure that its products or services satisfy the customer's **quality requirements** and
  - comply with any **regulations** applicable to those products or services.

Generic Standards

- No matter what the organization's scope of activity
- if it wants to establish a **quality management system**, ISO 9001 gives the essential features
- or if it wants to establish an **environmental management system**,

#### Who is responsible for developing ISO standards

- ISO technical committee and sub committee are responsible for the development of the standards.
- The work is conducted on the basis of consensus among quality and industry experts nominated by the national standards
- QMS should be a strategic decision of an organization
- Design & Implementation
  - Business
  - Environment,
  - Changes in that environment, or
  - Risks associated with that environment;
  - Its varying needs; its particular objectives;
  - Products it provides;
  - The processes it employs;
  - Its size and
  - Organizational structure

#### Process approach

- To identify and manage numerous linked activities
- Ongoing control that it provides over the linkage between the individual processes within the system of processes

- a) understanding and meeting requirements,
- b) the need to consider processes in terms of added value,
- c) obtaining results of process performance and effectiveness, and

d) continual improvement of processes based on objective measurement.

ISO 9000:2005	Quality management systems -- Fundamentals and vocabulary
ISO 9004:2000	Quality management systems -- Guidelines for performance improvements
ISO 10002:2004	Quality management -- Customer satisfaction -- Guidelines for complaints handling in organizations
ISO 10005:2005	Quality management systems -- Guidelines for quality plans

#### ISO 9004 : 2000

- International Standard provides guidelines beyond the requirements given in ISO 9001
- Both the effectiveness and efficiency of a quality management system,
- Potential for improvement of the performance of an organization. When compared to ISO 9001,
- The objectives of customer satisfaction and product quality are extended
  - satisfaction of interested parties
  - performance of the organization.
- International Standard is applicable to
  - the processes of the organization
  - quality management principles
  - The achievement of ongoing improvement, measured through the satisfaction of customers and other interested parties.
- International Standard consists of guidance and recommendations

- ISO 9004 has been developed to maintain consistency with ISO 9001
- ISO 9001 specifies requirements for a QMS

#### Where should ISO 9004 be positioned ?

- As an introductory guidance 'textbook' ?
- As a direct guide to ISO 9001 ?
- As a higher level set of certification requirements than ISO 9001 (a competitor to the quality awards programmes ) ?
- As a guide on 'quality management' or 'business excellence' ?

#### Relationship ISO 9001/ISO 9004

A "consistent pair" of standards, but each capable of being used on its own

- Allows for ready transition between the two standards
- Harmonized main clause titles, structures and terminology

Based on 8 "Quality Management Principles" "Process Approach"

#### Process-based structure

Management responsibility

Policy, objectives, planning, system, review

Resource management

Human resources, information, facilities

Product realization

Customer, design, purchasing, production, calibration

Measurement, analysis and improvement

Audit, process/product control, improvement

#### Basic process model



#### **Documentation**

- One of the goals of the ISO based Management System standards is to bring control and consistency to your processes.
- The standards ask you to identify your key processes, and manage and improve those processes.
- Documentation is one of the ways you manage and control your processes. By writing procedures and work instructions you will make sure that everyone is performing the process the same way.
- ISO documentation typically comprises four tiers. Each tier should point to the next.

# Documentation Pyramid

