



NSCET E-LEARNING PRESENTATION

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Electrical and Electronics Engineering

IV YEAR/7th Semester

GE8077-Total Quality Management

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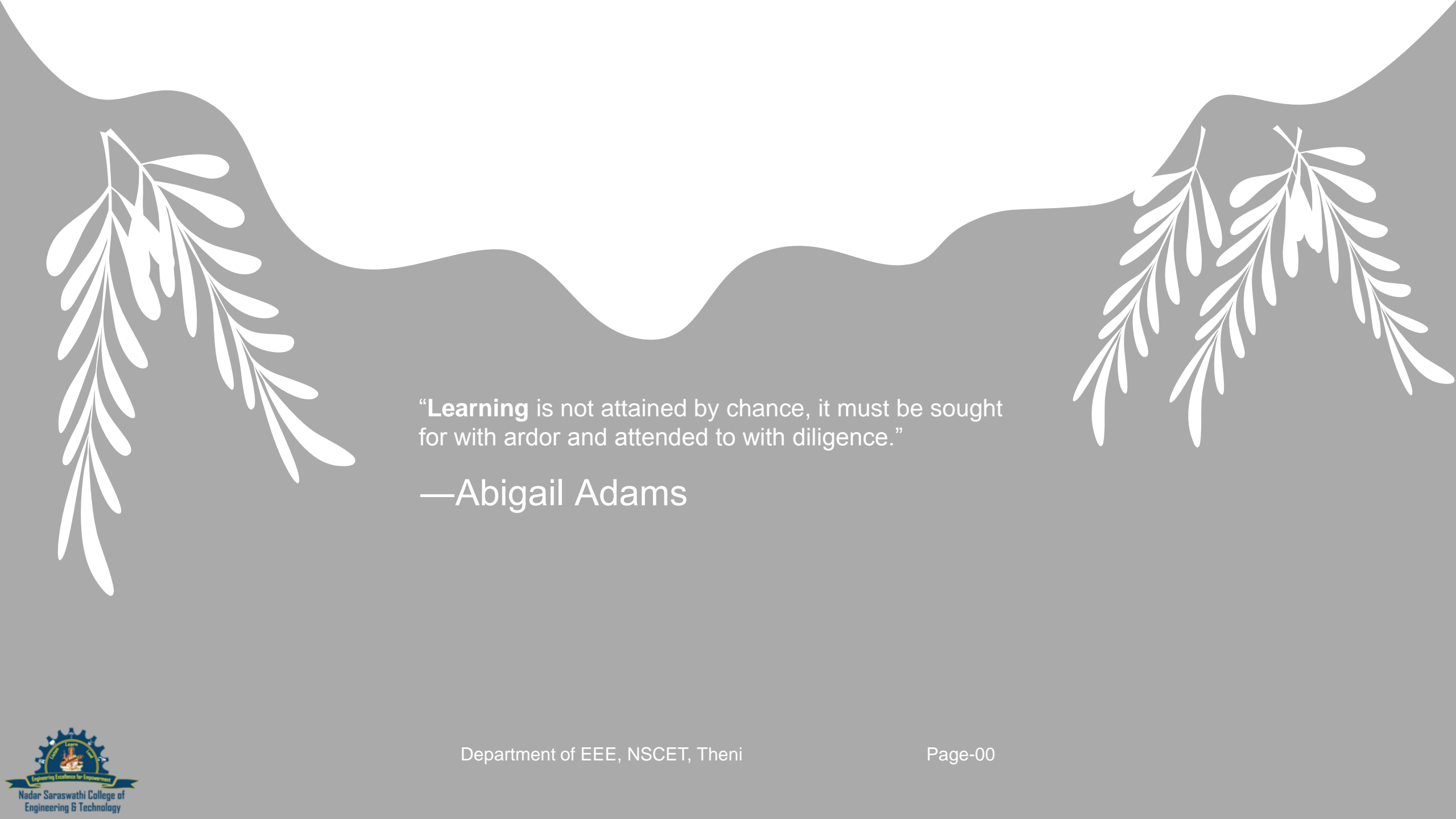
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UNIT-IV TQM TOOLS AND TECHNIQUES II





“**Learning** is not attained by chance, it must be sought for with ardor and attended to with diligence.”

