

**MARTHANDAM COLLEGE OF ENGINEERING AND TECHNOLOGY
KUTTAKUZZHI
DEPARTMENT OF INFORMATION TECHNOLOGY**



GE71

TOTAL QUALITY MANAGEMENT

16 MARKS QUESTIONS AND ANSWER

YEAR/SEM : IV / 08

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UNIT I

1) Explain the evolution of quality.

One of the important issues that business has focused on in the last two decades is “quality”. The other issues are cost and delivery. Quality has been widely considered as a key element for success in business in the present competitive market. Quality refers to meeting the needs and expectations of customers. It is important to understand that quality is about more than a product simply working properly.

Quality refers to certain standards and the ways and means by which those standards are achieved, maintained and improved. Quality is not just confined to products and services. It is a homogeneous element of any aspect of doing things with high degree of perfection. For example Business success depends on the quality decision making.

EVOLUTION OF QUALITY

Time	Events
Until 1960s	
Prior to the 20 th century	Quality is an art Demands overcome potential production An era of workmanship
F.Taylor 1900s	The scientific approach to management resulting in rationalization of work and its break down leads to greater need for standardization, inspection and supervision
Shewart 1930s	Statistical beginnings and study of quality control. In parallel, studies by R A Fisher on experimental design; the beginning of control charts at western Electric in USA
Late 1930s	Quality standards and approaches are introduced in France and Japan. Beginning of SQC, reliability and maintenance engineering
1942	Seminal work by Deming at the ministry of war in USA on quality control and sampling Working group setup by Juran and Dodge on SQC in US army Concepts of acceptance sampling devised
1944	Daodge and Deming carried out seminal research on acceptance sampling
1945	Founding of the Japan standard association
1946	Founding of the ASQC
1950	Visit of Deming in Japan at the invitation of K Ishikawa
1951	Quality assurance increasingly accepted
1954	TQC in Japan ; Book published 1956
1957	Founding of European organization for the control of quality
After 1960s	
1961	The Martin Co in USA introduces the zero defects approach while developing and producing Pershing Missiles. Quality motivation is starting in the US and integrated programmes begun
1962	Quality circles are started in Japan

1964	Ishikawa publishes book on Quality management
1970	Iskiawa publishes the book on the basics of quality circles and the concept of Total Quality is affirmed and devised in Japanese industries
1970 to 1980	Just – in –Time and quality become crucial for competitiveness. A large number of US and European corporations are beginning to appreciate the advance of Japan’s industries. Taguchi popularizes the use of environmental design to design robust systems and products
1980+	Facing the rising sun challenge in quality management Development and introduction of FMSs and greater dependence on supplier contracts. Growth of economic based on quality control, information software packages
1990+	The management of quality has become a necessity that is recognized at all levels of management Increasing importance is given to off line quality management for the design of robust manufacturing processes and products. The growth of process optimization

2) Explain Quality .

1. Predictable degree of uniformity and dependability at low cost and suited to the market -Deming
2. Fitness for use-Juran
3. Conformance to requirements - Crosby
4. Minimum loss imparted by a product to society from the time the product is shipped - Taguchi
5. A way of managing tile organization -Feigenbaum
6. Correcting and preventing loss, not living with loss - Hosffin .
7. The totality of characteristics of an entity that bear on its ability to satisfy stated and implied needs – ISO

QUANTIFICATION OF QUALITY

$$Q = \frac{P}{E}$$

P = Performance

E = Expectations

DIMENSION OF QUALITY

1. Performance	2. Features	3. Conformance
4. Reliability	5. Durability	6. Service
7. Response	8. Aesthetics	9. Reputation

3) Explain about Total Quality Management.

Total - Made up of the whole

Quality- *Degree of excellence a product or service provides*

Management- *Act, Art or manner of handling, controlling, directing, etc...*

Why TQM:

1. A question of survival in the intense competitive environment
2. Increasing customer consciousness

DEFINITION:

1. 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 to society.- **ISO**
2. TQM is an integrated organizational approach in delighting customers (both internal and external) by meeting their expectations on a continuous basis through every one involved with the organization working on continuous improvement in all products, services, and processes along with proper problem solving methodology - **INDIAN STATISTICAL INSTITUTE (ISI)**
3. TQM is a people - focused management system that aims at continual increase in customer satisfaction at continually lower cost. TQM is a total system approach (not a separate area of program), and an integral part of high level strategy. It works horizontally across functions and departments, involving all employees, top to bottom, and extends backwards and forward to include the supply chain and the customer chain – **TOTAL QUALITY FORUM OF USA**

CHARACTERISTICS

1. Customer Oriented
2. Long term commitment for continuous improvement of all process
3. Team work
4. Continuous involvement of top management
5. Continuous improving at all levels and all areas of responsibility

4) Explain the basic concepts of TQM:

1. Top management commitment
2. Focus on the customer – Both internal and external
3. Effective involvement and utilization of entire work force
4. Continuous improvement
5. Treating suppliers as partners
6. Establishing performance measures for the processes

5) Explain the principles of TQM:

1. Customers requirements - (both internal & external) must be met first time & every time
2. Everybody must be involved
3. Regular two way communication must be promoted I
4. Identify the training needs and supply it to the employees
5. Top management commitment is must
6. Every job must add value
7. Eliminate waste & reduce total cost
8. Promote creativity
9. Focus on team work.

6) Explain TQM frame work.

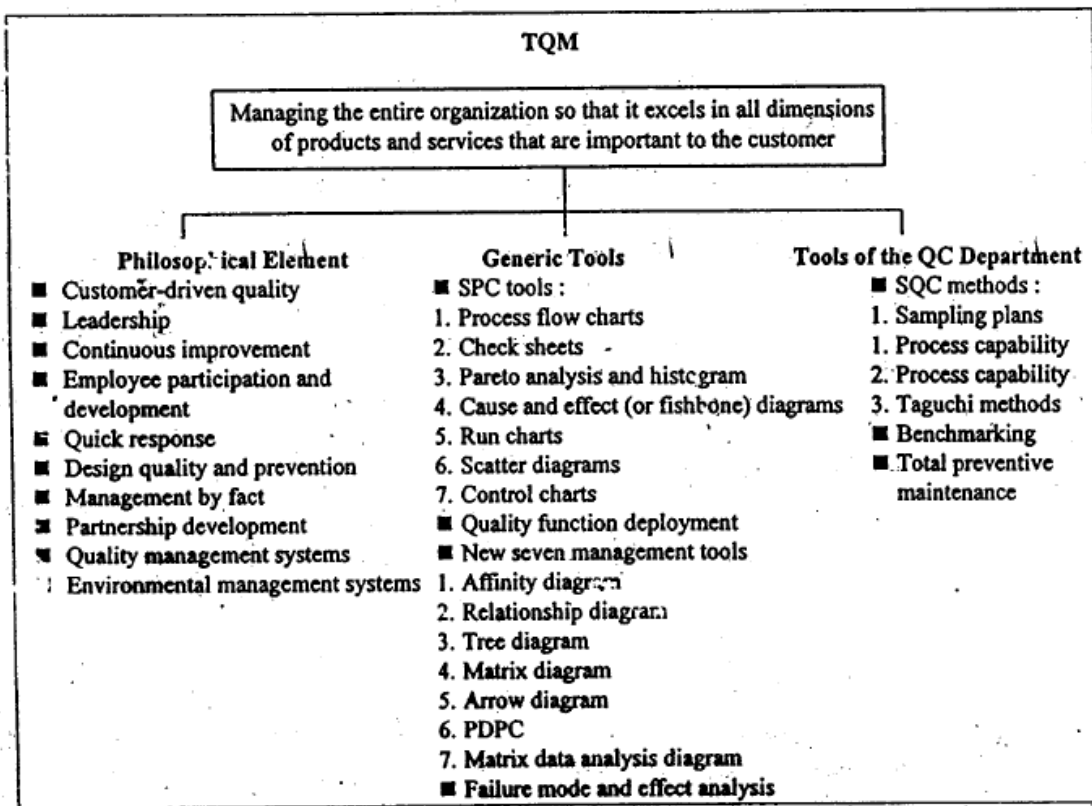
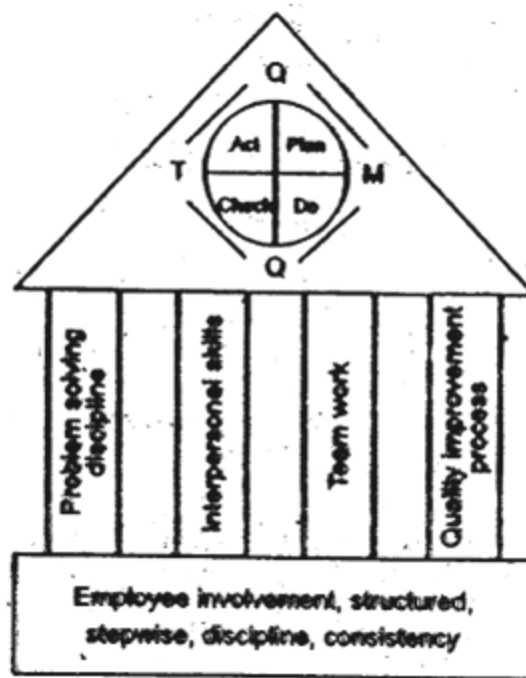


Fig. Elements of Total Quality Management



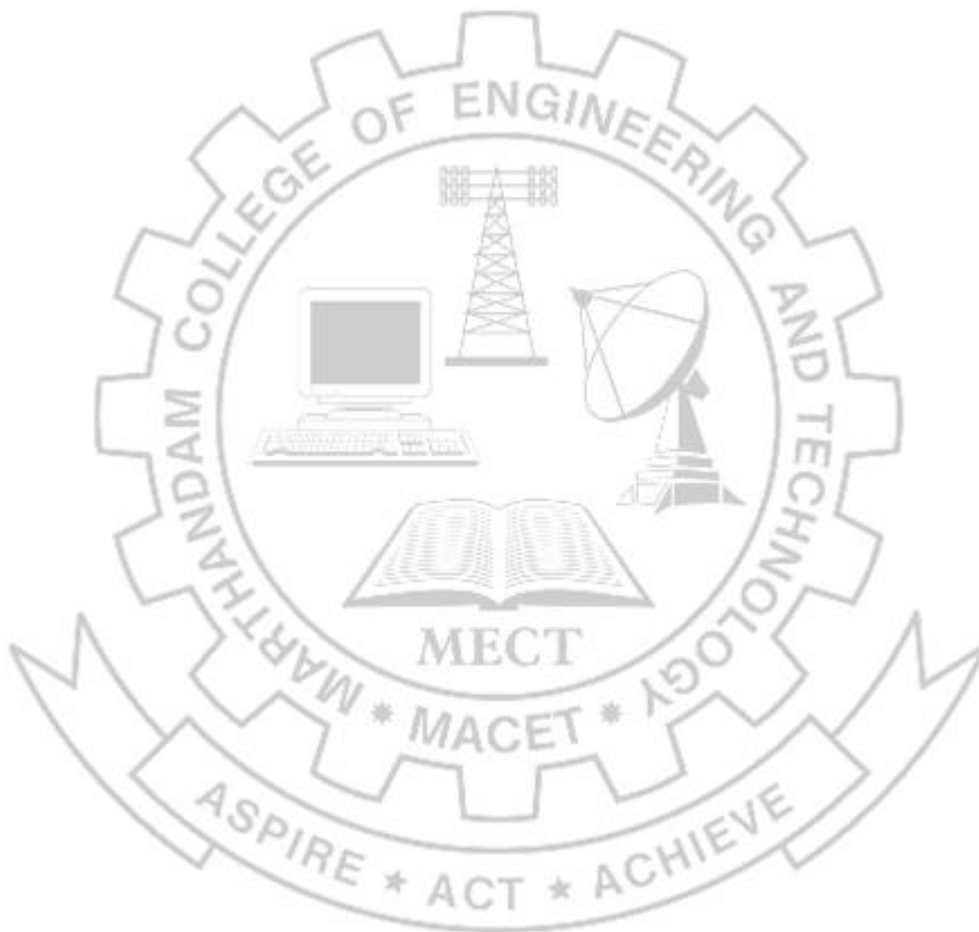
7) Explain the barriers of TQM.

1. Lack of management commitment
2. Lack of faith in and support to TQM activities among management personnel
3. Failure to appreciate TQM as a cultural revolution. In other words, inability to change organizational culture
4. Misunderstanding about the concept of TQM
5. Improper planning
6. Lack of employees commitment
7. Lack of effective communication
8. Lack of continuous training and education
9. Lack of interest or incompetence of leaders
10. Ineffective measurement techniques and lack of access to data and results
11. Non-application of proper tools and techniques
12. Inadequate use of empowerment and team work

8) Explain the benefits of TQM.

Tangible Benefits	Intangible Benefits
<ul style="list-style-type: none"> • Improved product quality • Improved productivity • Reduced quality costs • Increased market and customers • Increased profitability • Reduced employee grievances 	<ul style="list-style-type: none"> • Improved employee participation • Improved team work • Improved working relationships • Improved customer satisfaction • Improved communication • Enhancement of job interest • Enhanced problem solving capacity

	<ul style="list-style-type: none">• Better company image
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UNIT II

TQM PRINCIPLES

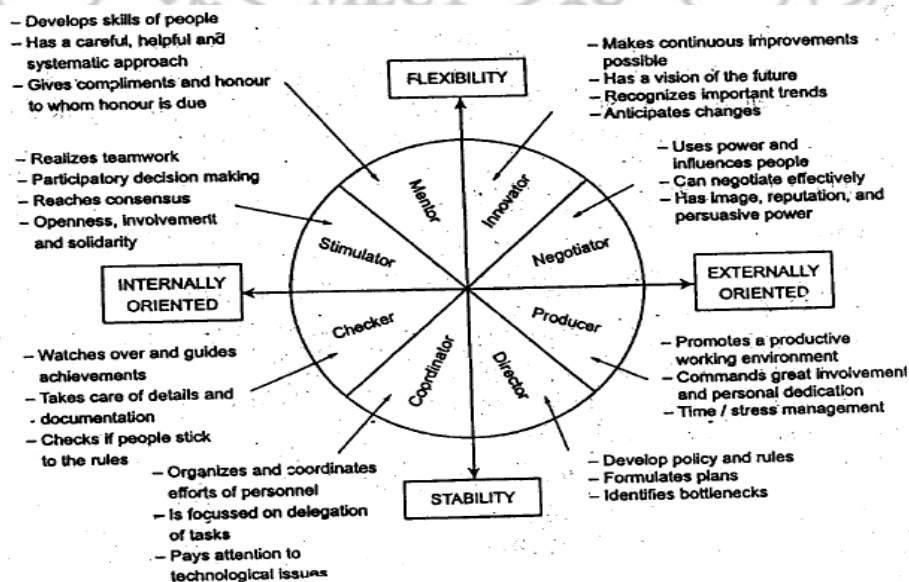
1) Explain Leadership

The process of influencing others towards the accomplishment of goals. He triggers the will to do, shows the direction and guide the group members towards the accomplishment of goals.

