

Quality Management

Quality
(refers to how good something is compared to other similar things)



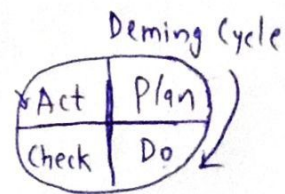
Management
(designing & maintaining all env. in which individuals, working together in groups, efficiently accomplish selected aims)

QM :- It is the act of assessing all activities & tasks that must be accomplished to maintain a desired level of excellence.

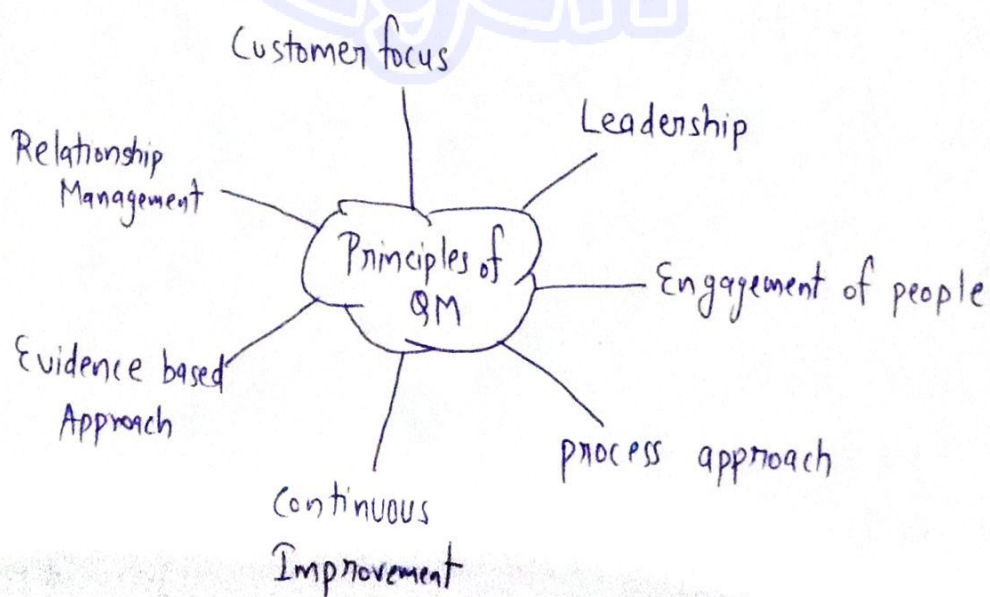
This includes the determination of Quality policy, creating & implementing quality planning & assurance & quality control & quality improvement.

Components of QM :-

1. Quality Planning
2. Quality Improvement
3. Quality Control
4. Quality Assurance



Principles of QM :-

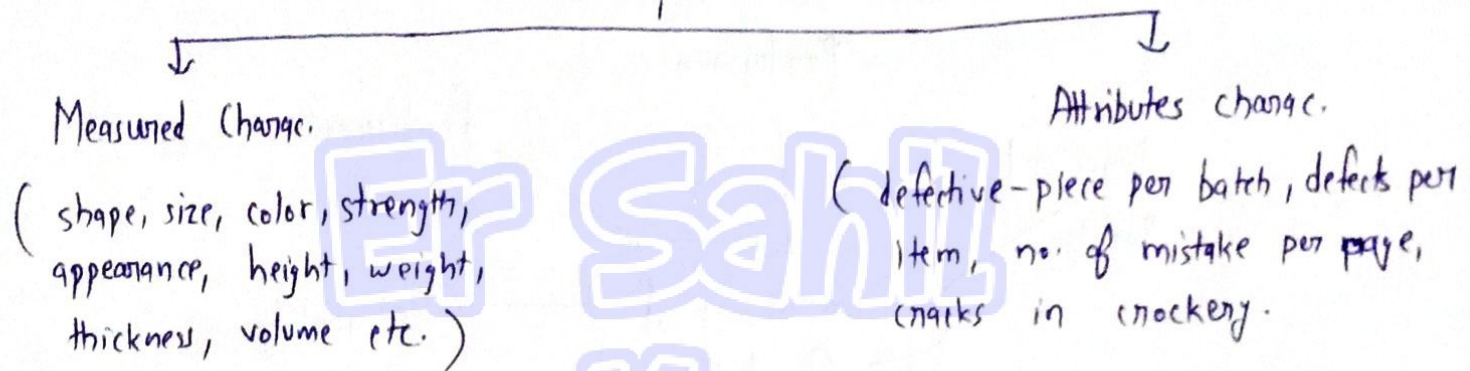


Product :- A product consists of good & service.