—Abigail Adams

Unit IV - Syllabus

TQM TOOLS AND TECHNIQUES II

Quality Circles - Cost of Quality - Quality Function Deployment (QFD) - Taguchi quality loss function - TPM - Concepts, improvement needs - Performance measures.

QUALITY CIRCLES

- Quality Circle is a small group of 6 to 12 employees doing similar work who voluntarily meet together on a regular basis to identify improvements in their respective work areas.
- Quality Circle is one of the employee participation methods. It implies the development of skills, capabilities, confidence and creativity of the people through cumulative process of education, training, work experience and participation.
- It is "a way of capturing the creative and innovative power that lies within the work force".

CONCEPT

Quality Circle concept has three major attributes:

- a. Quality Circle is a form of participation management.
- b. Quality Circle is a human resource development technique.
- c. Quality Circle is a problem solving technique.

OBJECTIVE

The objectives of Quality Circles are multi-faced.

- a) Change in Attitude.
- b) Self Development Bring out Hidden Potential of people
- c) Development of Team Spirit Individual Vs Team
- d) Improved Organizational Culture

ORGANIZATIONAL STRUCTURE

- A Quality Circle has an appropriate organizational structure for its effective and efficient performance. The structure of a Quality Circle consists of the following elements.
 - i. A steering committee
 - ii. Co-ordinator
 - iii. Facilitator
 - iv. Circle leader
 - v. Circle members

PROCESS OF OPERATION

The operation of quality circles involves a set of sequential steps

- Problem identification
- Problem selection
- Problem Analysis
- Generate alternative solutions
- Select the most appropriate solution
- Prepare plan of action
- Present solution to management circle members
- Implementation of solution

BENEFITS AND LIMITATIONS OF QUALITY CIRCLES

Advantages of quality circles

- Increase Productivity
- Improve Quality
- Boost Employee Morale

Disadvantages/problems with QC

- Inadequate Training
- Unsure of Purpose
- Not truly Voluntary
- Lack of Management Interest
- Quality Circles are not really empowered to make decisions

QUALITY COST

- Quality costs are defined as those costs associated with the non-achievement of product/service quality as defined by the requirements established by the organization and its contracts with customers and society.
- Quality cost is a cost for poor product of service.

ELEMENTS OF QUALITYCOST

- Cost of prevention
- Cost of appraisal
- Cost of internal failures
- Cost of external failures.

Quality Cost



INTERNAL FAILURE COSTS

- The cost associated with defects that are found prior to transfer of the product to the customer. You incur an internal failure cost when a defective product is produced. This appears in the form of scrapped or reworked goods.

EXTERNAL FAILURE COSTS

- The cost associated with defects that are found after product is shipped to the customer. It also incur an external failure cost when a defective product was produced, but now the cost is much more extensive, because it includes the cost of product recalls, warranty claims, field service.

ANALYSIS TECHNIQUES OF QUALITY COST

- The purpose of quality cost analysis is to determine the cost of maintaining a certain level of quality. Such activity is necessary to provide feedback to management on the performance of quality assurance and to assist management in identifying opportunities.
 - Index Numbers
 - Trend Analysis
 - Pareto analysis

QUALITY FUNCTION DEPLOYMENT

- Quality Function Deployment is a planning tool used to fulfill customer expectations.
- Quality Function Deployment focuses on customer expectations or requirements, often referred to as voice of the customer.

QFD TEAM

- There are two types of teams namely
 - 1. Team for designing a new product
 - 2. Team for improving an existing product