CHARACTERISTICS OF QUALITY LEADERS

1. Customers first
2. Value people
3. Build supplier partnership
4. Empower people
5. Strive for excellence
6. Demonstrate involvement / commitment
7. Explain & deploy policy
8. Improve communication
9. Promote teamwork
10. Benchmark continuously
11. Establish system
12. Encourage collaboration

LEADERSHIP ROLES



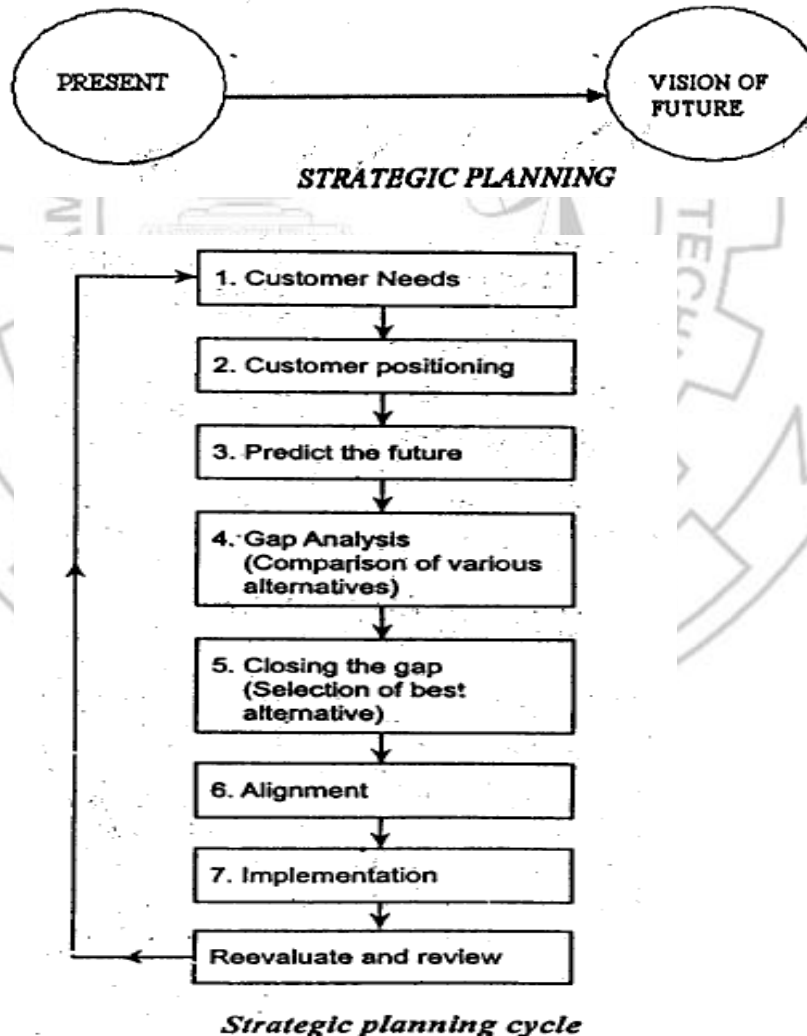
ROLE OF SENIOR MANAGEMENT

1. Study and investigate TQM concepts and issues

2. Set clear quality policies and provide challenging tasks
3. Establish customer satisfaction as a long term goal
4. To become coaches and cheer leaders for encouraging and supporting the managers during transition phase of the transformation
5. To stimulate employees to be involved
6. To attend TQM training programs
7. To up hold norms and issues
8. To create a basic of trust, respect and open communication which ensures individual participation and continuous improvement.
9. To monitor whether quality improvement programs are conducted as planned.

2) Explain strategic planning

It sets the long term direction of the organization in which it wants to proceed in future. Can be defined "As the process of deciding on objectives of the organization, on changes on this objective, on the resource used to obtain these objectives and on the policies that are to govern the acquisition use and disposition of these resources"



3) Explain Quality statements

VISION STATEMENT: It is a short declaration of what an organization aspires to be tomorrow. It is an ideal state which may never be achieved.

Example: “To continuously enrich knowledge base of practioners in mobility industry and institutions in the service of humanity” - **SAE**

MISSION STATEMENT: Describes the function of the organization. It provides the clear statement of purpose for the employees, customers and suppliers.

Example: “Facilitating world class technical education through high quality institutions, academic excellence and innovative research and development programmes, technology forecasting and global manpower planning, promoting industry institute interaction, inculcating entrepreneurship” - **AICTE**

QUALITY POLICY STATEMENT: It is a guide for everyone in the organization as to how they provide products and services to the customer. Written by the CEO feedback from workforce and approved by quality council.

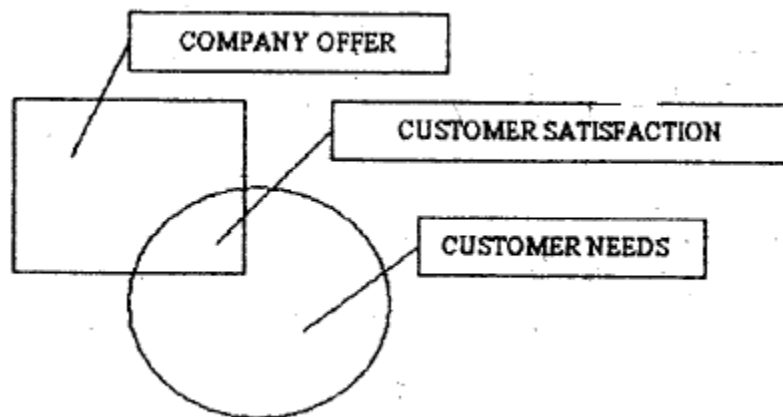
Example: “Xerox is a quality company. Quality is the basic business principle for Xerox. Quality means providing our external and internal customers with innovative products and service that fully satisfy their requirements. Quality is the job of every employee” – **Xerox Corporation**

Customer satisfaction:

The Customer is the King - Emphasized by Today's Buyers Market. TQM's Purpose is meeting or exceeding customer expectations, so that the customers are delighted. The customer satisfactions must be the primary goal of any organization.

4) Explain customer satisfaction model

Teboul's Model of customer satisfaction as shown in figure



From the above diagram it is understood that the company should strive for increasing the intersection portion i.e. Customer Satisfaction.

THE CUSTOMERS ARE

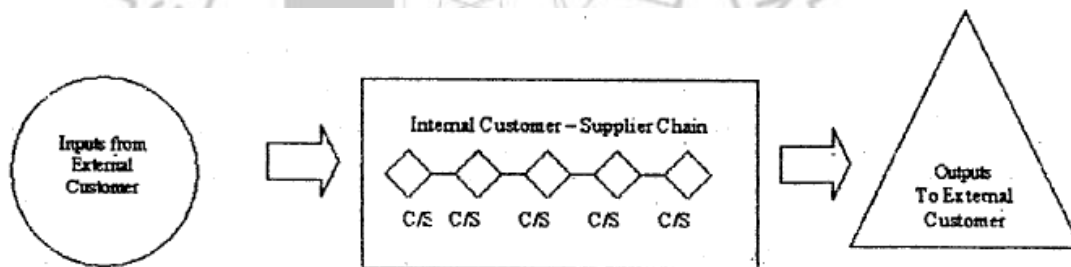
- The most important people in the business
- Not dependent on the organization, but the organization depends on them.
- Not an interruption to work but are the purpose of it.
- Doing a favor when they seek business and not vice-versa.
- A part of business, not outsiders and they are life blood of the business
- People who come with their needs and jobs
- Deserve the most courteous and attentive treatment.

TYPES OF CUSTOMERS

Internal Customer: The customer inside the company are called internal customers

External Customers: An external customer is the one who used the product or service or who purchase the products or service or who influences the sale of the product or service.

CUSTOMER SUPPLY CHAIN



5) Explain about customer complaints (feedback)

Customer feedback must be continuously solicited and monitored to reduce the dissatisfied customers as much as possible.

CUSTOMER FEEDBACK OR CUSTOMER COMPLAINT IS REQUIRED

- To discover customer dissatisfaction
- To identify customer's needs
- To discover relative priorities of quality
- To compare performance with the competition
- To determine opportunities, for improvement

TOOLS USED FOR COLLECTING CUSTOMER COMPLAINTS

- **Comment card** - Low cost method, usually attached to warranty card
- **Questionnaire** - Popular tool, costly and time consuming - by mail or telephone preferably multiple choice questions or a point rating system (1 to 5) or (1 to 10)

- **Customer Focus groups** - Meeting by a representative of the company with the group of customers. Imprint analysis is an emerging technique to obtain intrinsic feelings using customer meetings, word associations, discussion, relaxation techniques etc.
- **Phone** - Toll free Telephone numbers
- **Customer visits** - Visit customer's place of business.
- **Report cards** - Usually, send to customer on a quarterly basis.
- **The internet and computer** - It includes newsgroups, electronic bulletin board mailing lists,
- Employee feedback.
- **Mass Customization** - Capturing the voice of customers using data of what customer want instead of what customer is thinking about buying and manufacturing exact what they want.

STEPS TO SOLVE CUSTOMER COMPLAINTS

- Complaints can be collected from all sources (letters, phone -calls, meetings and verb inputs)
- Develop procedures for complaint resolution, that include empowering front-line personnel.
- Analyze complaints, but understand that complaints do not always fit into new categories
- Work to identify process and material variations and then eliminate the root cause.
- When a survey response is received, a senior manager should contact the customer and strive to resolve the concern.
- Establish customer satisfaction measures and constantly monitor them.
- Communicate complaint information, as well as the result of all investigation solution, to all people in the organization. .
- Provide a monthly complaint report to the quality council for their evaluation and needed, the assignment of process improvement teams.
- Identify customer's expectations beforehand rather than afterward through complaint analysis.

6) Explain about customer retention.

- More powerful and effective than customer satisfaction
- It is the process of retaining the existing customer
- Customer care can be defined as every activity which occurs within the organization that ensures that the customer is not only satisfied but also retained.

SIGNIFICANCE OF CUSTOMER RETENTION

- 60% of organizations future revenue will come from exiting customers
- 2% increase in customer retention has 10% decrease in operating cost.

- 96% of unhappy customers do not complain but 3 times likely to convey to other customers about their bad experience.
- 91% of unhappy customers never purchase goods and services from you.
- It costs 5 times more to attract the customer than retaining the existing customer.
- Customer retention creates customer loyalty and moves customer satisfaction to a next level called customer delight.

6) Explain about employee involvement

It is the total involvement from every person at all levels in the organization

ASPECTS OF EMPLOYEE INVOLVEMENT

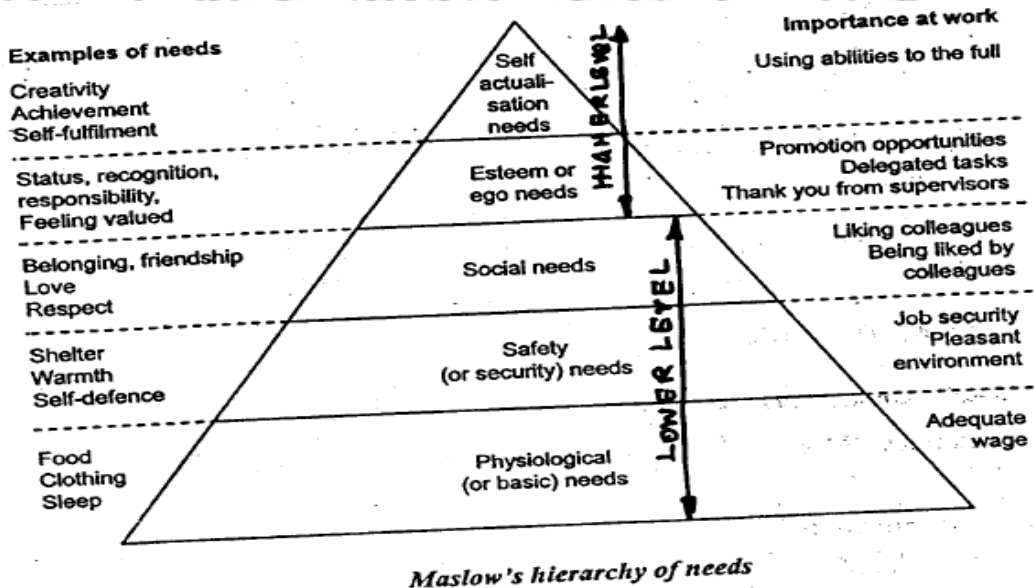
1. Employee motivation
2. Employee Empowerment
3. Teams and Team work
4. Recognition and Reward Schemes
5. Performance Appraisal

1. EMPLOYEE MOTIVATION

It is the process of stimulating people or attempting to influence other to do your will or accomplish desire goals through the possibility of reward

- Improves employee involvement
- Reduces absenteeism and increases turn over
- Promotes job satisfaction

THEORIES OF MOTIVATION



HERZBERG'S TWO FACTOR THEORY

1. Motivation Factor: People are motivated by recognition, responsibility, achievement, advancement and the work itself. These are called as motivators
2. Dissatisfies or Hygiene Factor: Low salary, minimal fringe benefits, poor working conditions, ill defined organizational policy, mediocre technical supervision are dissatisfies which implies they are preventable.

EMPLOYEE WANTS

1. Good pay factor is normally in the middle of ranking.
2. Normal Wants are interesting work, appreciation, involvement job security, Good pay, Promotion/growth, Good working conditions, Loyalty to employees, Help with personal problems and Tactful Discipline.

ACHIEVING A MOTIVATED WORK FORCE BY THE MANAGERS

Know thyself, Know employees, Establish a positive attitude, Share the goal, Monitor progress, Develop interesting work by job rotation, job enlargement(Horizontal) and job enrichment (Vertical), Communicate effectively, Celebrate success.

7) Explain employee empowerment.

It is an environment in which people have the ability, the confidence and the commitment to take his responsibility and ownership to improve the process and initiate the necessary steps to satisfy customer requirements within well-defined boundaries in order to achieve organizational values and goals.

Job Enrichment: Is expanding content of the Job.

Job Empowerment: Is expanding the context of the job.

GENERAL PRINCIPLES OR CHARACTERISTICS FOR' EMPOWERING EMPLOYEES

1. Tell people what their responsibilities are.
2. Given the authority equal to the responsibility assigned to them.
3. Set standards of excellence.
4. Give them knowledge information and feed back.
5. Trust them and treat them with dignity and respect.