Product is one of the important element of marketing mix.
A marketer can satisfy consumer needs & wants through product.

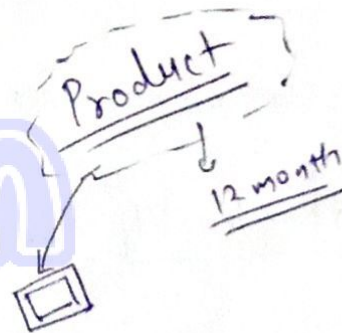
Product Quality :- It means to incorporate features that have a capacity to meet consumer needs & gives customer satisfaction by improving products & making them free from any defects.

Product Characteristics



Features of PQ:-

- (i) Quality of design
- (ii) Quality Conformance
- (iii) Reliability
- (iv) Safety
- (v) Proper storage



Importance of PQ

For Company

It's because, bad quality products will affect the consumer's confidence, image & sales of company. It may even affect the survival of the company.

For Consumers

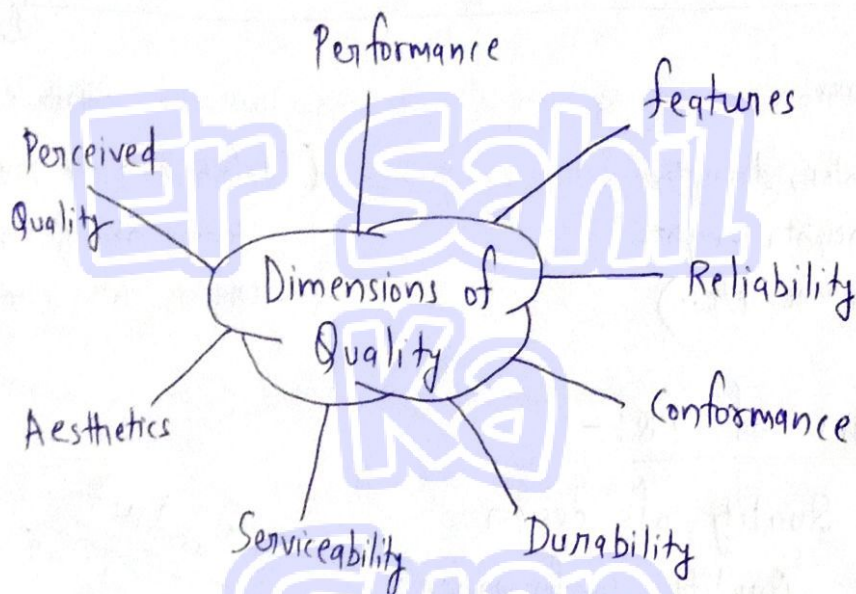
They are ready to pay high prices, but in return, they expect best quality product. If they are not satisfied with product quality of company, they will purchase from the competitors.

Service Quality:- It measures how well a service is delivered compared to customer expectations. Business that meet or exceed expectations are considered to have high service quality.

Service Quality was seen as having 2 basic dimensions:

Technical Quality:- When customer receives as a result of interactions with service firm.

Functional Quality:- How customer receives service; the expressive nature of service delivery.