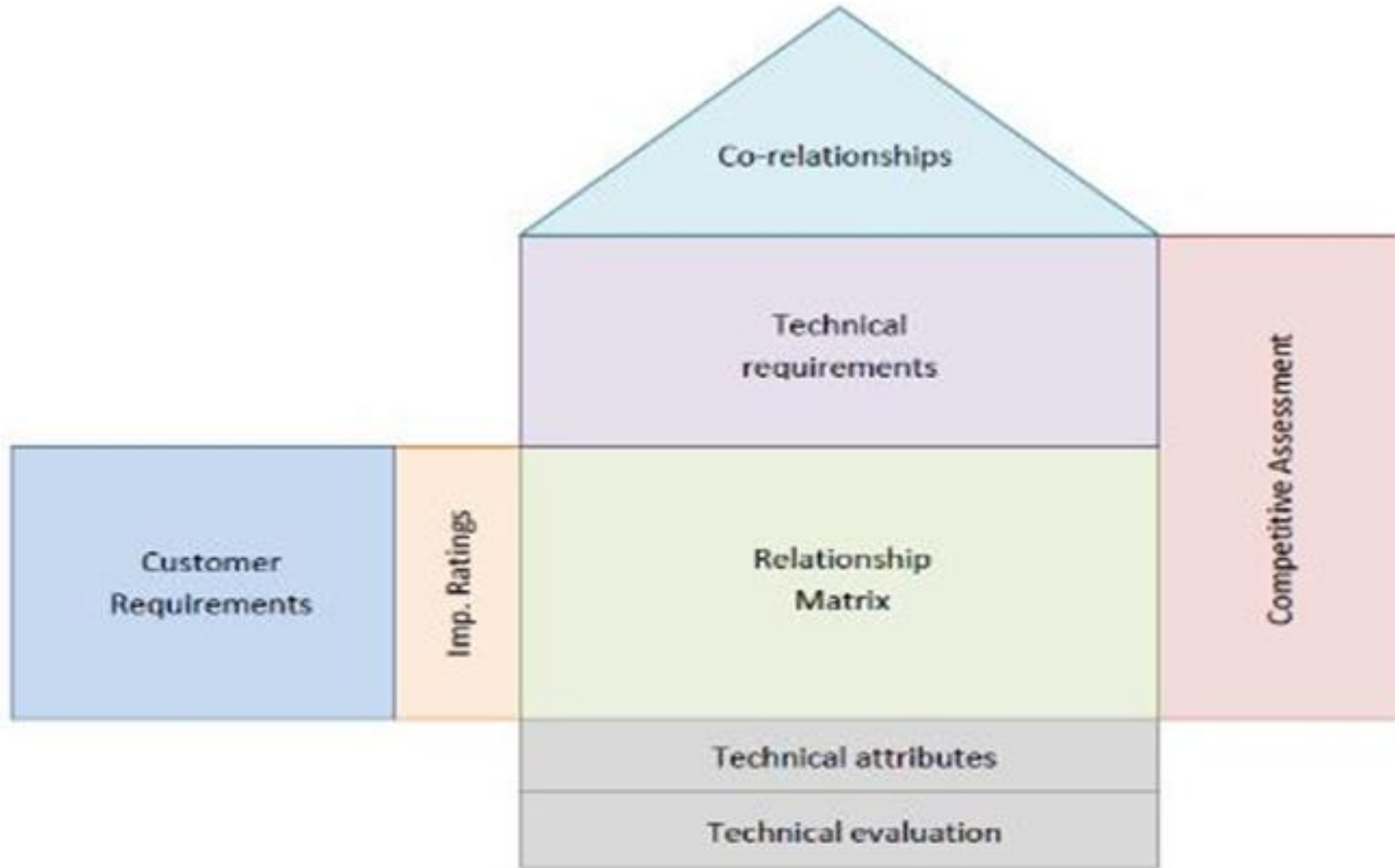
THE VOICE OF THE CUSTOMER

- QFD begins with marketing to determine what exactly the customer desires from a product. The various sources for determining customer expectations are focus groups, surveys, complaints, consultants, standards, and federal regulations.

HOUSE OF QUALITY

- The primary planning tool used in QFD is the House of Quality (HOQ).
- The house of quality converts the voice of the customer into product design characteristics.
- OFD uses a series of matrix diagrams, also called, 'quacity tables', that resemble connected houses.

