GE 2022 TOTAL QUALITY MANAGEMENT

UNIT I

Introduction – Need for Quality – Evolution of quality- Definition of quality – Dimensions of manufacturing and service quality – Basic concepts of TQM – Definition of TQM – TQM Frame work – Contribution of Deming, Juran and Crosby – Barriers to TQM

INTRODUCTION TO 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 20th 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

QUALITY – DEFINITION

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

QUANITIFICATION 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

TOTAL QUALITY MANAGEMENT

Total - M*ade up of the whole*
Quality- D*egree of excellence a product or service provides*
Management- Act, A*rt 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 me participation of all its members and aiming at long-term success through customer satisfaction. and benefits to all members of me 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 exceeds 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

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

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
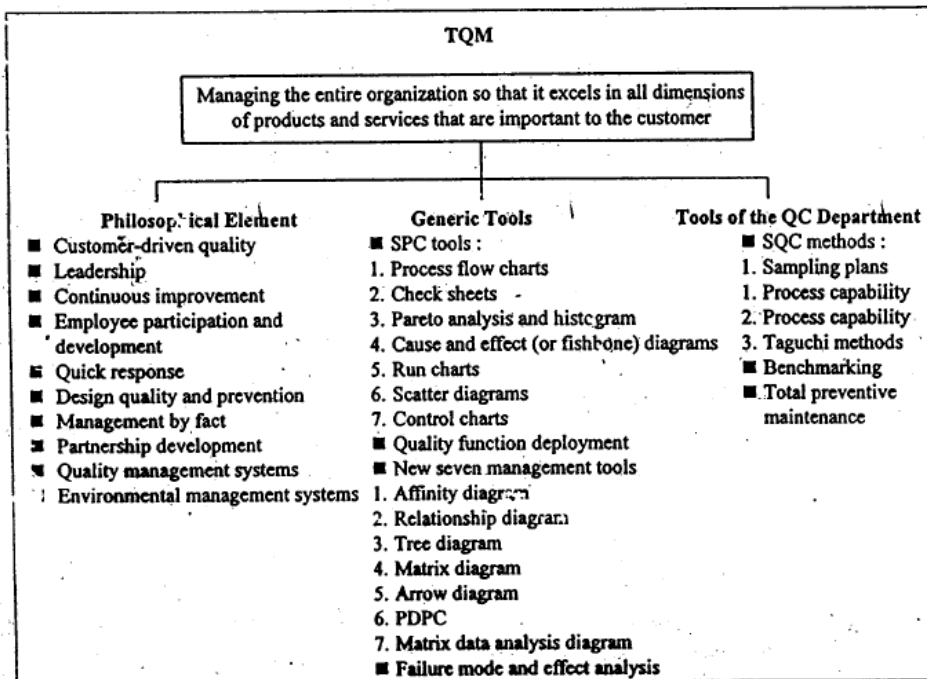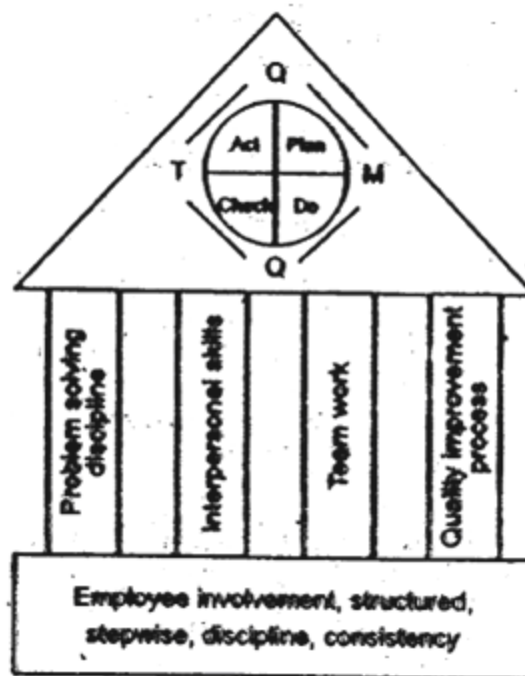9. Focus on team work.

TQM FRAME WORK

Fig. Elements of Total Quality Management

BARRIERS TO TQM

IMPLEMENTATION

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

BENEFITS OF TQM

Tangible Benefits	Intangible Benefits
• Improved product quality • Improved productivity • Reduced quality costs • Increased market and customers • Increased profitability • Reduced employee grievances	• Improved employee participation • Improved team work • Improved working relationships • Improved customer satisfaction • Improved communication • Enhancement of job interest • Enhanced problem solving capacity • Better company image

UNIT II

Leadership – Strategic quality planning, **Quality statements** – Customer focus – Customer orientation**, Customer satisfaction**, **Customer complaints**, **Customer retention** – **Employee involvement** – **Motivation, Empowerment, Team and Team work, Recognition and Reward**, **Performance appraisal** – **Continuous process improvement** – **PDSA cycle, 5S, Kaizen** – **Supplier partnership** – **Partnering supplier selection** – **Supplier rating.**