Cost of Quality:- It is a methodology used to define & measure where & what amount of an organization's resources are being used for prevention activities & maintaining produced quality as opposed to the costs resulting from internal & external failures.

$$CoQ = CoGrQ + CoPQ$$

CoQ can be divided into 4 categories:-

1. Prevention] \rightarrow CoGrQ
2. Appraisal]
3. Internal failure] \rightarrow CoPQ
4. External failure]

CoGD:-

Prevention Costs - costs incurred from activities intended to keep failures to a minimum. These can include,

- Establishing Product Specifications
- Quality Planning
- New Product Development & Testing
- Development of QMS
- Proper Employee Training

Appraisal costs - costs incurred to maintain acceptable product quality levels.

- Incoming Material Inspections
- Process Controls
- Check Fixtures
- Quality Audits
- Supplier Assessments ✓

CoPQ:-

Internal failures - costs associated with defects found before product or service reaches the customer.

- Excessive Scrap ✓
- Product Re-work ✓
- Waste due to poorly designed processes ✓
- Machine breakdown due to improper maintenance ✓
- Costs associated with failure Analysis ✓

External Failures - costs associated with defects found after customer receives product or service.

- Service & Repair Costs ✓
- Warranty Claims ✓
- Customer Complaints ✓
- Product or Material Returns ✓
- Incorrect Sales Orders ✓
- Incomplete BOMs ✓
- Shipping Damage due to inadequate Packaging ✓

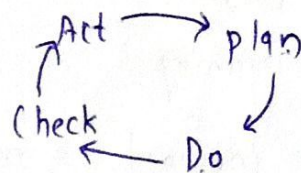
$$CoGQ = PC + AC$$

$$CoPQ = IFC + EFC$$

$$CoQ = (PC + AC) + (IFC + EFC)$$

William Edwards deming Quality Philosophy \Rightarrow

deming cycle



14 principles

Joseph Moses Juran Quality Philosophy \Rightarrow

- \rightarrow Quality Planning \checkmark
- \rightarrow Quality Control \checkmark
- \rightarrow Quality Improvement \checkmark

educating
&
Training

• 3 Steps to Progress :-

1. Accomplish improvements that are structured on regular basis with commitment & a sense of urgency.
2. Build an extensive training program
3. Cultivate commitment & leadership at higher echelons of management.

Process Quality :- PQ refers to the degree to which all acceptable process, including measurements & criteria for quality, has been implemented & adhered to in order to produce the artifacts.

It is a measure of excellence of interrelated work items (like tasks, procedures, steps).

Example -

- Six Sigma, a Project Management Methodology
- TQM (Total Quality Management)
- BPR (Business Process Reengineering)
- PDCA (Plan Do check Act) Cycle
- OSM (Object-oriented QM)

Six-Sigma :- It is a business process that guides companies to produce high Quality products, reduce costs & improve efficiency.

DFSS concepts can be included into all existing product development process

It includes 5-step process:-

Define, Measure, Analyze, Improve, Control

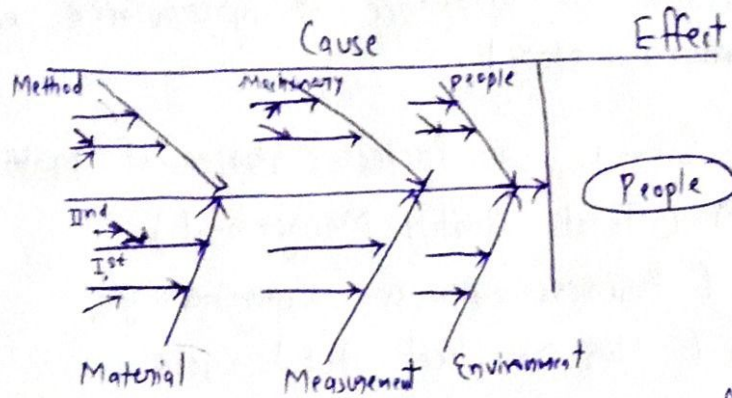
* Graphical & Statistical tech for Process Quality Improvement:-

* 7 QC tools :- These are basic quality control tools which helps in solving quality issues through data collection, analysing data, identification & root cause & measuring results.