CONDITIONS TO CREATE THE EMPOWERED ENVIRONMENT

1. Every one should understand the need to change
2. The system need to change to new paradigm.
3. The organization must provide information, education, and skill to its employees.

Teams and Team works

A team can be defined as a group of people working together to achieve common objectives or goals

Team work is the cumulative actions of the team during which each member of the team subordinates his individual interest and opinions for the fulfilling of objectives of the group.

8) Explain about team and team work.

Improved solutions to quality problems, ownership of solutions, communication and integration

Objectives – Short Term Planning

Goal – Long Term Planning

TYPES OF TEAMS

Process improvement team: Involved in improvement of sub processes or processes. Usually has 6-10 members. Disbanded when the objective is reached. May include the local supplier and customer depending on the location

Cross functional teams: 6-10 members temporary team. Members are Top management level from various functional areas of management. Discuss complex problems and break down into smaller parts to refer it to various departmental teams for further solution.

Natural work teams: Not voluntary and the total work unit is part of the team. Manager also a part of the team and the management selects the projects to be improved. Managers must also ensure that the entire team is comfortable with each other.

Self directed / self managed work team: Extension of natural work teams but here the group of individuals is empowered not only to do work but manage it. No manager will present but a coordinator (Which will be normally rotated among members) will be appointed. Additional responsibilities of the team hiring/ dismissal, performance evaluation, customer relations, supplier relations, recognition/rewards and training.

CHARACTERISTICS OF SUCCESSFUL TEAMS

1. **Sponsor:** In order to have effective liaison with quality council, there should be sponsor. The sponsor is a person from the quality council, he is to provide support to the organization
2. **Team Charter:** A team charter is a document that defines the team's mission boundaries, the background of the problem, the team's authority and duties and resources. It also identifies the members and their assigned roles – leader, recorder, time keeper and facilitator.
3. **Team Composition:** Not exceeding 10 members except natural work team and self managed teams.
4. **Training:** The team members should be trained in the problem solving techniques team dynamics and communication skills
5. **Ground Rules:** The team should have separate rules of operation and conduct. Ground rules should be discussed with the members, whenever needed it should be reviewed and revised

6. **Clear objectives, Accountability** : Periodic status report should be submitted to quality council for review
7. **Well defined decision procedure, Resources:** Adequate information should be provided
8. **Trust by the management, Effective problems solving:** Not by hunches or quick fires
9. **Open communication, Appropriate Leadership, Balanced participation and Cohesiveness**

TEAM MEMBER ROLE

Leader, Facilitator (One who helps the team gets started in the stages), Recorder, Time keeper and Team member.

DECISION MAKING METHODS

Non decision, Unilateral decision, Handclasp decision (Two members with a good idea of the subject decide), Minority-rule decision, Majority rule decision, Consensus (Not everyone need to accept, But every one should be willing to implement)

ELEMENTS OF EFFECTIVE TEAM WORK

Regular scheduling with a fixed time limit, purpose, role and responsibilities, activities, decision, results and recognition.

TEAM MANAGEMENT WHEEL

To make a lean more effective a team management wheel has been evolved. The activities are advising, innovating, promoting, developing, organization, producing, inspecting, maintaining and linking. The roles of wheel are advisor, explore, organizer and controller.

STAGES OF TEAM DEVELOPMENT

Forming stage- Initial stage with only group of individuals and no team work. Team purpose, roles are created.

Storming Stage -Initial agreement roles are challenged. Hostilities, emerge which may be resolved

Norming Stage-Formal informal relations get established.

Performing Stage -Team operates in a successful manner with trust, openness, healthy conflict and decisiveness among the members.

Maintenance stage – Functioning should not deteriorate with time Q

Evaluating Stage – Evaluating team performance

TEN COMMON PEOPLE PROBLEMS

Floundering, overbearing participants, Dominating participants, reluctant participants, unquestioned acceptance of opinions as facts, rush to accomplish, Attribution, Discounts and plops, Wanderlust, Feuding team members.

BARRIERS TO TEAM PROGRESS

Insufficient training, Incompatible rewards and compensation, First-line supervisor resistance, Lack of planning; Lack of management support, Access to information systems, Lack of union support, Project scope too large, Project objectives are not significant, No clear measures of success and No time to do improvement work.

9) Explain about recognition and reward.

Recognition is a process whereby management shows acknowledgement (Verbal or written) of an employee outstanding performance. Recognition is a form of employee +ve motivation.

Reward is a tangible one such as increased salaries, commission, cash bonus, gain sharing etc., to promote desirable behavior. It can be even theatre tickets, dinner for two, a small cash awards, etc.,

The employees are recognized to improve their morale, show the company's appreciation for Better Performance, create satisfied and motivated workplace and stimulate creative efforts.

INTRINSIC VS EXTRINSIC REWARDS

INTRINSIC REWARDS	EXTRINSIC REWARDS
Related to feeling of accomplishment or self worth	Related to pay or compensation issues
<ol style="list-style-type: none"> 1. Non monetary forms of recognition to acknowledge achievement of quality improvement goals 2. Celebrations to acknowledge achievement of quality improvement goals 3. Regular expression of appreciation by managers and leaders to employees to acknowledge achievement of quality improvement goals 4. 360° performance appraisals feedback from co-workers, subordinates or customers is incorporated into performance appraisal 5. Formal suggestion system available for individuals to make quality improvement suggestion 6. Developmental based performance appraisals 7. Quality based promotion 	<ol style="list-style-type: none"> 1. Profit sharing 2. Gain sharing 3. Employment security 4. Compensation time 5. Individual based performance systems 6. Quality based performance appraisals

STEVE SMITH'S TWENTY DIFFERENT WAYS TO RECOGNIZE THE EMPLOYEES

- Send thank letter whenever possible
- Develop behind the scenes award
- Create the best ideas of the year booklet
- Feature the quality team of the month and put their picture in prominent place
- Honor peers by recognizing them
- Allow people to attend meetings in your name when you are not available
- Involve teams with external customers and suppliers by visiting them
- Invite a team for coffee or lunch whenever possible
- Create a visibility wall displaying posters, pictures, to thank the contributions of employee
- Credit the team to higher authorities when their ideas are accepted
- Take interest in employee's development
- Get the team picture in company newspaper
- Mention the ideas of others during your meetings, so that they are recognized
- Write a letter of praise to contributed team member and copy to boss
- Ask people to help you with the project which is difficult but challenging
- Send a team to special seminars, workshops to cover topics they are really interested in
- Ask your boss to send a letter of acknowledgement and thanks
- Honor outstanding contribution with awards
- Have a stock of small gifts to give to people on the spot whom you catch doing things right
- Promote or nominate for promotion, those people who contribute most

10. Explain about Performance appraisal.

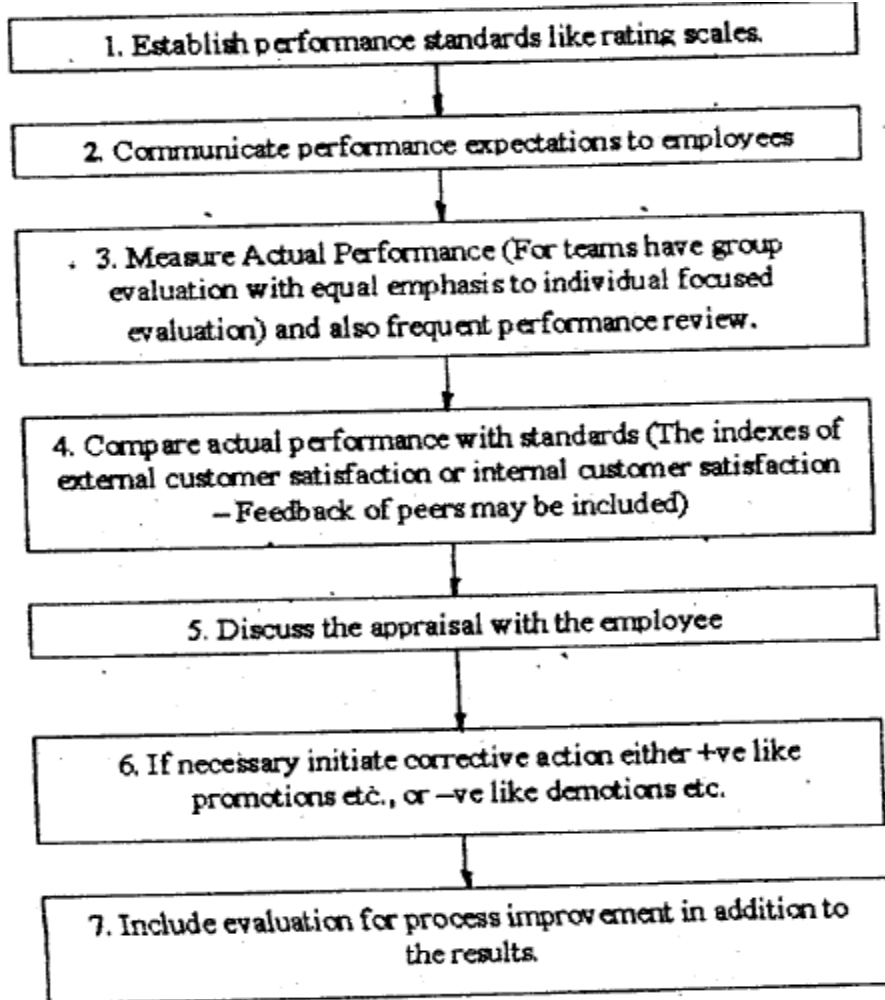
It is a systematic and objective assessment or evaluation of performance and contribution of individual

Needs

- Identifying employees for salary revision, promotion, transfer, demotion, lay off
- To determine training needs of employee
- To take organizational inventory of people
- To know personal strength and weakness of individuals
- To validate the selection procedure

APPRAISAL FORMATS

Ranking (From highest to lowest), Narrative (Telling strength and weakness), Graphics (Graphical display of duties by rating), Forced choice (Placing each employee with a predetermined % like Good 25%, Poor 10% etc)

APPRAISAL PROCESS**BENEFITS OF PERFORMANCE APPRAISAL**

1. Provides a feedback to identify employees for salary revision, transfer, lay-off
2. Helps in determining training needs of employee
3. Provides organization inventory of people
4. Helps to evaluate personal strength and weakness of individuals
5. To validate the selection procedure.
6. Provide the basis for promotion, demotion etc
7. May provide some information on external factors like family circumstances, health, financial or personal matters that may be affecting the performance

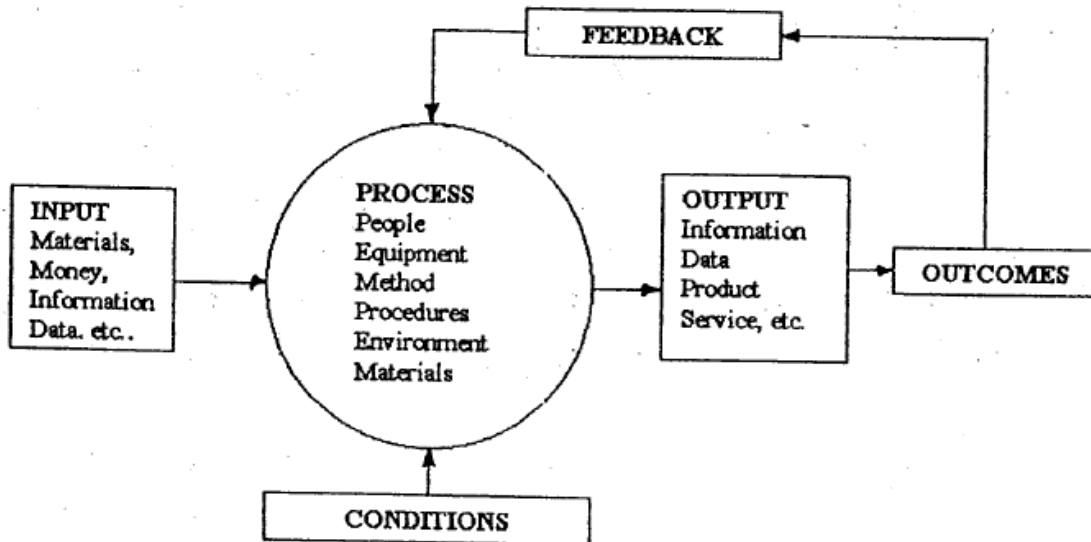
11) Explain about Continuous Process Improvement (CPI)

- TQM has been defined as a philosophy based on quest for progress and continual improvement in the areas of cost, reliability, quality, innovation, efficiency and business effectiveness

- It is a continuous learning process which never stops and is cyclic and iterative
- To do CPI, we have different approaches such as Juran Trilogy, PDSA cycle, Kaizen and 5S concept

INPUT / OUTPUT PROCESS MODEL

The process refers to business and production activities of an organization.
Example Purchasing, Engineering, Marketing and Accounting



BASIC WAYS TO IMPROVE PROCESS

- To reduce resources
- To reduce errors
- To meet exceed customer needs
- To make process safer
- To make process more satisfying to the person doing it.

JURAN TRILOGY

Dr. Joseph M. Juran, who wrote a 1900 page text. book on **QUALITY CONTROL HANDBOOK** and other contributions to the total quality. Juran divides Quality Management into

- Quality Planning
- Quality control
- Quality improvement. .

QUALITY PLANNING

Planning process is crucial for improvement to become continuous activity with a long term view: The Juran Quality Planning road Map as given below.

Existing & Established Product, Process & Goals → **Identify Customers** → List of customers → **Discover customers needs** → Customer's needs (in their language) → **Translate** → Customer's needs (in our language) → **Establish Unit of measure** → Units of measure → **Establish measurement** → **Customer needs (in units of measure)** → Existing Product and process → **Develop Product** → Product features → **Optimize product design** → Product goals → **Develop process** → Process features → **Optimize: Prove process capability** → Process ready to transfer → **Transfer to operation** → Process ready to produce

QUALITY CONTROL

At this stage, control processes are designed to meet and ensure the goals set in the planning stage. Juran's Quality control Process as shown.