LEADERSHIP

The process of influencing others towards the accomplishment of goals. He triggers tile 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 suppler 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
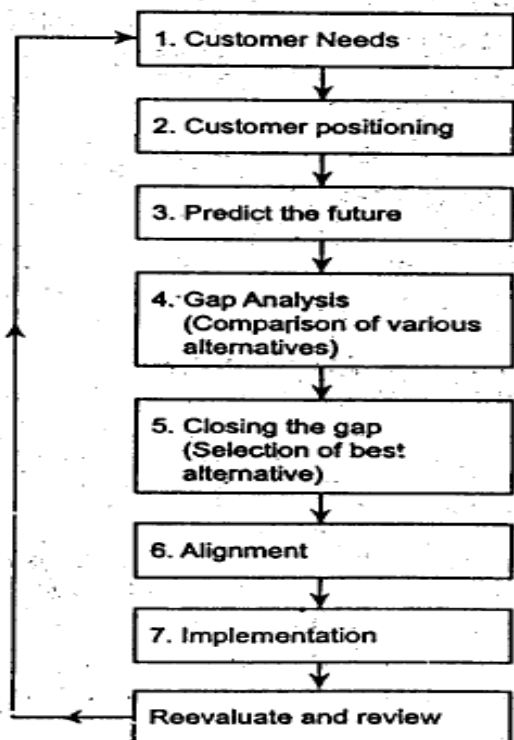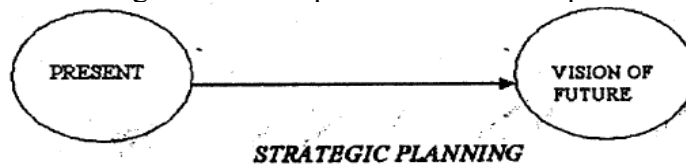11. Establish system
12. Encourage collaboration

LEADERSHIP ROLES
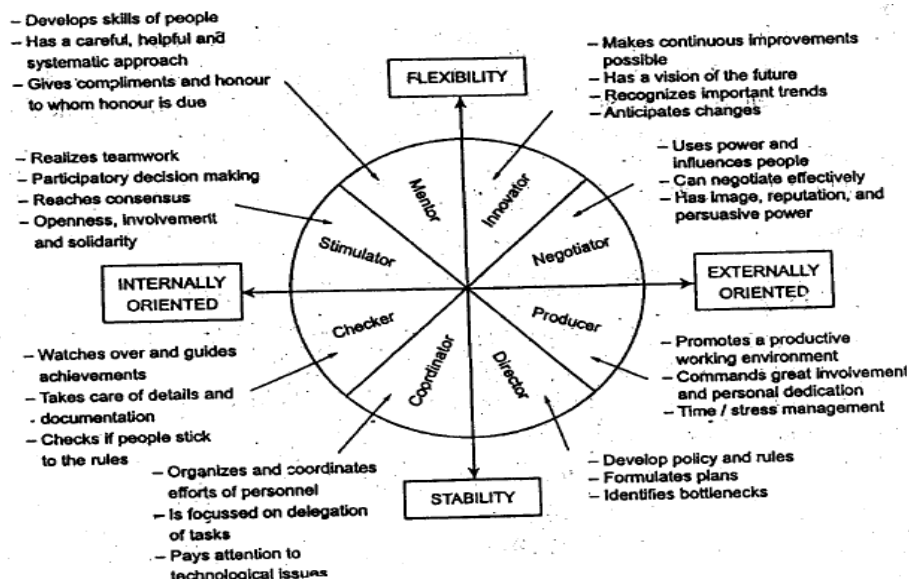
ROLE OF SENIOR MANAGEMENT
1. Study and investigate TQM concepts and issues
2. Set clear quality policies and provide challenging tasks
3. Establish customer satisfaction as a long term goal
4. To become coaches and cheer leaders for encouraging and supporting the managers during transition phase of the 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.

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"

PRESENT → VISION OF FUTURE

STRATEGIC PLANNING

1. Customer Needs
2. Customer positioning
3. Predict the future
4. Gap Analysis (Comparison of various alternatives)
5. Closing the gap (Selection of best alternative)
6. Alignment
7. Implementation
Reevaluate and review

Strategic planning cycle

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.