1. Cause & Effect Diagram
2. Check Sheet
3. Control Chart
4. Histogram
5. Pareto chart
6. Scatter Diagram
7. Flow chart

3CHPSF → Trick

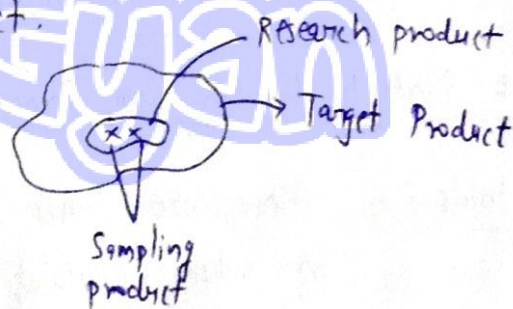
1. Cause & Effect Diagram:- It is also known as fishbone diagram. It shows relationship of all factors (Causes) that lead to the given situation (effect). It identifies major causes & breaks them down into sub-causes.



Purpose:-



- Identifies various causes effecting a process
- Helps groups in reaching a common understanding of a problem.

Sampling:- It is the selection of a set of elements from a target population on product. Sampling is frequently used because gathering data on every member of a target population on every product.



Sampling distribution:- It is a probability distribution of a given random-sample based statistic.

Hypothesis Testing:- choice is made b/w null & alternative based on info. in sample.

→ population 
→ sample 



(i) Null Hypothesis → 20% from previous result (same)

(ii) Alternative Hypothesis → difference b/w parameter & specific value.

→ Test

- χ^2
- t-student
- Fisher's Z

First we do test then we determine is it null or alternative

so we use these range

→ Level of significance (α) [5% 1%]

→ Level of confidence (c) [95% 99%]

$$\alpha + c = 1$$

if result is less than 5% then null otherwise...

Regression Analysis ⇒ It is a method of estimating the value of one variable where that of other is known & variables are correlated.

Linear
Multiple Linear
Non-Linear

→ for estimation of relationships b/w dependent variables & one or more independent variables.

Linear Regression:-

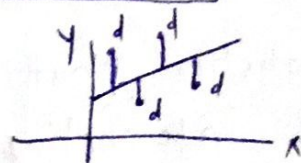
$$y = a + bx + \epsilon$$

Labels: y is dependent, a is intercept, x is independent, b is slope, ϵ is error.

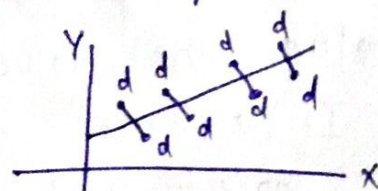
Multiple linear Regression:-

$$y = a + bx_1 + cx_2 + dx_3 + \dots + \epsilon$$

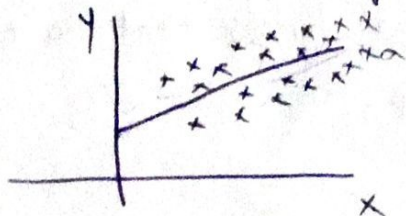
Line of regression of y on x (vertical) ⇒



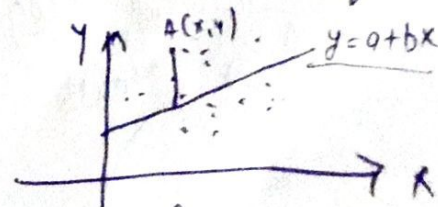
_____ of x on y (Horizontal) ⇒



Method of Scatter Diagram:-



Method of least Square:-



eqⁿ of line is $y = a + bx$

* ANOVA (Analysis of Variance):

- designed to test MEANS by utilizing different estimates of the VARIANCE.
- Allowed for 3 or more groups.
- Used in statistics that splits an observed aggregate (mean) variable found inside a data set into 2 parts: Systematics (given data set) and random factors.
- ANOVA test to determine influence that independent variables have on dependent variable in regression.

$$F = \frac{MST}{MSE} \quad \left(\begin{array}{l} \text{Mean sum of squares due to treatment} \\ \text{coefficient} \quad \quad \quad \text{to error} \end{array} \right)$$