Choose control subjects, decide items to control → **Choose units of measurement** → **Establish standards of performance** → **Measure actual performance** → **Note difference between performance and standard** → **Take action to close the performance gap**

QUALITY IMPROVEMENT

To find and remedy the basic causes of poor quality - Aims to higher levels of performance that are significant to current level- Juran's ten steps to improvement are

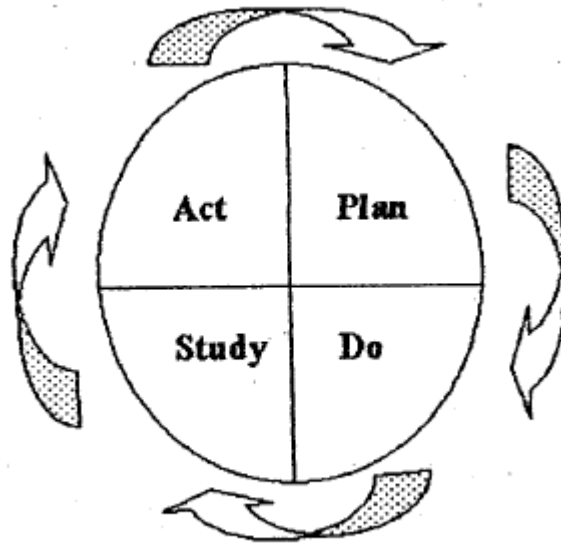
- Build awareness of the need and opportunity for improvement
- Set for improvement
- Organize to reach the goals
- Provide training
- Carry out project to solve problems
- Report progress
- Give recognition
- Communicate results
- Keep score
- Maintain momentum by making annual improvement part of the regular system processes of company

JURAN TRILOGY DIAGRAM

It describes the way in which Juran's trilogy is designed to the cost of quality over time which is a cyclic and ever-ending continuous improvement approach. - The sporadic waste should be identified and corrected through whereas the chronic waste requires an improvement process.

12) Explain about PDSA CYCLE

It is also called as Deming Cycle or Deming Wheel. Developed by Walter A. Shewart and popularized by Edward Deming



PLAN

- Identify the problem, plan and opportunities
- Observe and analyze
- Isolate the real causes
- Determine corrective actions

DO

- Prepare
- Apply
- Check application

STUDY / CHECK

- Check results
- Compare with goals

ACT

- Standardize and consolidate
- Prepare next stage of planning

BENEFITS OF PDSA CYCLE

- Daily routine management for the individual and or the team
- Problem solving process
- Project management
- Continuous development
- Vendor development
- Human resource management
- New product development

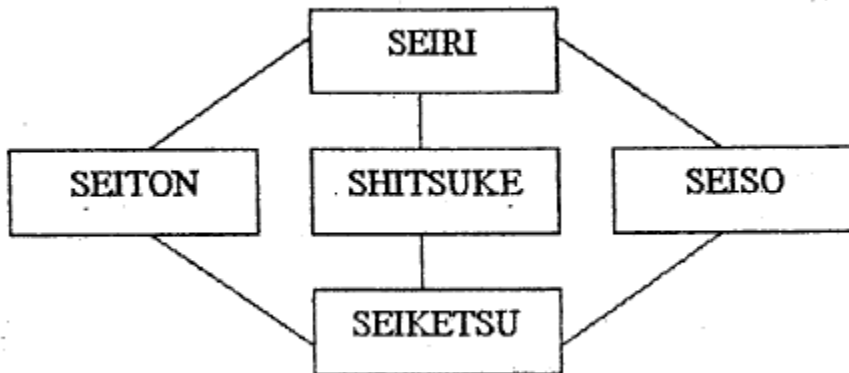
- Process trials

13) Explain about 5S HOUSE KEEPING

This is a house keeping technique used to establish and maintain a productive and quality environment in an organization. This method is invented in Japan which will give safer, more efficient and more productive operation results in boosting of morale of workers, job involvement and satisfaction and ownership of their responsibilities.

JAPANESE TERM	ENGLISH EQUIVALENT	MEANING
SEIRI	Tidiness	Cleaning – Throw away all rubbish unrelated materials in the work place
SEITON	Orderliness	Arranging – Set everything in proper place for quick retrieval and storage
SEISO	Cleanliness	Sweeping – Clean the work place, every thing with out fail
SEIKETSU	Standardization	Maintaining Cleanliness – Standardizing the way of maintaining cleanliness
SHISUKE	Discipline	Self Discipline – Practice ‘5S’ daily. Make it a way or life. This also means commitment

RELATIONSHIP BETWEEN VARIOUS 5S



OBJECTIVES OF 5S

- To create a neat and clean work place
- To create systemize day to day working
- To improve work efficiency
- To standardize work practice
- To improve work discipline
- To improve the quality of work and products

FACTORS IN IMPLEMENTING 5S

- **Participation by all** - Should be understood and practiced by all employees
- **Top management commitment** – CEO and Senior management team need personally commitment practice and supervise the program
- **Should be self sustaining** – Banners, slogan posters and new tutors should be fully utilized to draw attention of every one
- **Review the program** – Every month group of people from different areas of responsibilities plan and evaluate each zone

BENEFITS IN IMPLEMENTING 5S

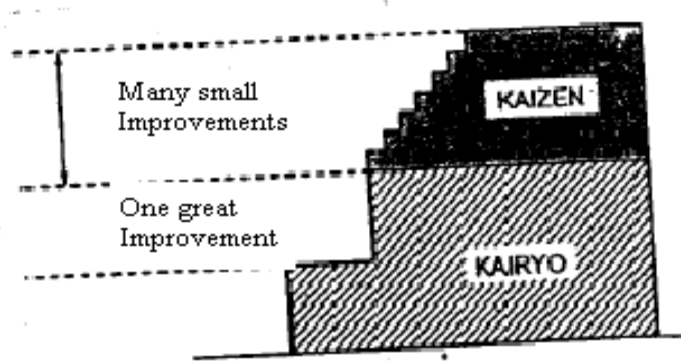
- Work place becomes proud place to work
- Results in good image and- generates business
- Operations become easier and safer in work place
- Disciplined people
- Improve productivity' and morality
- Better quality awareness
- More usable space
- Less Material handling time
- Less production cost
- Preventive maintenance
- High employee involvement
- Less accidents
- More time to improvement.

KAIZEN

Japanese - word -means continuous improvement or improvement over improvement - continuous improvement in small increments that make the process more efficient, effective, controllable and adequate.

KAIRYO

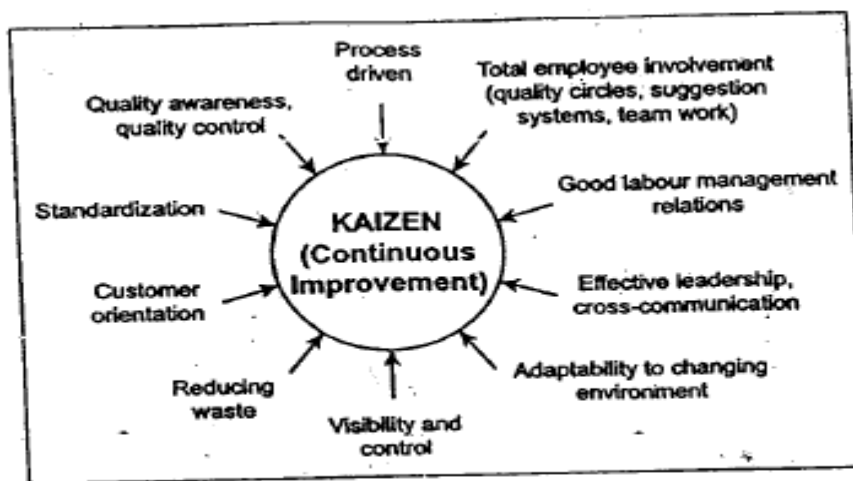
Western philosophy - improvement through innovation, i.e., improvement in one or two great jumps



Comparison between Kaizen and Kairyo

KAIZEN VS KAIRYO

KAIZEN	KAIRYO
It is achieved through conventional know how and PDCA	It is obtained by technological or organizational break through
It is employee oriented	It is technology oriented
It requires little investment but great effort to maintain	It requires large investment but little effort to maintain
It involves everybody in the company	It involves a selected few experts and researchers
It requires recognition of effort before results	It is motivated by expected results



Various aspects of Kaizen Philosophy

FEATURES OF KAIZEN

1. Value added and non value added work activities
2. Muda, which refers to the seven classes of wastes. Wastes are over production, delay, transportation, processing, inventory, wasted motion, and defective parts
3. Principles of motion study and the use of cell technology
4. Principles of materials handling and use of one piece flow
5. Documentation of standard operating procedures
6. The 5S for workplace organization, which are five Japanese words that mean proper arrangement (SEIRI), Orderliness (SEITON), Personal cleanliness (SEISO), Standardization (SEIKETSU) and Discipline (SHITSUKE)
7. Visual management by means of visual display that everyone in the plant can use for better communication
8. Just in time principle to produce only the units in the right quantities at the right time and with the right resources
9. Poka-Yoke to prevent or detect errors
10. Team dynamics, which include problem solving, communication skills and conflict resolution

ROLE OF PEOPLE IN IMPLEMENTING KAIZEN

1. Top management must be committed to introducing Kaizen as a company strategy
2. The executives just below top management must formulate and carry out Kaizen goals according to guidelines from top management
3. Supervisors like everyone else must use Kaizen in their activities
4. Workers must be involved in Kaizen through the suggestions systems and small group activities

13) Explain about Supplier partnership

A commitment to continuous quality improvement cannot be translated into reality without treating supplier as partner

PRINCIPLES OF CUSTOMER / SUPPLIER RELATION

- Both the customer and the supplier are fully responsible for the control quality
- Both the customer and the supplier should be independent of each other and respect each other's independence
- The customer is responsible for providing the supplier with clear and sufficient requirements so that the supplier can know precisely what to produce
- Both the customer and the supplier should enter into a non adversarial contract with respect to quality, quantity, price, delivery method and terms of payments
- The supplier is responsible for providing the quality that will satisfy the customer and submitting necessary data upon the customer's request
- Both the customer and the supplier should decide the methods to evaluate the quality of the product or service to the satisfaction of both parties

- Both the customer and the supplier should establish in the contract the method by which they can reach an amicable settlement of any disputes that may arise
- Both the customer and the supplier should continually exchange information, sometimes using multifunctional teams, in order to improve the product or service quality
- Both the customer and the supplier should perform business activities such as procurement, production and inventory planning, clerical work and system so that an amicable and satisfactory relationship is maintained
- When dealing with business transactions both the customer and the supplier should always have the best interest of the end user in mind

SUPPLIER PARTNERING

It is defined as a continuing relationship, between a buying firm and supplying firm, involving a commitment over an extended time period, an exchange of information, and acknowledgement of the risks and rewards of the relationship.

BENEFITS OF SUPPLIER PARTNERING

- Improved Quality
- Reduced cost
- Increased Productivity
- Increased efficiency
- Increased market share
- Increased opportunity for innovation
- Continuous improvement of products/services. .

JAPANESE REVIEW OF PARTNERING

The Japanese partnering concept is KELRESTU – developing long term relationships with a few key suppliers rather than having short term relationship with many suppliers.

Key elements to Partnering

- Long term Commitment
- Trust
- Shared vision - To satisfy the end users is the common goal of both supplier and customer.

SUPPLIER SOURCING

- **Sole sourcing** - only one supplier for the entire organization. This may be forced to happen because of patent, technical specification, raw material location, monopolistic supplier
- **Multiple sourcing** - For a single item having two or more supplier, resulting in better quality, better service at lower cost

- **Single sourcing-** use of one supplier to one item when several sources are available leading to long-term partnering relationship.

BASIS OF SUPPLIER SELECTION

Cost, Quality, Delivery, Reliability, Management compatibility, Goal congruence and Strategic direction of supplier firm.

STAGE IN SUPPLIER SELECTION & EVALUATION

Survey stage, enquiry stage, negotiation and selection stage, experience stage.

- The supplier should understand and appreciate the management philosophy of the organization
- The supplier should have a stable management system
- The supplier should maintain high technical standards and have the capability of dealing with future technological innovation
- The supplier should provide those raw materials and parts required by the purchaser and those supplied meet the quality specifications
- The supplier should have the capability to produce the amount of production needed
- The supplier should not breach the corporate secrets
- The supplier should be easily accessible in terms of transportation and communication
- The supplier should be sincere in implementing the contract provisions
- The supplier should have an effective quality system and improvement program such as ISO / QS 9000
- The supplier should have a track record of customer satisfaction and organization credibility

14) Explain Supplier rating

Also referred as score card system, is used to obtain and overall rating of supplier performance based on quality, price, performance and production capability

OBJECTIVES OF SUPPLIER RATING

Obtain an overall rating of supplier performance – ensure complete communication with suppliers - provide each supplier about the details of problems for corrective action and - maintain and improve the partnering relationship between the customer and the supplier.

EXAMPLE SUPPLIER SCORECARD

Item: Head stack assembly						
Period: 4Q94						
		Supplier A	Supplier B	Supplier C	Supplier D	Supplier E
QUALITY PERFORMANCE	MAXIMUM POINTS	ACTUAL POINTS	ACTUAL POINTS	ACTUAL POINTS	ACTUAL POINTS	ACTUAL POINTS
Line returns	30	27.66	29.61	28.11	28.71	28.65
PPM deduction (Maximum-10)		- 10	- 10	- 10	- 10	- 10
Certified yield multiplier		0.9	0.94	0.87	0.85	0.72
Penalty: Field issues (Maximum-15)						
Stop shipment (Maximum-15)						
Line purge (-5 each time)						
Subtotal (0-30)	30	15.894	18.433	15.756	15.904	13.428
Process control	8	6.5	6.5	5.5	5	6
Process technology	6	5.2	4	5.2	4.8	4.6
Sustaining technical support	6	2.3	1.6	3.5	4	2.8
On-time delivery	20	20	18	19	19	18
Product technology	10	9.7	6.7	9.1	7.4	8.2
Lead time	15	13	13	13	13	13
Purchasing and material support	5	5	3	2	5	2
Performance matrix total	100	77.594	71.233	73.056	74.204	68.028
Price index = target price/actual price	1	0.878	0.947	1	0.905	0.967
SCORE = performance matrix × price index	100	68.127	67.457	73.056	67.154	65.783
Total Cost of Supply = ((100 - SCORE)/100) + 1	1	1.3187	1.3254	1.2694	1.3285	1.3422

1.0 = perfect
2.0 = worst possible

Reproduced, with permission, from Richard S. Allen and Ralph H. Kilmann, "How Well Does Your Reward System Support TQM?" *Quality Progress* (December 1998): 47-51.