Structure of House of Quality

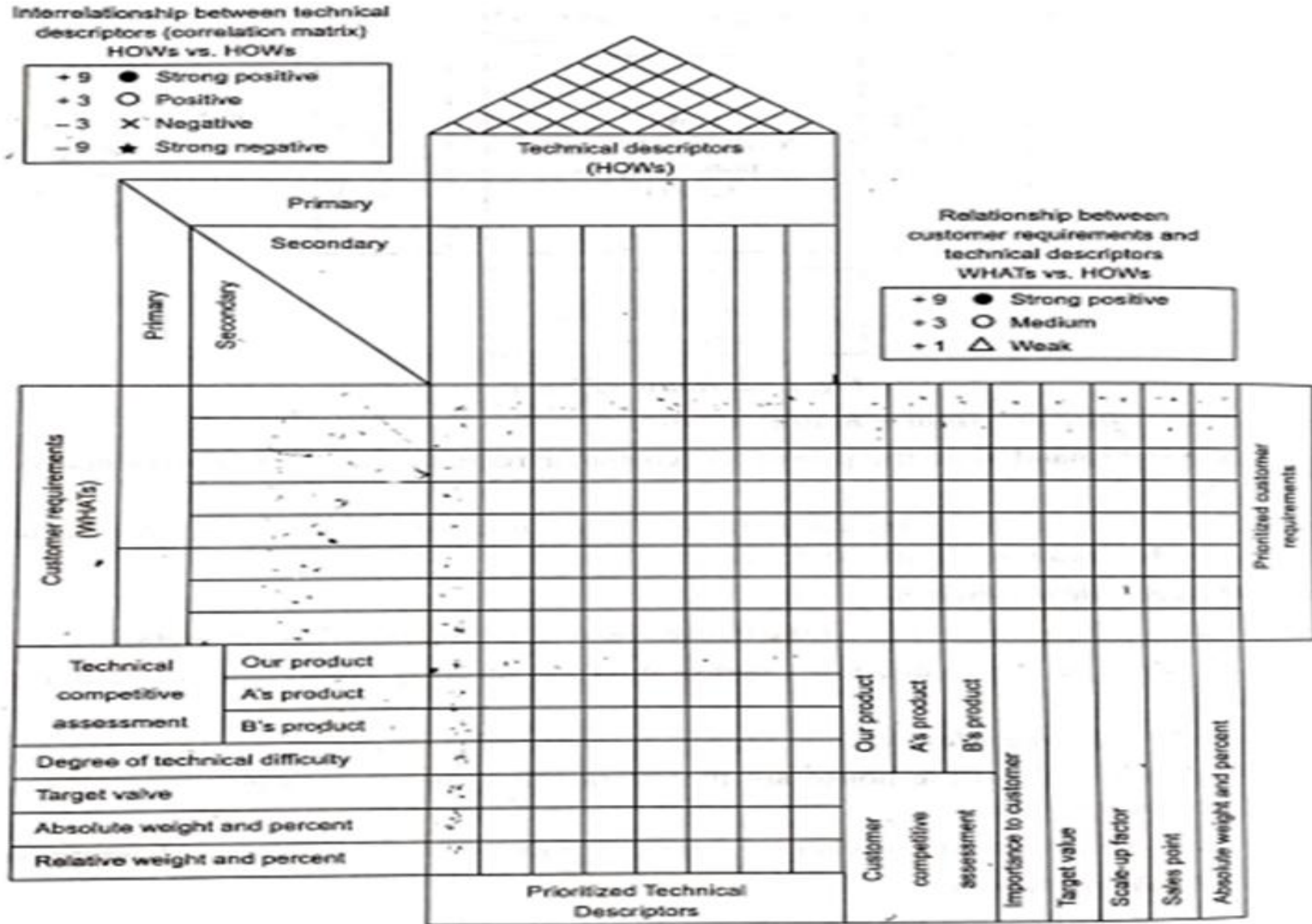


House of Quality

The house of quality has six sections

- ✓ Section I: Customer Requirements
- ✓ Section II : Prioritized Customer Requirements
- ✓ Section III: Technical Descriptors
- ✓ Section IV: Relationship Matrix
- ✓ Section V: Trade-off Matrix
- ✓ Section VI : Prioritized Technical Descriptors

House of Quality in Matrix Format



Basic house of quality matrix

QFD PROCESS

There are four phases of product development :