- Used to determine whether any statistical significant difference b/w means of 3 or more independent groups

$$F = \frac{MSS_B}{MSS_W} = \frac{\text{Between Variance (due to groups)}}{\text{Within Variance (due to internal variation)}}$$

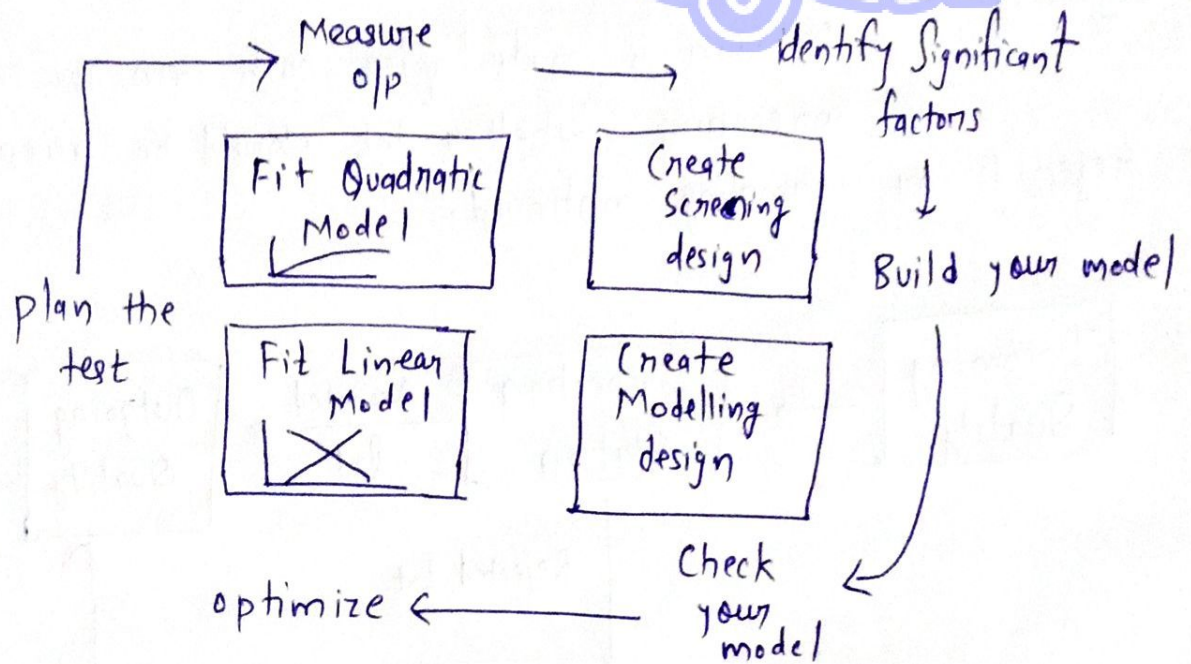
Design of Experiment (DOE): — It is defined as a branch of applied

statistics that deals with planning, conducting, analyzing & interpreting controlled tests to evaluate the factors that control the value of a parameter or group of parameters

- It reduces no. of test runs on trial builds - saving project time.
- Project team can identify the factors that have most & least impact on o/p.