THREE BASIC FACTORS FOR SUCCESSFUL SUPPLIER RATING SYSTEM

- An internal structure to implement and sustain the rating program
- A regular and formal review process
- A standard measurement for all the suppliers

RELATIONSHIP DEVELOPMENT

Refers to maintaining the relationship development through the various techniques discussed previously. For maintainability and growth of relationship the following key factors are considered

- Inspection – 100% inspection, Sampling, Audit and identify check
- Training
- Team approach – Formation of customer supplier team in all the functional areas
- Recognition – Customers can recognize suppliers by non monetary / monetary rewards

PERFORMANCE MEASURE

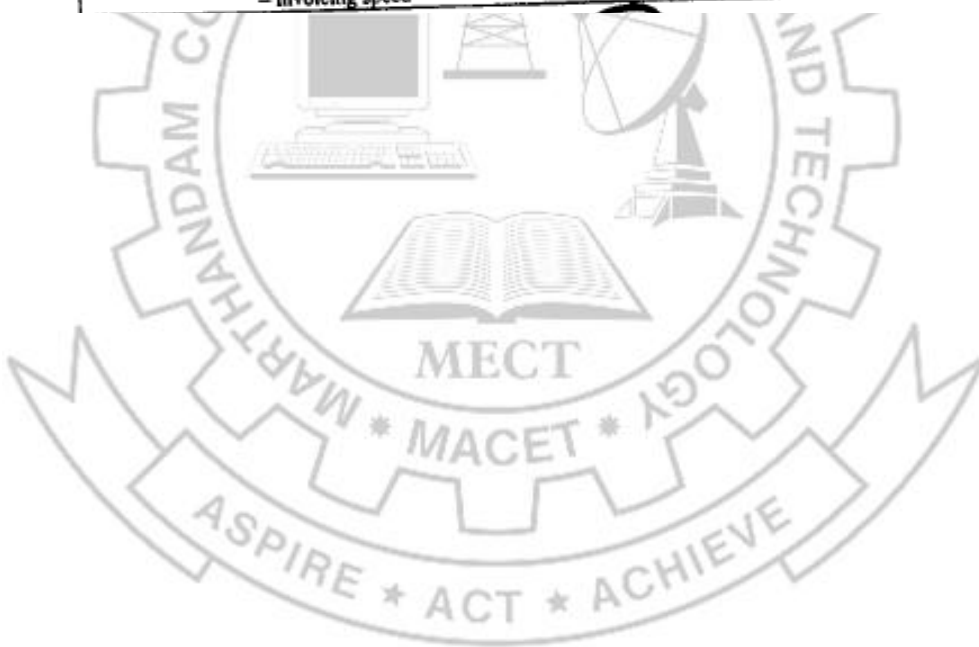
An important principle along with customer satisfaction, employee involvement, continuous process improvement and supplier partnership, refers to measuring the performance of entire organization

Performance Indicators – (What are the items to be measured?)

Table Performance Indicators	
Criteria	Indicators / Determinants
1. Customers	<ul style="list-style-type: none"> - number of customer's complaints - number of warranty claims - number of suggestions per employee - number of suggestions implemented - % returns by customers - customer satisfaction index - time to resolve complaints - mean time to repair
2. Production	<ul style="list-style-type: none"> - productivity = output / input = result / costs - labour productivity = result / labour costs - capital productivity = result / capital costs - material productivity = result / material costs - effectiveness* = actual result / expected result - efficiency* = expected costs / actual costs - revenue growth - % rejects ; % scrap - failure rate = (number of failures / total number of products tested) × 100% - quality grade = $\left(\frac{\text{production quantity} - \text{number of defects}}{\text{production quantity}} \right) \times 100\%$ - throughput time = processing time + inspection time + movement time + waiting time - manufacturing cycle effectiveness = processing time / throughput time - number of breakdowns - availability = MTBF / MTTR where MTBF = Mean time between failures, and MTTR = Mean time to repair. - actual processing time Vs waiting times - lead time for product development
3. Suppliers	<ul style="list-style-type: none"> - service rating - on-time delivery - quality performance - SPC charts - billing accuracy - average lead time - just-in-time delivery target
4. Research and Development	<ul style="list-style-type: none"> - new product time to market - time needed to launch a new product - design change orders - cost estimating errors - % of sales from new products

* Efficiency has been defined as 'doing things better' and effectiveness as 'doing better things'.

<p>5. Human Resources</p>	<ul style="list-style-type: none"> - % personnel turnover - % absence due to illness - employee satisfaction index - number of training hours per employee - number of active teams - number of suggestions / grievances - % safety incidents - % environmental incidents
<p>6. Marketing / Sales</p>	<ul style="list-style-type: none"> - sales growth - market growth - % delivery completed - sales expense to revenue - new customers - sales income to number of sales people - order accuracy
<p>7. Administration</p>	<ul style="list-style-type: none"> - revenue growth - revenue per employee - expense to revenue - cost of poor quality - % of payroll distribution on time - office equipment up-time - order entry / billing accuracy - invoicing speed



UNIT III

1) Explain The seven traditional tools of quality

I - Pareto chart: Italian economist Vilfredo Pareto Shows on a bar graph which factors are more significant. This method helps to find the vital few contributing maximum impact.

Purpose: The purpose of the Pareto chart is to prioritize problems No company has enough resources to tackle every problem, so they must prioritize.

Pareto Principle: The Pareto concept was developed by the describing the frequency distribution of any given characteristic of a population. Also called the 20-80 rule, he determined that a small percentage of any given group (20%) account for a high amount of a certain characteristic (80%).

Conclusion: The most important thing in improving quality is to start somewhere, doing something. As you begin using the Pareto chart to decide where your problems are, you will discover many things about your processes and will come because you will know where to improve.

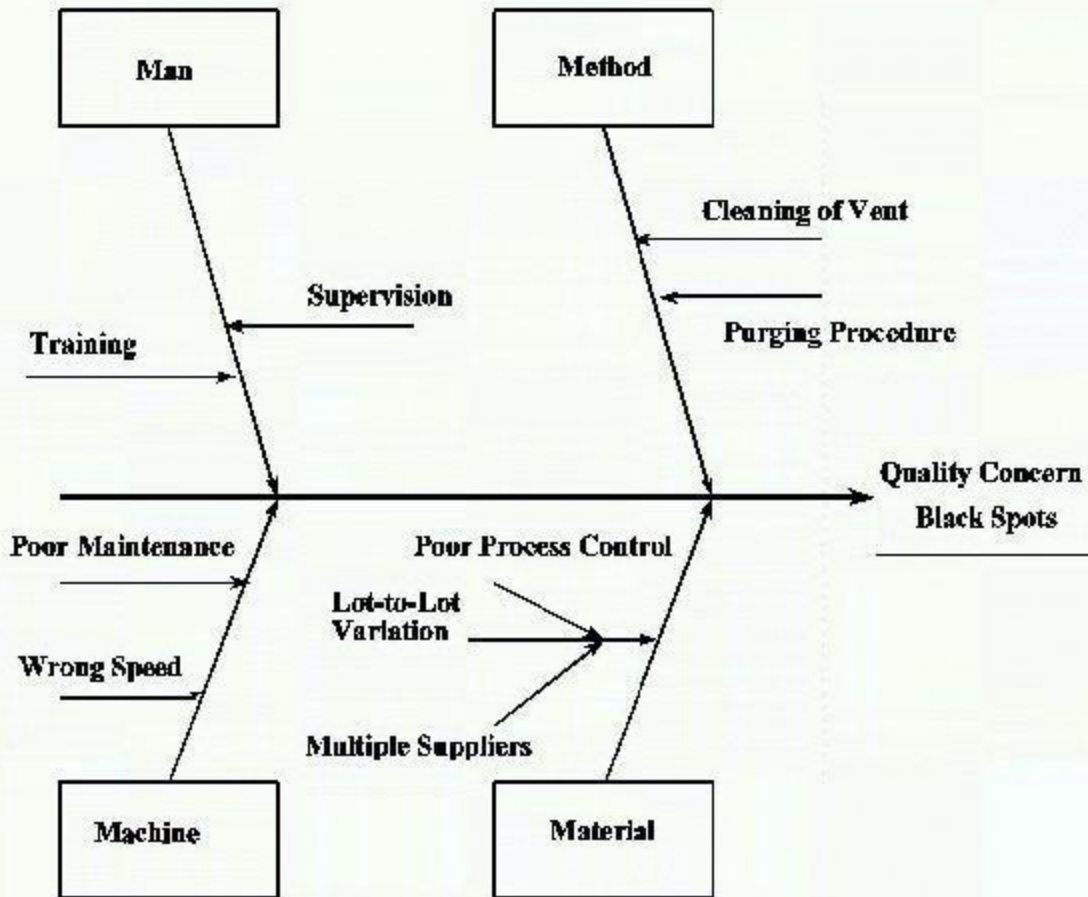
II - Flowchart: A technique that separates data gathered from a variety of sources so that patterns can be seen (some lists replace "stratification" with or "run chart").

Purpose: Flow Charts provide a visual illustration of the sequence of operations required to complete a task.

A picture of the steps the process undergoes to complete it's task. Every process will require input(s) to complete it's task, and will provide output(s) when the task is completed. Flow charts can be drawn in many styles. Flow charts can be used to describe a single process, parts of a process, or a set of processes. There is no right or wrong way to draw a flow chart. The true test of a flow chart is how well those who create and use it can understand it. Input -----Process-----Output

III - Cause-and-Effect Diagrams - 1943 by Mr. Kaoru Ishikawa at the University of Tokyo

Purpose: One important part of process improvement is continuously striving to obtain more information about the process and it's output. Cause-and-effect diagrams allow us to do not just that, but also can lead us to the root cause, or causes, of problems.



Constructing the Cause-and-Effect Diagram:

Step 1: Select the team members and a leader. Team members knowledgeable about the quality. Team members focus on the problem under investigation.

Step 2: Write the problem statement on the right hand side of the page, and draw a box around it with an arrow running to it. This quality concern is now the effect.

Step 3: Brain-storming. The team members generate ideas as to what is causing the effect.

Step 4: This step could be combined with step 3. Identify, for each main cause, its related sub-causes that might affect our quality concern or problem (our Effect). Always check to see if all the factors contributing to the problem have been identified. Start by asking why the problem exists.

Step 5: Focus on one or two causes for which an improvement action(s) can be developed using other quality tools such as Pareto charts, check sheets, and other gathering and analysis tools. **Conclusion:** Improvement requires knowledge. The more information we have about our processes the better we are at improving them. Cause-and-effect diagrams are one quality tool that is simple yet very powerful in helping us better understand our processes.

IV - Check Sheets

Purpose: Check sheets allow the user to collect data from a process in an easy, systematic, and organized manner.

Data Collection: Before we can talk about check sheets we need to understand what we mean by data collection. This collected data needs to be accurate and relevant to the quality problem. The first is to establish a purpose for collecting this data. Second, we need to define the type of data that is going to be collected. Measurable data such as length, size, weight, time,...etc., and countable data such as the number of defects. The third step is to determine who is going to collect that data and when it should be collected.

V- Histograms

Purpose: To determine the spread or variation of a set of data points in a graphical form. It is always a desire to produce things that are equal to their design values.

Histograms: A histogram is a tool for summarizing, analyzing, and displaying data. It provides the user with a graphical representation of the amount of variation found in a set of data.

Constructing a Histogram: The following are the steps followed in the construction of a histogram:

Data collection: To ensure good results, a minimum of 50 data points, or samples, need to be collected

Calculate the range of the sample data: The range is the difference between the largest and smallest data points. *Range = Largest point - smallest point.*

Calculate the size of the class interval. The class interval is the width of each class on the X axis. It is calculated by the following formula:

Class interval = Range / Number of classes.

Calculate the number of data points (frequency) that are in each class. A tally sheet is usually used to find the frequency of data points in each interval.

Conclusion: Histogram is simple tools that allow the user to identify and interpret the variation found in a set of data points. It is important to remember that histograms do not give solutions to problems.

VI - Scatter Diagrams

Purpose: To identify correlations that might exist between a quality characteristic and a factor that might be driving it.

Scatter Diagrams: A scatter diagram is a nonmathematical or graphical approach for identifying relationships between a performance measure and factors that might be driving it. This graphical approach is quick, easy to communicate to others, and generally easy to interpret.

Interpreting the Results: Once all the data points have been plotted onto the scatter diagram, you are ready to determine whether there exists a relation between the two selected items or not. When a strong relationship is present, the change in one item will automatically cause a change in the other. If no relationship can be detected, the change in one item will not effect the other item. There are three basic types of relationships that can be detected to on a scatter diagram: 1. Positive relationship 2. Negative relationship 3. No relationship

Conclusion: Scatter diagrams allow the user to graphically identify correlations that could exist between a quality characteristic and a factor that might be driving it. It is a quality tool that is simple, easy to communicate to others, and generally easy to interpret.

VII - Control Charts

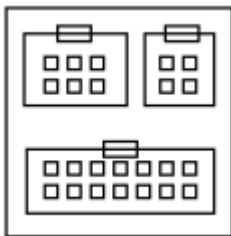
Purpose: Process is in control and to monitor process variation on a continuous basis. Identifying the tolerance level in the variations. Control charts is one SPC tool that enables us to monitor and control process variation. Types of variation Common and Special Cause Variation

Control charts: Developed in the mid 1920's by Walter Shewhart of Bell labs. There are two basic types of control charts, the average and range control charts. The first deals with how close the process is to the nominal design value, while the range chart indicates the amount of spread or variability around the nominal design value. A control chart has basically three line: the upper control limit UCL, the center line CL, and the lower control limit LCL. A minimum of 25 points is required for a control chart to be accurate.

2) Explain the New management tools

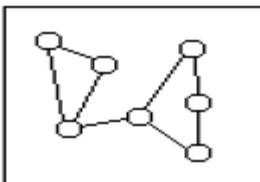
Seven New Management and Planning Tools In 1976, the Union of Japanese Scientists and Engineers (JUSE) saw the need for tools to promote innovation, communicate information and successfully plan major projects. A team researched and developed the seven new quality control tools, often called the seven management and planning (MP) tools, or simply the seven management tools. Not all the tools were new, but their collection and promotion were. The seven MP tools, listed in an order that moves from abstract analysis to detailed planning, are:

1. **Affinity diagram:** organizes a large number of ideas into their natural relationships.

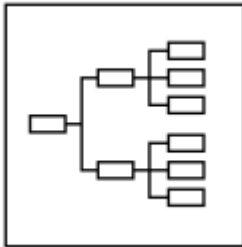


2. InterRelations diagram:

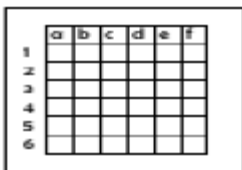
shows cause-and-effect relationships and helps you analyze the natural links between different aspects of a complex situation.



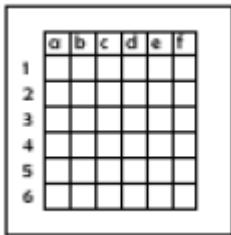
3. **Tree diagram:** breaks down broad categories into finer and finer levels of detail, helping you move your thinking step by step from generalities to specifics.