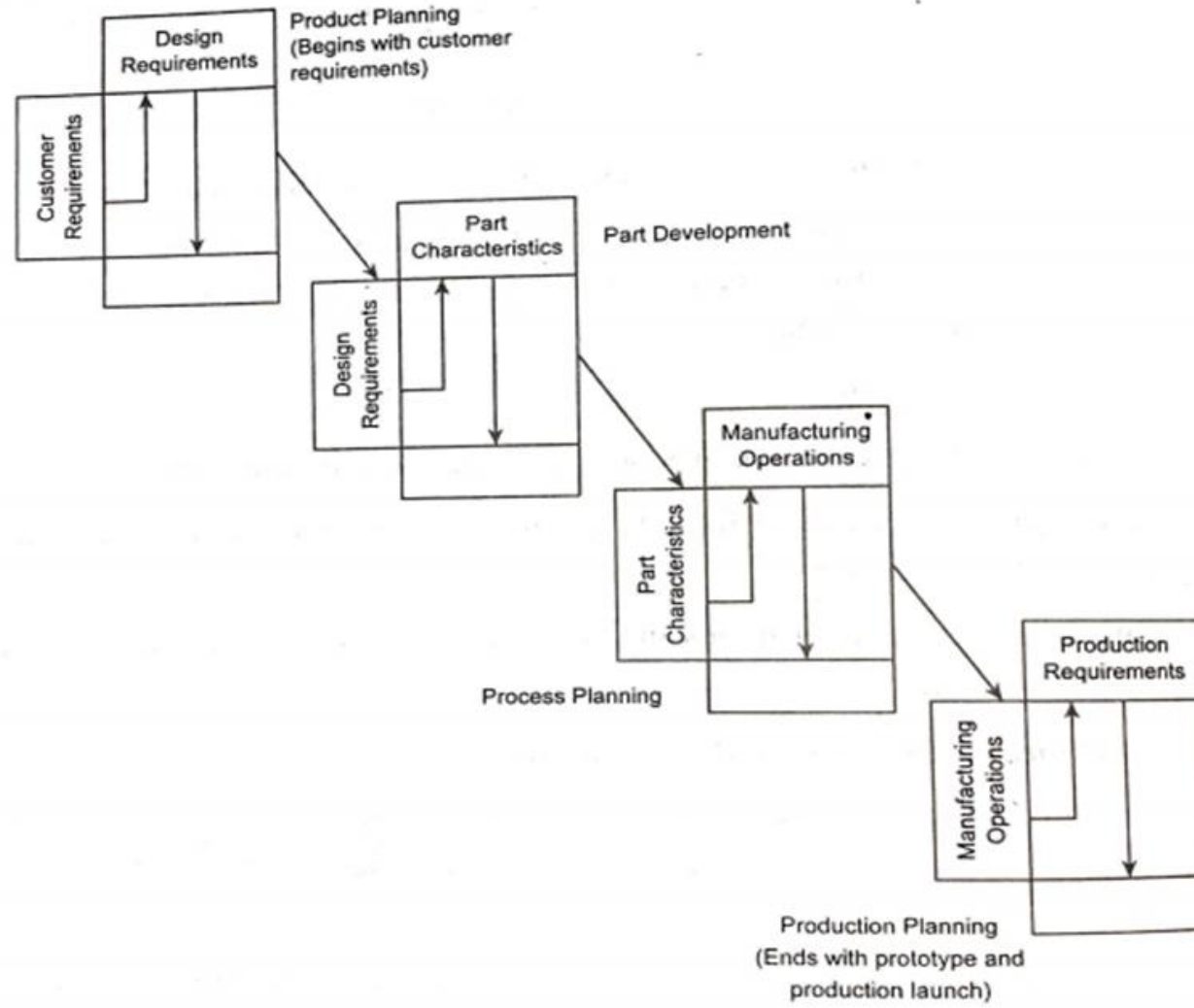
(i) Product planning

(ii) Part development

(iii) Process planning and

(iv) Product planning.

Quality Function Deployment



Part Deployment in QFD

BENEFITS OF QFD

QFD is a communication and planning tool that :

- (i) Promotes better understanding of customer demands;
- (ii) Improves customer satisfaction;
- (iii) Promotes team work
- (iv) Facilitates better understanding of design interactions ;
- (v) Involves manufacturing in the design process;

BENEFITS OF QFD

- (vi) Breaks down barriers between functions and departments;
- (vii) Concentrates on design effort;
- (viii) Minimizes the number of later engineering changes:
- (ix) Introduces new design to the market faster;
- (x) Provides better documentation of the design and development process; and
- (xi) Reduces the overall costs of design and manufacture.