Steps in DOE :-

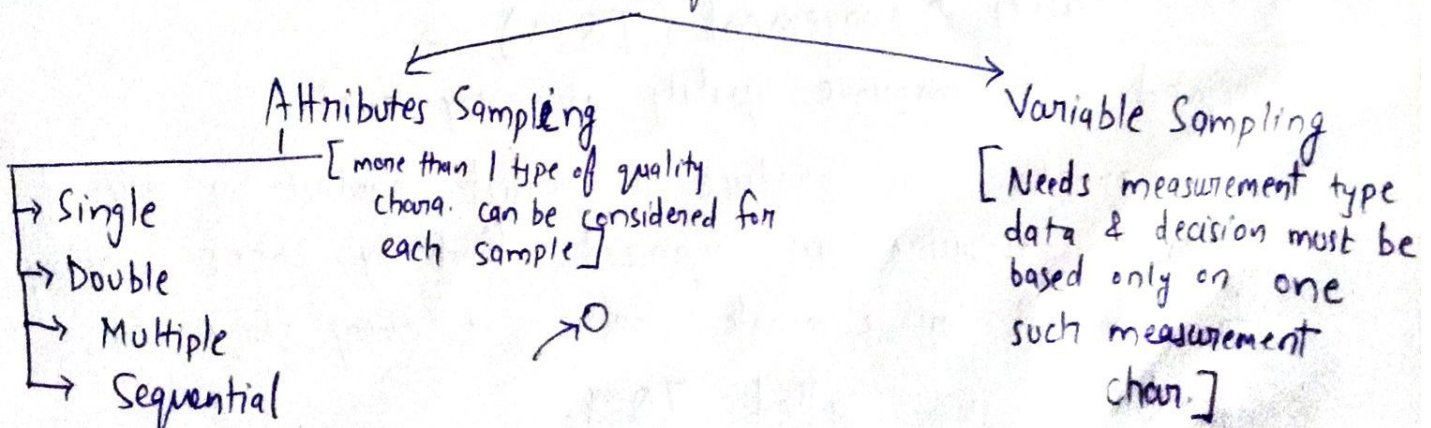
- (i) Selects independent variables
- (ii) Selects no. of level settings for each independent var.
- (iii) Selects orthogonal array
- (iv) Assigning ind. var to each column
- (v) Conducting the exp.
- (vi) Analyzing the data
- (vii) Inference



Accepting Sampling Plan: -
(Decision Making Tool)

It is defined as sampling inspection in which decisions are made to accept or reject products or services.

Sampling Plans



Single:- A plan in which inspector is forced to make a decision concerning acceptability of a lot_(ACT) or batch on basis of inspection of units in one sample taken.

→ N , lot size → n , sample size → c , acceptance no.

Double:- They are characterised by 2 sample size along with 2 sets of acceptance rejection no.

Multiple:- 3 or more before decision is reached regarding (ACT)

Sequential:-

Decision is made after each item is inspected concerning whether lot should be accepted or rejected or sampling continued.

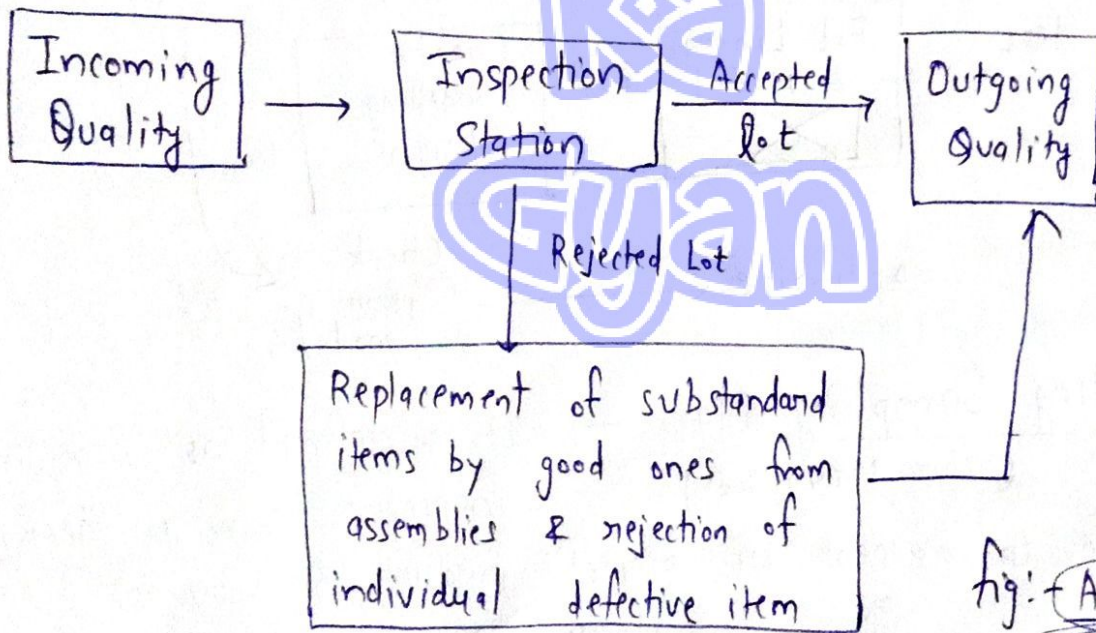


fig: ASP

Total Quality Management (TQM):-

→ Designed to improve quality at every level.