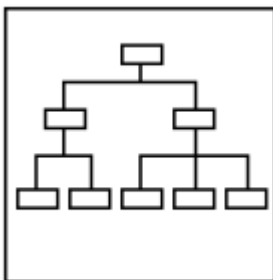
4. **Matrix diagram:** shows the relationship between two, three or four groups of information and can give information about the relationship, such as its strength, the roles played by various individuals, or measurements.



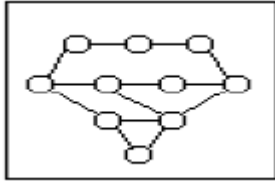
5. **Matrix data analysis:** a complex mathematical technique for analyzing matrices, often replaced in this list by the similar prioritization matrix. One of the most rigorous, careful and time-consuming of decision-making tools, a prioritization matrix is an L-shaped matrix that uses pairwise comparisons of a list of options to a set of criteria in order to choose the best option(s).



6. **Arrow diagram:** shows the required order of tasks in a project or process, the best schedule for the entire project, and potential scheduling and resource problems and their solutions.



7. **Process decision program chart (PDPC):** systematically identifies what might go wrong in a plan under development.



3) Explain Six-sigma

Six Sigma concepts:

Six Sigma has evolved over the last two decades and so has its definition. Six Sigma has literal, conceptual, and practical definitions. Features that set Six Sigma apart from previous quality improvement initiatives include –

- A clear focus on achieving measurable and quantifiable financial returns from any project.
- An increased emphasis on strong and passionate management leadership and support.
- A special infrastructure of "Champions," "Master Black Belts," "Black Belts," etc. to lead and implement the Six Sigma approach.
- A clear commitment to making decisions on the basis of verifiable data, rather than assumptions and guesswork.

At Motorola University, we think about Six Sigma at three different levels:

- As a metric
- As a methodology
- As a management system

Essentially, Six Sigma is all three at the same time.

Six Sigma as a Metric

The term "Sigma" is often used as a scale for levels of "goodness" or quality. Using this scale, "Six Sigma" equates to 3.4 Defects Per Million Opportunities (DPMO). Six Sigma started as a defect reduction effort in manufacturing and then applied to other business processes for the same purpose. Taking the 1.5 sigma shift into account, short-term sigma levels correspond to the following long-term DPMO values (one-sided):

- One Sigma = 690,000 DPMO => efficiency 31%
- Two Sigma = 308,000 DPMO => efficiency 69.2%
- Three Sigma = 66,800 DPMO => efficiency 93.32%
- Four Sigma = 6,210 DPMO => efficiency 99.379%
- Five Sigma = 230 DPMO => efficiency 99.977%
- Six Sigma = 3.4 DPMO => efficiency 99.9997%

Six Sigma as a Methodology

As Six Sigma has evolved, there has been less emphasis on the literal definition of 3.4 DPMO, or counting defects in products and processes. Six Sigma is a business improvement methodology that focuses an organization on:

- Understanding and managing customer requirements
- Aligning key business processes to achieve those requirements
- Utilizing rigorous data analysis to minimize variation in those processes
- Driving rapid and sustainable improvement to business processes

At the heart of the methodology is the DMAIC model for process improvement. DMAIC is commonly used by Six Sigma project teams and is an acronym for:

DMAIC - The basic methodology consists of the following five steps:

- Define* process improvement goals that are consistent with customer demands and the enterprise strategy.
- Measure* key aspects of the current process and collect relevant data.
- Analyze* the data to verify cause-and-effect relationships. Determine what the relationships are, and attempt to ensure that all factors have been considered.
- Improve* or optimize the process based upon data analysis using techniques like Design of Experiments.

4) Explain about Benchmarking.

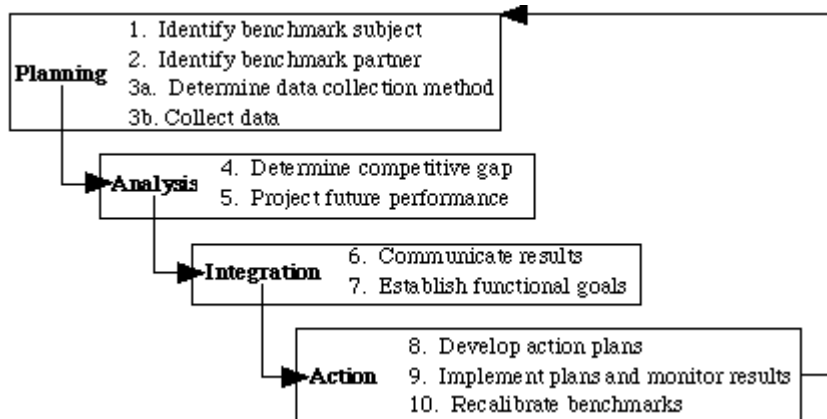
"Benchmarking: A continuous, systematic process of evaluating and comparing the capability of one organization with others normally recognized as industry leaders, for insights for optimizing the organizations processes." **Benchmarking** is the process of comparing the cost, time or quality of what one organization does against what another organization does. The result is often a business case for making changes in order to make improvements. —The systematic process of comparing an organization's products, services and practices against those of competitor organizations or other industry leaders to determine what it is they do that allows them to achieve high levels of performance.|| (Society for Human Resources Management)

Advantages of benchmarking

Benchmarking is a powerful management tool because it overcomes "paradigm blindness." Benchmarking opens organizations to new methods, ideas and tools to improve their effectiveness. It helps crack through resistance to change by demonstrating other methods. Allows employees to visualise the improvement which can be a strong motivator for change Helps to identify weak areas and indicates what needs to be done to improve.

The Benchmarking process

The formal 10-step benchmarking process is shown in outline below.



The benchmarking process consists of following phases:

1. Planning.

The essential steps are those of any plan development: what, who and how.

- What is to be benchmarked?** Every function of an organization has or delivers a —product|| or output. Benchmarking is appropriate for any output of a process or function, whether it’s a physical good, an order, a shipment, an invoice, a service or a report.
- To whom or what will we compare?** Business-to-business, direct competitors are certainly prime candidates to benchmark. But they are not the only targets. Benchmarking must be conducted against the best companies and business functions regardless of where they exist.
- How will the data be collected?** There’s no one way to conduct benchmarking investigations. There’s an infinite variety of ways to obtain required data – and most of the data you’ll need are readily and publicly available. Recognize that benchmarking is a process not only of deriving quantifiable goals and targets, but more importantly, it’s the process of investigating and documenting the best industry practices, which can help you achieve goals and targets.

2. Analysis.

The analysis phase must involve a careful understanding of your current process and practices, as well as those of the organizations being benchmarked. What is desired is an understanding of internal performance on which to assess strengths and weaknesses. Ask:

- Is this other organization better than we are?
- Why are they better?
- By how much?
- What best practices are being used now or can be anticipated?
- How can their practices be incorporated or adapted for use in our organization?

Answers to these questions will define the dimensions of any performance gap: negative, positive or parity. The gap provides an objective basis on which to act—to close the gap or capitalize on any advantage your organization has.

3. Integration.

Integration is the process of using benchmark findings to set operational targets for change. It involves careful planning to incorporate new practices in the operation and to ensure benchmark findings are incorporated in all formal planning processes.

Steps include:

Gain operational and management acceptance of benchmark findings. Clearly and convincingly demonstrate findings as correct and based on substantive data.

Develop action plans.

Communicate findings to all organizational levels to obtain support, commitment and ownership.

4. Action.

Convert benchmark findings, and operational principles based on them, to specific actions to be taken. Put in place a periodic measurement and assessment of achievement. Use the creative talents of the people who actually perform work tasks to determine how the findings can be incorporated into the work processes. Any plan for change also should contain milestones for updating the benchmark findings, and an ongoing reporting mechanism. Progress toward benchmark findings must be reported to all employees. 5. Maturity. Maturity will be reached when best industry practices are incorporated in all business processes, thus ensuring superiority. Tests for superiority:

If the now-changed process were to be made available to others, would a knowledgeable businessperson prefer it?

Do other organizations benchmark your internal operations?

Maturity also is achieved when benchmarking becomes an ongoing, essential and self-initiated facet of the management process. Benchmarking becomes institutionalized and is done at all appropriate levels of the organization, not by specialists.

5) Explain the Types of Benchmarking.

Process benchmarking - the initiating firm focuses its observation and investigation of business processes with a goal of identifying and observing the best practices from one or more benchmark firms. Activity analysis will be required where the objective is to benchmark cost and efficiency; increasingly applied to back-office processes where outsourcing may be a consideration.

Financial benchmarking - performing a financial analysis and comparing the results in an effort to assess your overall competitiveness.

Performance benchmarking - allows the initiator firm to assess their competitive position by comparing products and services with those of target firms.

Product benchmarking - the process of designing new products or upgrades to current ones. This process can sometimes involve reverse engineering which is taking apart competitors products to find strengths and weaknesses.

Strategic benchmarking - involves observing how others compete. This type is usually not industry specific meaning it is best to look at other industries.

Functional benchmarking - a company will focus its benchmarking on a single function in order to improve the operation of that particular function. Complex functions such as Human Resources, Finance and Accounting and Information and Communication Technology are unlikely to be directly comparable in cost and efficiency terms and may need to be disaggregated into processes to make valid comparison

Implementation in manufacturing

Poka-yoke can be implemented at any step of a manufacturing process where something can go wrong or an error can be made. For example, a jig that holds pieces for processing might be modified to only allow pieces to be held in the correct orientation, or a digital counter might track the number of spot welds on each piece to ensure that the worker executes the correct number of welds.

Shigeo Shingo recognized three types of poka-yoke for detecting and preventing errors in a mass production system:

1. The *contact* method identifies product defects by testing the product's shape, size, color, or other physical attributes.
2. The *fixed-value* (or *constant number*) method alerts the operator if a certain number of movements are not made.
3. The *motion-step* (or *sequence*) method determines whether the prescribed steps of the process have been followed.

Either the operator is alerted when a mistake is about to be made, or the poka-yoke device actually prevents the mistake from being made. In Shingo's lexicon, the former implementation would be called a *warning* poka-yoke, while the latter would be referred to as a *control* poka-yoke.

6) Explain about FMEA

Failure modes and effects analysis (FMEA) is a procedure for analysis of potential failure modes within a system for the classification by severity or determination of the failures' effect upon the system. It is widely used in the manufacturing industries in various phases of the product life cycle and is now increasingly finding use in the service industry as well. Failure causes are any errors or defects in process, design, or item especially ones that affect the customer, and can be potential or actual. *Effects analysis* refers to studying the consequences of those failures.

Step 1: Severity

Determine all failure modes based on the functional requirements and their effects. Examples of failure modes are: Electrical short-circuiting, corrosion or deformation. It is important to note that a failure mode in one component can lead to a failure mode in another component. Therefore each failure mode should be listed in technical terms and for function. Hereafter the ultimate effect of each failure mode needs to be considered.

A failure effect is defined as the result of a failure mode on the function of the system as perceived by the user. In this way it is convenient to write these effects down in terms of what the user might see or experience. Examples of failure effects are: degraded performance, noise or even injury to a user.

Each effect is given a **severity number(S)** from 1(no danger) to 10(important). These numbers help an engineer to prioritize. If the severity of an effect has a number 9 or 10, actions are considered to change the design by eliminating the failure mode, if possible, or protecting the user from the effect. A severity rating of 9 or 10 is generally

reserved for those effects which would cause injury to a user or otherwise result in litigation.

Step 2: Occurrence

In this step it is necessary to look at the cause of a failure and how many times it occurs. This can be done by looking at similar products or processes and the failures that have been documented for them. A failure cause is looked upon as a design weakness. All the potential causes for a failure mode should be identified and documented. Again this should be in technical terms. Examples of causes are: erroneous algorithms, excessive voltage or improper operating conditions.

A failure mode is given a **probability number**(O), again 1-10. Actions need to be determined if the occurrence is high (meaning >4 for non safety failure modes and >1 when the severity-number from step 1 is 9 or 10). This step is called the detailed development section of the FMEA process.

Step 3: Detection

When appropriate actions are determined, it is necessary to test their efficiency. Also a design verification is needed. The proper inspection methods need to be chosen. First, an engineer should look at the current controls of the system, that prevent failure modes from occurring or which detect the failure before it reaches the customer.

Hereafter one should identify testing, analysis, monitoring and other techniques that can be or have been used on similar systems to detect failures. From these controls an engineer can learn how likely it is for a failure to be identified or detected. Each combination from the previous 2 steps, receives a **detection number**(D). This number represents the ability of planned tests and inspections at removing defects or detecting failure modes. After these 3 basic steps, Risk Priority Numbers (RPN) are calculated.

Risk Priority Numbers RPN do not play an important part in the choice of an action against failure modes. They are more threshold values in the evaluation of these actions. After ranking the severity, occurrence and detectability the RPN can be easily calculated by multiplying these 3 numbers: $RPN = S \times O \times D$ This has to be done for the entire process and/or design. Once this is done it is easy to determine the areas of greatest concern. The failure modes that have the highest RPN should be given the highest priority for corrective action. This means it is not always the failure modes with the highest severity numbers that should be treated first. There could be less severe failures, but which occur more often and are less detectable.

7) Explain the Timing of FMEA

The FMEA should be updated whenever: At the beginning of a cycle (new product/process) Changes are made to the operating conditions A change is made in the design New regulations are instituted Customer feedback indicates a problem

Uses of FMEA

Development of system requirements that minimize the likelihood of failures. Development of methods to design and test systems to ensure that the failures have been eliminated. Evaluation of the requirements of the customer to ensure that those do not

give rise to potential failures. Identification of certain design characteristics that contribute to failures, and minimize or eliminate those effects. Tracking and managing potential risks in the design. This helps avoid the same failures in future projects. Ensuring that any failure that could occur will not injure the customer or seriously impact a system.

Advantages

Improve the quality, reliability and safety of a product/process
Improve company image and competitiveness
Increase user satisfaction
Reduce system development timing and cost
Collect information to reduce future failures, capture engineering knowledge
Reduce the potential for warranty concerns
Early identification and elimination of potential failure modes
Emphasis problem prevention
Minimize late changes and associated cost
Catalyst for teamwork and idea exchange between functions

Disadvantages

If used as a top-down tool, FMEA may only identify major failure modes in a system. Fault tree analysis (FTA) is better suited for "top-down" analysis. When used as a "bottom-up" tool FMEA can augment or complement FTA and identify many more causes and failure modes resulting in top-level symptoms. It is not able to discover complex failure modes involving multiple failures within a subsystem, or to report expected failure intervals of particular failure modes up to the upper level subsystem or system. Additionally, the multiplication of the severity, occurrence and detection rankings may result in rank reversals, where a less serious failure mode receives a higher RPN than a more serious failure mode. The reason for this is that the rankings are ordinal scale numbers, and multiplication is not a valid operation on them. The ordinal rankings only say that one ranking is better or worse than another, but not by how much. For instance, a ranking of "2" may not be twice as bad as a ranking of "1," or an "8" may not be twice as bad as a "4," but multiplication treats them as though they are.