TAGUCHI QUALITY LOSS FUNCTION

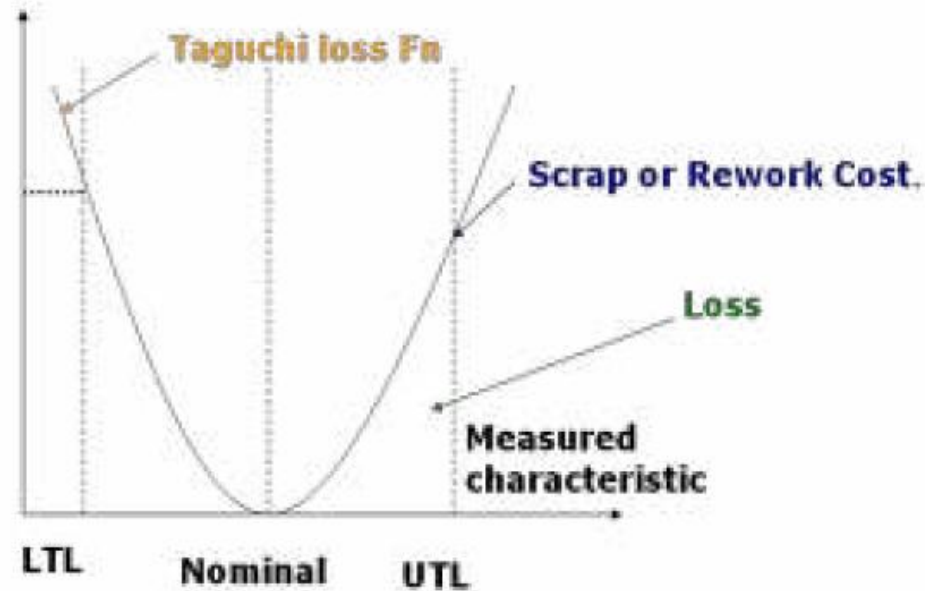
- Taguchi Methods is a statistical methods developed largely by GENICHI TAGUCHI to improve quality of manufactured goods.
- The philosophy of off- line quality control.
- Innovations in the design of experiments.

DEFINITION

- Taguchi defines Quality as “the loss imparted by the product to society from the time the *product is shipped.*”
- LOSS = Cost to operate, Failure to function, maintenance and repair cost, customer satisfaction, poor design.
- Product to be produced “being within specification”

Taguchi's U-shaped loss Function Curve

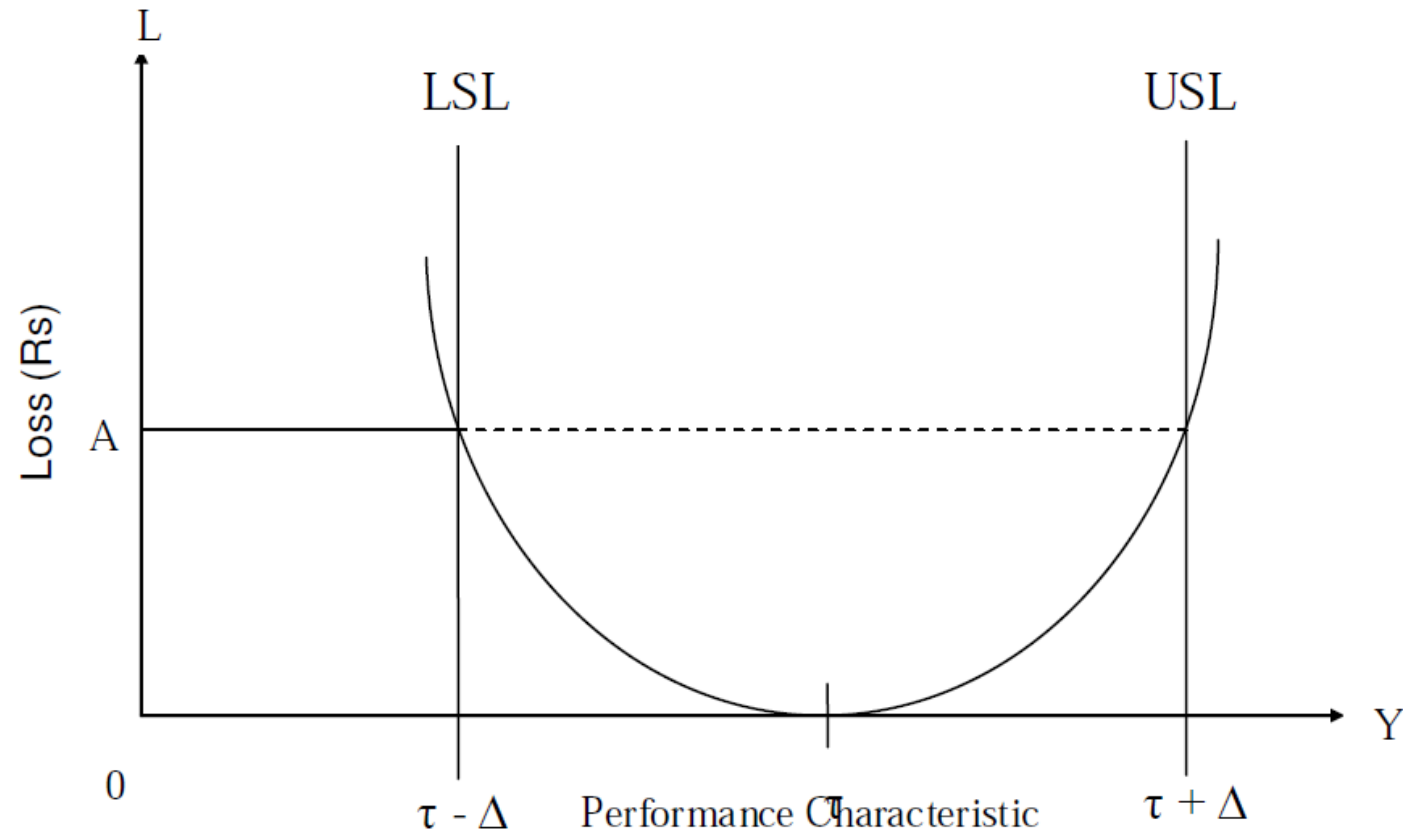
Taguchi's U-shaped loss Function Curve.