→ The process to produce a perfect product by series of measures require an organized effort by entire company to prevent or eliminate errors at every stage in production is called TQM.

Principles of TQM:-

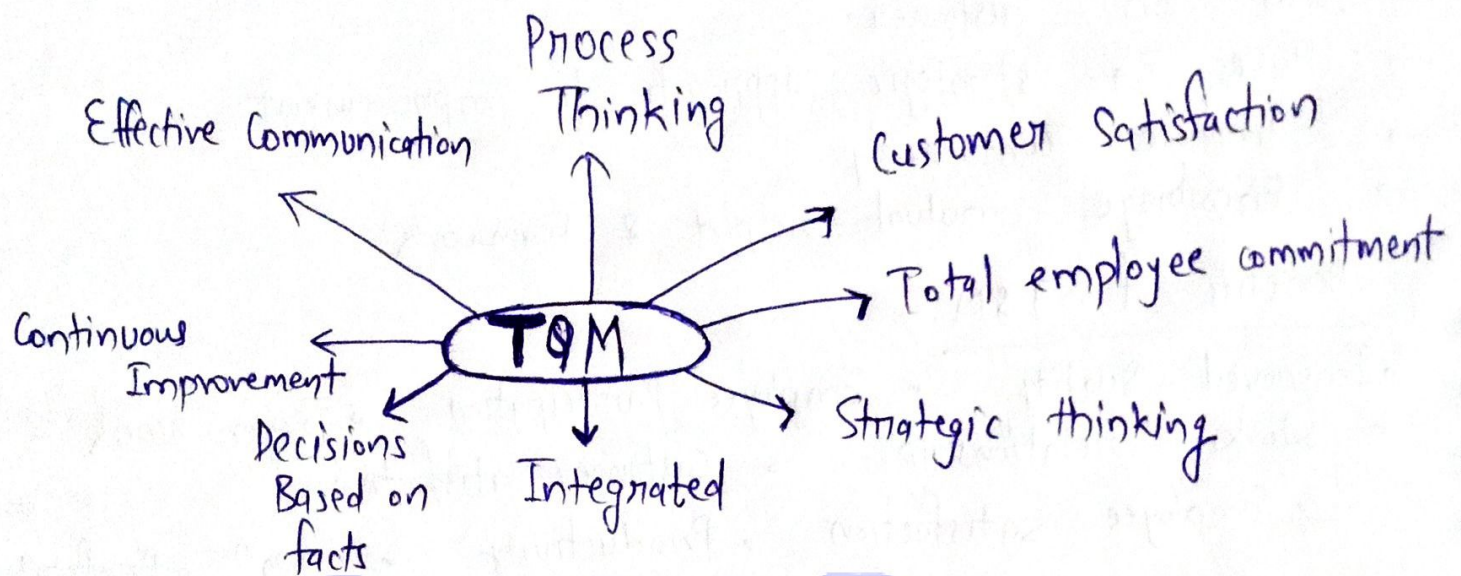
- Produce quality work first & last time.
- Focus on customer.
- Have a strategic approach to improvement
- Improve continuously
- Encourage mutual respect & teamwork

Benefits of TQM:-

- Improved Quality
- Employee Participation
- Team work
- Working relationship
- Customer Satisfaction
- Employee satisfaction
- Productivity
- Commn
- Profitability

3 Aspects of TQM:-

- Counting ⇒ Tools, Tech. & training in their use for analyzing, understanding & solving quality problems.
- Customers ⇒ Quality for customer as driving force & central concern
- Culture ⇒ Shared values & belief expressed by leaders that defined & support quality



Er Sahil
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