8) Explain the Benchmarking process.

The benchmarking process consists of following phases:

1. Planning.

The essential steps are those of any plan development: what, who and how.

- **What is to be benchmarked?** Every function of an organization has or delivers a —product|| or output. Benchmarking is appropriate for any output of a process or function, whether it's a physical good, an order, a shipment, an invoice, a service or a report.
- **To whom or what will we compare?** Business-to-business, direct competitors are certainly prime candidates to benchmark. But they are not the only targets. Benchmarking must be conducted against the best companies and business functions regardless of where they exist.

How will the data be collected? There's no one way to conduct benchmarking investigations. There's an infinite variety of ways to obtain required data – and most of the data you'll need are readily and publicly available. Recognize that benchmarking is a process not only of deriving quantifiable goals and targets, but more importantly, it's the process of investigating and documenting the best industry practices, which can help you achieve goals and targets.

2. Analysis.

The analysis phase must involve a careful understanding of your current process and practices, as well as those of the organizations being benchmarked. What is desired is an understanding of internal performance on which to assess strengths and weaknesses. Ask:

- Is this other organization better than we are?
- Why are they better?
- By how much?
- What best practices are being used now or can be anticipated?
- How can their practices be incorporated or adapted for use in our organization?

Answers to these questions will define the dimensions of any performance gap: negative, positive or parity. The gap provides an objective basis on which to act—to close the gap or capitalize on any advantage your organization has.

3. Integration.

Integration is the process of using benchmark findings to set operational targets for change. It involves careful planning to incorporate new practices in the operation and to ensure benchmark findings are incorporated in all formal planning processes.

Steps include:

Gain operational and management acceptance of benchmark findings. Clearly and convincingly demonstrate findings as correct and based on substantive data.

Develop action plans.

Communicate findings to all organizational levels to obtain support, commitment and ownership.

4. Action.

Convert benchmark findings, and operational principles based on them, to specific actions to be taken. Put in place a periodic measurement and assessment of achievement. Use the creative talents of the people who actually perform work tasks to determine how the findings can be incorporated into the work processes. Any plan for change also should contain milestones for updating the benchmark findings, and an ongoing reporting mechanism. Progress toward benchmark findings must be reported to all employees. 5. Maturity. Maturity will be reached when best industry practices are incorporated in all business processes, thus ensuring superiority. Tests for superiority:

UNIT IV

1) Explain about 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 using proven techniques for analysing and solving work related problems coming in the way of achieving and sustaining excellence leading to mutual upliftment of employees as well as the organisation. It is "a way of capturing the creative and innovative power that lies within the work force".

CONCEPT

The concept of Quality Circle is primarily based upon recognition of the value of the worker as a human being, as someone who willingly activates on his job, his wisdom, intelligence, experience, attitude and feelings. It is based upon the human resource management considered as one of the key factors in the improvement of product quality & productivity. Quality Circle concept has three major attributes:

- 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. From "I don't care" to "I do care" Continuous improvement in quality of work life through humanisation of work. b) Self Development Bring out 'Hidden Potential' of people People get to learn additional skills. c) Development of Team Spirit Individual Vs Team – "I could not do but we did it" Eliminate inter departmental conflicts. d) Improved Organisational Culture Positive working environment. Total involvement of people at all levels. Higher motivational level. Participate Management process.

2) Explain the organisational structure

A Quality Circle has an appropriate organisational structure for its effective and efficient performance. It varies from industry to industry, organisation to organisation. But it is useful to have a basic framework as a model. The structure of a Quality Circle consists of the following elements.

i. **A steering committee:** This is at the top of the structure. It is headed by a senior executive and includes representatives from the top management personnel and human resources development people. It establishes policy, plans and directs the program and meets usually once in a month.

ii. **Co-ordinator:** He may be a Personnel or Administrative officer who co-ordinates and supervises the work of the facilitators and administers the programme.

iii. **Facilitator:** He may be a senior supervisory officer. He co-ordinates the works of several quality circles through the Circle leaders.

iv. **Circle leader:** Leaders may be from lowest level workers or Supervisors. A Circle leader organises and conducts Circle activities.

v. **Circle members :** They may be staff workers. Without circle members the programme cannot exist. They are the lifeblood of quality circles. They should attend all meetings as far as possible, offer suggestions and ideas, participate actively in group process, take training seriously with a receptive attitude. The roles of Steering Committee, Co-ordinator, Facilitator, Circle leader and Circle members are well defined.

The Quality Circles also are expected to develop internal leadership, reinforce worker morale and motivation, and encourage a strong sense of teamwork in an organisation. A variety of benefits have been attributed to Quality Circles, including higher quality, improved productivity, greater upward flow of information, broader improved worker attitudes, job enrichment, and greater teamwork.

3) Explain about Quality cost

Quality cost:

During the 1950's the concept of —Quality Cost|| emerged. Different people assigned different meanings to the term. Some people equated quality cost with the cost of attaining quality; some people equated the term with the extra incurred due to poor quality. But, the widely accepted thing is —Quality cost is the extra cost incurred due to poor or bad quality of the product or service.

Categories of Quality Cost :

Many companies summarize quality costs into four broad categories. They are, a) Internal failure costs - The cost associated with defects that are found prior to transfer of the product to the customer. b) External failure costs - The cost associated with defects that are found after product is shipped to the customer. c) Appraisal costs - The cost incurred in determining the degree of conformance to quality requirement. d) Prevention costs - The cost incurred in keeping failure and appraisal costs to a minimum.

Analysis technique for Quality Cost

The term "**trend analysis**" refers to the concept of collecting information and attempting to spot a pattern, or *trend*, in the information. In some fields of study, the term "trend analysis" has more formally-defined meanings. Although trend analysis is often used to predict future events, it could be used to estimate uncertain events in the past, such as how many ancient kings probably ruled between two dates, based on data such as the average years which other known kings reigned.

4) Explain Pareto Analysis

This fact gave rise to the Pareto *effect* or Pareto's law: – 'the vital few and the trivial many'. The Pareto effect is named after Vilfredo Pareto, an economist and sociologist who lived from 1848 to 1923. Originally trained as an engineer he was a one time managing director of a group of coalmines.

Pareto analysis is a statistical technique in decision making that is used for selection of a limited number of tasks that produce significant overall effect. It uses the Pareto principle - the idea that by doing 20% of work you can generate 80% of the advantage of doing the entire job. Or in terms of quality improvement, a large majority of problems (80%) are produced by a few key causes (20%).

Pareto analysis is a formal technique useful where many possible courses of action are competing for your attention. In essence, the problem-solver estimates the benefit delivered by each action, then selects a number of the most effective actions that deliver a total benefit reasonably close to the maximal possible one. Use of Pareto principle in prioritizing or ranking a range of items which have different levels of significance. Its objective is to separate the 'vital few' from the 'useful many.'

Steps to identify the important causes using Pareto analysis

- Step 1: Form a table listing the causes and their frequency as a percentage.
- Step 2: Arrange the rows in the decreasing order of importance of the causes (i.e, the most important cause first)
- Step 3: Add a cumulative percentage column to the table
- Step 4: Plot with causes on x - and cumulative percentage on y -axis
- Step 5: Join the above points to form a curve
- Step 6: Plot (on the same graph) a bar graph with causes on x - and percent frequency on y -axis
- Step 7: Draw line at 80% on y -axis parallel to x -axis. Then drop the line at the point of intersection with the curve on x -axis. This point on the x -axis separates the important causes (on the left) and trivial causes (on the right)

5) Explain Taguchi quality loss function

Genichi Taguchi is a Japanese quality expert, known for the Quality Loss Function and for methodologies to optimise quality at the design stage – —*robust design*. Taguchi received formal recognition for his work including Deming Prizes and Awards. Genichi Taguchi considers quality loss **all the way through to the customer**, including cost of scrap, rework, downtime, warranty claims and ultimately reduced market share.

Genichi Taguchi's Quality Loss Function

The Quality Loss Function gives a **financial value** for customers' increasing **dissatisfaction** as the product performance goes below the desired target performance. Equally, it gives a financial value for **increasing costs** as product performance goes

above the desired target performance. Determining the target performance is an educated guess, often based on customer surveys and feedback.

The quality loss function allows **financial decisions** to be made at the **design stage** regarding the cost of achieving the target performance.

Quality through Robust Design Methodology

Taguchi methods emphasised quality through robust design, not quality through inspection. Taguchi breaks the design process into three stages:

1. System design - involves creating a working prototype
2. Parameter design - involves experimenting to find which factors influence product performance most
3. Tolerance design - involves setting tight tolerance limits for the critical factors and looser tolerance limits for less important factors.

Taguchi's Robust Design methodologies allow the designer through experiments to determine **which factors most affect product performance** and which factors are unimportant. The designer can focus on **reducing variation** on the important or critical factors. Unimportant or uncontrollable —noise factors have negligible impact on the product performance and can be ignored.

Robust Design of Cookies This is easier explained by example. If your business makes cookies from raw ingredients, there are many possible factors that could influence the **quality of the cookie** - amount of flour, number of eggs, temperature of butter, heat of oven, cooking time, baking tray material etc. With Genichi Taguchi's Robust Design methodologies you would set up experiments that would **test a range of combinations of factors** - for example, high and low oven temperature, with long and short cooking time, 1 or 2 eggs, etc. The cookies resulting from each of these trials would be assessed for quality. A statistical analysis of results would tell you which the most important factors are, for example oven temperature affects cookie quality more than the number of eggs. With this knowledge you would design a process that ensures the oven maintains the optimal temperature and you would be able to consistently produce good cookies.

6) Explain TPM

Total Productive Maintenance

Total = Overall features for production Productive = production of goods and services that meet expectation Maintenance = Keeping the equipments and plant as good as new and working condition

Goals of TPM

Maintaining and Improving equipment capacity
 Maintaining equipment for longer life
 Using support from all areas of operation
 Encouraging input from all employees
 Continuous improvement.

Improvement needs

Machines expected to fail at one point or another – minimise that risk Employees who use and work that machine give the first hand information

Six major loss areas in terms of time

Downtime loss 1. Planned – i) start ups ii) Shift change iii) tea / lunch breaks iv) planned maintenance 2. Unplanned – i) Equipment breakdown ii) changeovers iii) lack of materials 3. Idling and minor stoppages 4. Slow downs 5. Process change 6. Scraps

Calculating Equipment Effectiveness

Downtime loss measured by equipment availability

$$A = (T/P) \times 100$$

A – availability, T – operating time (P – D), P – Planned operation time

D- Downtime

Performance efficiency

$$E = (CXN/T) \times 100$$

E – Performance efficiency,

C – Theoretical cycle time,

N – Processed amount (qty) Rate of quality products

R = (N-Q/N) X 100 R – Rate of quality products,

N = Processed amount Q – nonconformities

7) Explain Quality Function Deployment (QFD)

Quality Function Deployment (QFD) is a way of making the 'voice of the customer' heard throughout an organization. It is a systematic process for capturing customer requirements and translating these into requirements that must be met throughout the 'supply chain'. The result is a new set of target values for designers, production people, and even suppliers to aim at in order to produce the output desired by customers.

QFD is particularly valuable when design trade-offs are necessary to achieve the best overall solution, e.g. because some requirements conflict with others. QFD also enables a great deal of information to be summarized in the form of one or more charts. These charts capture customer and product data gleaned from many sources, as well as the design parameters chosen for the new product. In this way they provide a solid foundation for further improvement in subsequent design cycles.

QFD is sometimes referred to by other 'nicknames' - the voice of the customer (from its use as a way of communicating customer needs), or the House of Quality (from the characteristic house shape of a QFD chart). History The creation of QFD is generally attributed to Mitsubishi's Kobe shipyard in Japan. The original approach, conceived in the late 1960's, was adopted and developed by other Japanese companies, notably Toyota and its suppliers. In 1986 a study by the Japanese Union of Scientists and Engineers (JUSE) revealed that 54% of 148 member companies surveyed were using QFD. The

sectors with the highest penetration of QFD were transportation (86%), construction (82%), electronics (63%), and precision machinery (66%). Many of the service companies surveyed (32%) were also using QFD. Specific design applications in Japan range from home appliances and clothing to retail outlets and apartment layouts.

Benefits of QFD

The main 'process' benefits of using QFD are: improved communication and sharing of information within a cross-functional team charged with developing a new product. This team will typically include people from a variety of functional groups, such as marketing, sales, service, distribution, product engineering, process engineering, procurement, and production the identification of 'holes' in the current knowledge of the design team the capture and display of a wide variety of important design information in one place in a compact form support for understanding, consensus, and decision making, especially when complex relationships and trade-offs are involved the creation of an informational base which is valuable for repeated cycles of product improvement

The main 'bottom line' benefits of using QFD are: greater likelihood of product success in the marketplace, due to the precise targeting of key customer requirements reduced overall design cycle time, mainly due to a reduction in time-consuming design changes. This is a powerful benefit: customer requirements are less likely to have changed since the beginning of the design project; and more frequent design cycles mean that products can be improved more rapidly than the competition reduced overall cost due to reducing design changes, which are not only time consuming but very costly, especially those which occur at a late stage. reduced product cost by eliminating redundant features and over-design. When to use QFD QFD is a powerful tool that leads to significant improvements in product/process performances. However, it is not a short-term answer to product development problems.

The method on which QFD is implemented may have a large impact on benefits derived and companies should take up QFD only after getting the consent and commitment of the team members. QFD provides a systematic approach to build a team perspective on what needs to be done, the best ways to do it, the best order to accomplish the tasks proposed and the staffing and resources required to enhance customer satisfaction. It is also a good format for capturing and recording/documenting decision making. Applied through the Kaizen philosophy under Total Quality Control, QFD is the most highly developed form of integrated product and process development in existence. Strengths and weaknesses of QFD

Strengths include:

1. Enhanced customer satisfaction Listening to the voice of the customer Robust design
 2. Shorter time to market Reduced rework during development Creates team consensus and commitment
 3. Reduced costs
- Competitive benchmarking
 - Concurrent Engineering

Weaknesses

- Targets set based only on the House of Quality, may be unrealistic
- Customer requirements are a mix of functional requirements and customer attributes

- Sometimes customer influences may backfire

Success with QFD Companies using QFD for product development have on the average, experienced:

- 50% reduction in costs
- 33% reduction in product development time
- 200% increase in productivity

Companies that have successfully applied QFD include Toyota, Honda, ICI, Black & Decker, Integrated Design Control Systems and Rover.