Formula to find Taguchi's Loss function

- Taguchi uses Quadratic Equation to determine loss Curve
- $L(x) = k(x-N)^2$
- Where $L(x)$ = Loss Function,
- $k = C/d^2$ = Constant of proportionality, where C – Loss associated with sp limit
- d - Deviation of specification from target value
- x = Quality Features of selected product,
- N = Nominal Value of the product and
- $(x-N)$ = Tolerance

Quadratic Loss Function



Quadratic Loss Function

Quadratic Loss Function

- The quadratic loss function is described by the equation $L = k (y - \tau)^2$.
- Where, L = cost incurred as quality deviates from the target.
- y = Performance characteristic
- τ = target
- k = Quality loss coefficient.
- The loss coefficient is determined by setting $\Delta = (y - \tau)$, the deviation from the target.
When Δ is
- the USL (or) LSL, the loss to the customer of repairing (or) discarding the product is Rs. A .
- Thus,
- $K = A / (y - \tau)^2 = A / \Delta^2$

TOTAL PRODUCTIVE MAINTENANCE

TPM in three words:

- ❖ **Total** = All Individuals in the Organization working together.
- ❖ **Productive** = Production of goods that meet or exceed customer's expectation.
- ❖ **Maintenance** = Keeping equipment and plant in good condition at all times.

TOTAL PRODUCTIVE MAINTENANCE

- Total Productive Maintenance (TPM) is defined as keeping the running plant and equipment at its highest productive level with the co-operation of all areas of the organization.
- Predictive and Preventive maintenance are essential to building a foundation for a successful TPM environment. **Predictive Maintenance** is the process of using data and statistical tools to determine when a piece of equipment will fail.
- **Preventive Maintenance** is the process of periodically performing activities such as lubrication on the equipment to keep it running.

OBJECTIVES OF TPM

1. To maintain and improve equipment capacity.
2. To maintain equipment for life.
3. To use support from all areas of the operation.
4. To encourage input from all employees.
5. To use teams for continuous improvement.

TPM PHILOSOPHY – CONCEPT OF TPM :

Total Productive Maintenance (TPM) is an extension of the Total Quality Management (TQM) philosophy to the maintenance function.

TPM has the following steps:

1. Management should learn the new philosophy of TPM.
2. Management should promote the new philosophy of TPM.
3. Training should be funded and developed for everyone in the organization.

4. Areas of needed improvement should be identified.

Loss measurements to identify improvement needs are

- Down time losses
- Reduced speed losses
- Poor quality losses

5. Performance goals should be formulated.

6. An implementation plan should be developed.

7. Autonomous work groups should be established.