QFD – House of Quality

8) Explain the voice of the customer.

MEANING: The voice of the customer from the market research and various benchmarking is linked to the technicalities of the design and process of the product both new and existing.

DEFINITION: It is kind of conceptual map that provides a means of interfunctional planning and communication.

FEATURES:

- Concept of matrix and its correlation
- Plan as per the voice of the customer
- Focus on Customers need and technicalities
- WHAT the Customer wants and HOW to do it
- It is base tool for quality planning managers

Step I – List customer requirement

Decide Primary and secondary needs of the customer

Step II – List technical descriptions “HOW” Again primary and secondary is decided Primary – Material and Process Subdividing materials and process required Here current materials and process must be considered

Step III – Relation ship matrix between WHAT & HOW The crucial stage Relating WHAT & HOW Interlinking both primary and secondary No scope for variation Points and grading is done here Gives results of WHAT and HOW Key elements are discussed The Management decides the combination.

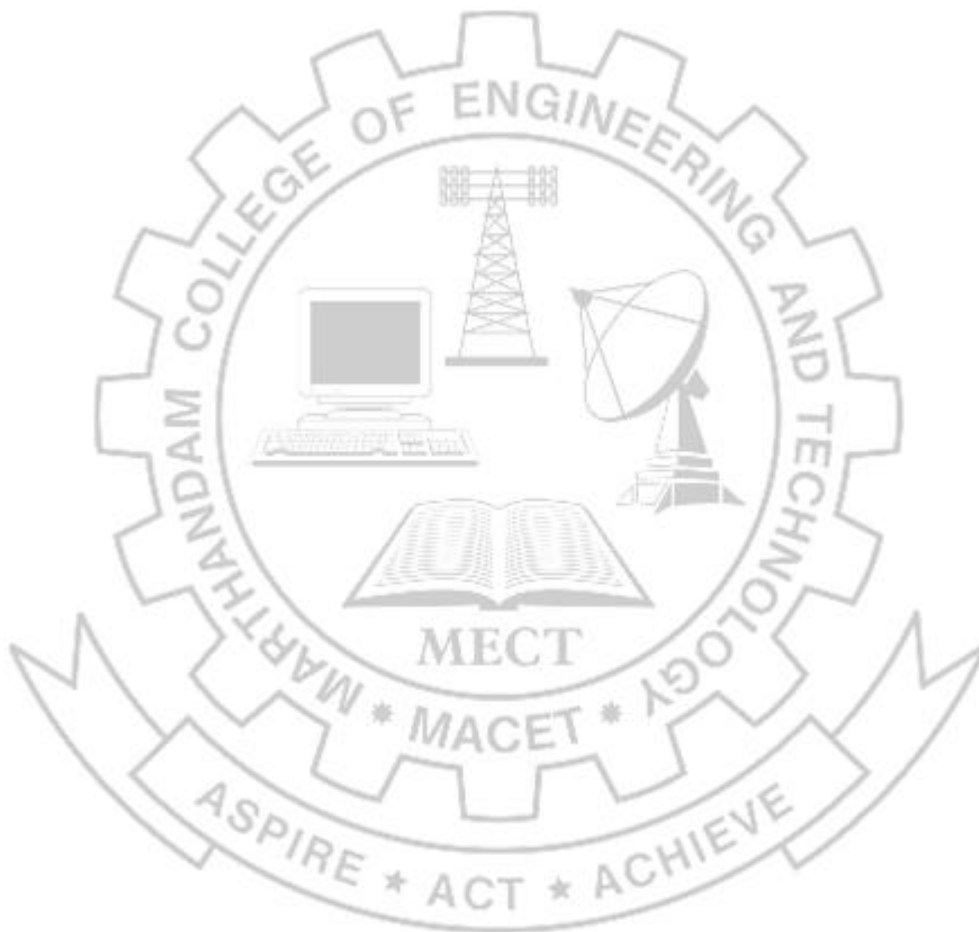
Costing and current process must be considered

Step IV – Interrelation matrix between HOW’s The materials and manufacturing is analyzed Ratings are done Enables the decisions in the process Current process to be considered Technical knowledge is a must for the analyst

Step V – Our product with others Analyzing competitors products customer expectation Difficult to get data Mismatch in requirements is possible Helps in identifying customer trend

Step VI – Technical Competitive assessment Analyzing how the similar companies are handling To what they give importance. Impact on technical process to meet the customers request.

Step VII – Prioritize Technical Descriptors Degree of technical difficulty Most needed change is decided Target value Physical attributes to be considered.



UNIT V

1) Explain the Need for ISO 9000- ISO 9000-2000 Quality System

Basic Requirements of ISO 9001

1. Procedure to cover all processes in the business
2. Monitoring process to ensure effectiveness
3. Keeping adequate record
4. Defect verification and appropriate correction
5. Regular review of individual processes
6. Facilitating continual improvement

Benefits of ISO Registration

1. Increase in internal quality – reduction of scrap, rework etc
2. Production reliability – measure of breakdowns, time and shift management etc
3. External quality – acceptance by customers, less claims, return of goods
4. Time performance – marketing, delivery, production time etc
5. Cost of poor quality – scraps and rework

2) Explain about ISO 9000 Family

- ISO 9000:2000 QMS – Fundamental and Vocabulary
- Basic QMS
- Guidance document for certification
- Revised in ISO 9000:2005

ISO 9001:2000 QMS – Requirements

- Design, development and installation
- Customer satisfaction through products and service

ISO 9004:2000 QMS – Guidelines for Performance

- Continuous improvement
- Enhance the mature system

Sector Specific Standards Need – One system may not cover all industry Sector specific standard work in hand with regular ISO Work in tandem with certifying bodies of such industry **AS9100** 1997 for Aerospace industry. Boeing was the brain behind it. NASA, DOD, FAA Common in USA, Europe and Japan **ISO/TS 16949 – March 2002 – Technical Specification** System for Automotive Suppliers In collaboration with US big 3 – Ford, GM, Chrysler with German, French, Italy and Japan Accepted by Asian automakers – they benefit a lot. Helps in Continuous improvement, defect prevention, variation reduction and supply chain Levels – ISO 9000, sector specific and company requirement **TL**

9000 - 1998 QuEST – Quality Excellence for Supplies of Telecommunications formed TL9000 Standards designed by Motorola, Lucent, Verizon, Southwest bell, AT&T. Along with ISO 9001 they have their own standard to deliver the need of customers

3) Explain QS 9000 – ISO 14000 –Requirements and Benefits

Five Layers ISO 9001 Requirement

Common TL9000 Requirement QSR – Quality Standard Requirement

HW Specific SW Specific Service Specific

Common TL9000 Measurement QSM – Quality Standard Measurement

HW Specific SW Specific Service Specific

Software products and related service AS9100 ISO/TS 16949	Aerospace industry
TL 9000 – 1998 ISO/TS 29001:2007	Technical Specification for Automotive Suppliers Telecommunications Petroleum, Petro chemical and Natural gas
ISO 14001:2004	Environment Management System – EMS
ISO IEC 9003:2004	Electrotechnical Software products

1. Policy
2. Procedure
3. Work instructions
4. Records
5. Document Development

Internal Audits

Objectives – determine actual performance, initiate corrective action, follow up, provide continuous improvement through feedback, Auditor – trained profs, ASQ updates training, written and oral comm., honesty, unbiased etc Techniques – Examine, Observe and interviews. Procedure – check list, documentation procedure, priority list etc

Registration – Selecting a Registrar - ASQ member, Registrar Accreditation Board RAB.

1. Qualification and Experience – Track record, client list, industry specific
2. Certificate of Recognition – authenticity of the registrar, reference, customer check
3. Registration process – structured process, help quality and productivity, efficiency
4. Time and cost constraints – period of the process, additional fees etc

5. Auditor qualifications – know the industry standard, types of process, knowledge. Interest etc

4) Explain QS 9000 – ISO 14000 – Concepts ,Requirements

Registration process Application for Registration

Basic process with the authorised registrar. With initial supporting docs, fees, time frame etc. Mutuality

Document Review – Scrutiny of docs and QMS, compare with latest ISO standards

Preassessment – overview of docs with the process, identify major flaws

Assessment – Actual doing, certifies audit is compared with internal audit. Less scope for variation

Registration – verbal summary, audit findings, minor non compliances and feedbacks are recorded.

Follow up of surveillance – periodicity of future visit. Random checks, registration valid for 3 years

5) Explain ISO 8204 for quality.

—Totality of characteristics of an entity that bears on its ability to satisfy stated and implied needs.|| This means that the Software product delivered should be as per the requirements defined. We now examine a few more terms used in association with Software Quality. Quality Planning: In the Planning Process we determine the standards that are relevant for the Software Product, the Organization and the means to achieve them. Quality Assurance : Once the standards are defined and we start building the product. It is very important to have processes that evaluate the project performance and aim to assure that the Quality standards are being followed and the final product will be in compliance. Quality Control: Once the software components are built the results are monitored to determine if they comply with the standards. The data collected helps in measuring the performance trends and as needed help in identifying defective pieces of code. Software Quality Management : Software Quality Management simply stated comprises of processes that ensure that the Software Project would reach its goals. In other words the Software Project would meet the clients expectations.

6) Explain key processes of Software Quality Management

The key processes of Software Quality Management fall into the following three categories: 1) Quality Planning 2) Quality Assurance 3) Quality Control The Software Quality Management comprises of Quality Planning, Quality Assurance and Quality Control Processes. We shall now take a closer look at each of them. 1) Quality Planning : Quality Planning is the most important step in Software Quality Management. Proper

planning ensures that the remaining Quality processes make sense and achieve the desired results. The starting point for the Planning process is the standards followed by the Organization. This is expressed in the Quality Policy and Documentation defining the Organization-wide standards. Sometimes additional industry standards relevant to the Software Project may be referred to as needed. Using these as inputs the Standards for the specific project are decided. The Scope of the effort is also clearly defined. The inputs for the Planning are as summarized as follows: a. Company's Quality Policy b. Organization Standards c. Relevant Industry Standards d. Regulations e. Scope of Work f. Project Requirements Using these as Inputs the Quality Planning process creates a plan to ensure that standards agreed upon are met. Hence the outputs of the Quality Planning process are: a. Standards defined for the Project b. Quality Plan

To create these outputs namely the Quality Plan various tools and techniques are used. These tools and techniques are huge topics and Quality Experts dedicate years of research on these topics. We would briefly introduce these tools and techniques in this article. a. Benchmarking: The proposed product standards can be decided using the existing performance benchmarks of similar products that already exist in the market. b. Design of Experiments: Using statistics we determine what factors influence the Quality or features of the end product .

7) Explain about Cost of Quality.

Cost of Quality: This includes all the costs needed to achieve the required Quality levels. It includes prevention costs, appraisal costs and failure costs. d. Other tools: There are various other tools used in the Planning process such as Cause and Effect Diagrams, System Flow Charts, Cost Benefit Analysis, etc. All these help us to create a Quality Management Plan for the project. 2) Quality Assurance : The Input to the Quality Assurance Processes is the Quality Plan created during Planning. Quality Audits and various other techniques are used to evaluate the performance of the project. This helps us to ensure that the Project is following the Quality Management Plan. The tools and techniques used in the Planning Process such as Design of Experiments, Cause and Effect Diagrams may also be used here, as required. 3) Quality Control : Following are the inputs to the Quality Control Process: - Quality Management Plan. - Quality Standards defined for the Project - Actual Observations and Measurements of the Work done or in Progress The Quality Control Processes use various tools to study the Work done. If the Work done is found unsatisfactory it may be sent back to the development team for fixes. Changes to the Development process may be done if necessary. If the work done meets the standards defined then the work done is accepted and released to the clients. Importance of Documentation: In all the Quality Management Processes special emphasis is put on documentation. Many software shops fail to document the project at various levels. Consider a scenario where the Requirements of the Software Project are not sufficiently documented. In this case it is quiet possible that the client has a set of expectations and the tester may not know about them. Hence the testing team would not be able test the software developed for these expectations or requirements. This may lead to poor —Software Quality|| as the product does not meet the expectations. Similarly consider a scenario where the development team does not document the installation

instructions. If a different person or a team is responsible for future installations they may end up making mistakes during installation, thereby failing to deliver as promised. Once again consider a scenario where a tester fails to document the test results after executing the test cases. This may lead to confusion later. If there were an error, we would not be sure at what stage the error was introduced in the software at a component level or when integrating it with another component or due to environment on a particular server etc. Hence documentation is the key for future analysis and all Quality Management efforts. Steps: In a typical Software Development Life Cycle the following steps are necessary for Quality Management:

1) Document the Requirements 2) Define and Document Quality Standards 3) Define and Document the Scope of Work.

8) Discuss about ISO 9000:2000 Quality Systems?

The term I S O 9 0 0 0 refers to a set of quality management standards. ISO 9000 currently includes three quality standards: ISO 9000:2000, ISO 9001:2000, and ISO 9004:2000. ISO 9001:2000 presents requirements, while ISO 9000:2000 and ISO 9004:2000 present guidelines.

ISO's purpose is to facilitate international trade by providing a single set of standards that people everywhere would recognize and respect.

The ISO 9000 2000 Standards apply to all kinds of organizations in all kinds of areas. Some of these areas include manufacturing, processing, servicing, printing, forestry, electronics, steel, computing, legal services, financial services, accounting, trucking, banking, retailing, drilling, recycling, aerospace, construction, exploration, textiles, pharmaceuticals, oil and gas, pulp and paper, petrochemicals, publishing, shipping, energy, telecommunications, plastics, metals, research, health care, hospitality, utilities, pest control, aviation, machine tools, food processing, agriculture, government, education, recreation, fabrication, sanitation, software development, consumer products, transportation, design, instrumentation, tourism, communications, biotechnology, chemicals, engineering, farming, entertainment, horticulture, consulting, insurance, and so on.

ISO 9000 is important because of its *orientation*. While the content itself is useful and important, the content alone does not account for its widespread appeal.

ISO 9000 is important because of its *international* orientation. Currently, ISO 9000 is supported by national standards bodies from more than 120 countries. This makes it the logical choice for any organization that does business internationally or that serves customers who demand an international standard of quality.

ISO is also important because of its *systemic orientation*. We think this is crucial.

Many people in this field wrongly emphasize motivational and attitudinal factors. The assumption is that quality can only be created if workers are motivated and have the right

attitude. This is fine, but it doesn't go far enough. Unless you *institutionalize* the right attitude by supporting it with the right policies, procedures, records, technologies, resources, and structures, you will never achieve the standards of quality that other organizations seem to be able to achieve.