CUSTOMER SATISFACTION MODEL

Teboul's Model of customer satisfaction as shown in figure
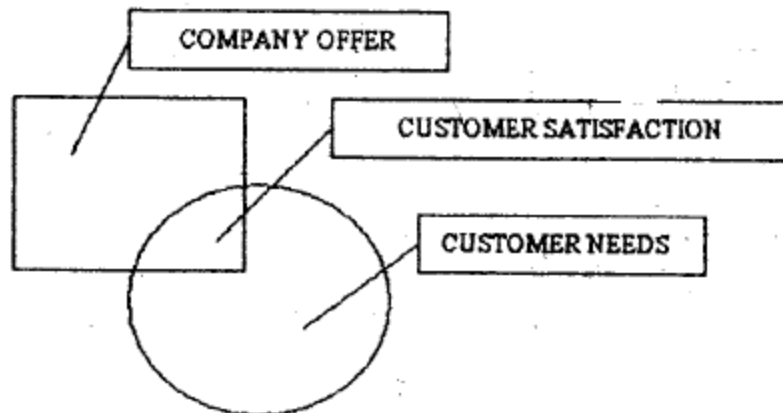
From the above diagram it is understood that the company should strive for increasing the intersection portion i.e. Customer Satisfaction.
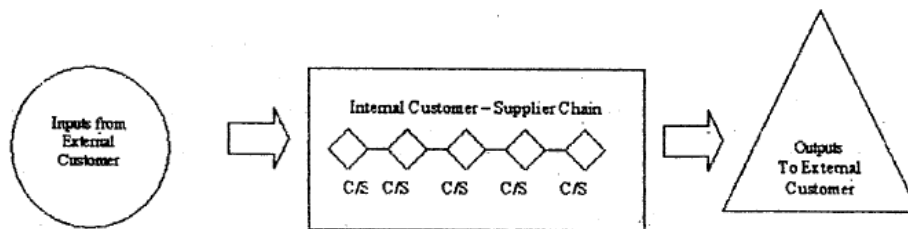
THE CUSTOMERS ARE

- 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

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.

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.

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

Maslow's hierarchy of needs
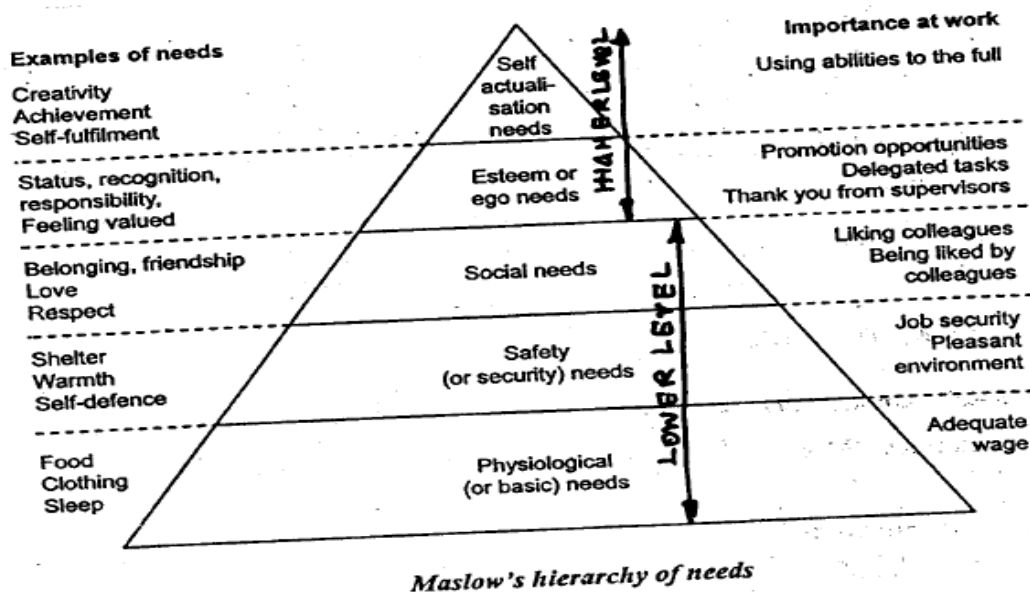
HERZBERG'S TWO FACTOR THEORY

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 arid 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.

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 under stand 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.

BENEFITS OF 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 supplied 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 manger 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.

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
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	1. Profit sharing 2. Gain sharing 3. Employment security 4. Compensation time 5. Individual based performance systems 6. Quality based performance appraisals

appraisals	
7. Quality based promotion	

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 will 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

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

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┌──────────────────────────────────────────────────────────┐
│         1. Establish performance standards like rating scales.│
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│     2. Communicate performance expectations to employees  │
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                              ▼
┌──────────────────────────────────────────────────────────┐
│   3. Measure Actual Performance (For teams have group     │
│   evaluation with equal emphasis to individual focused    │
│   evaluation) and also frequent performance review.       │
└──────────────────────────────────────────────────────────┘
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│  4. Compare actual performance with standards (The indexes of│
│  external customer satisfaction or internal customer satisfaction│
│        – Feedback of peers may be included)               │
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│        5. Discuss the appraisal with the employee         │
└──────────────────────────────────────────────────────────┘
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┌──────────────────────────────────────────────────────────┐
│  6. If necessary initiate corrective action either +ve like│
│       promotions etc., or –ve like demotions etc.         │
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│  7. Include evaluation for process improvement in addition to│
│                     the results.                          │
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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

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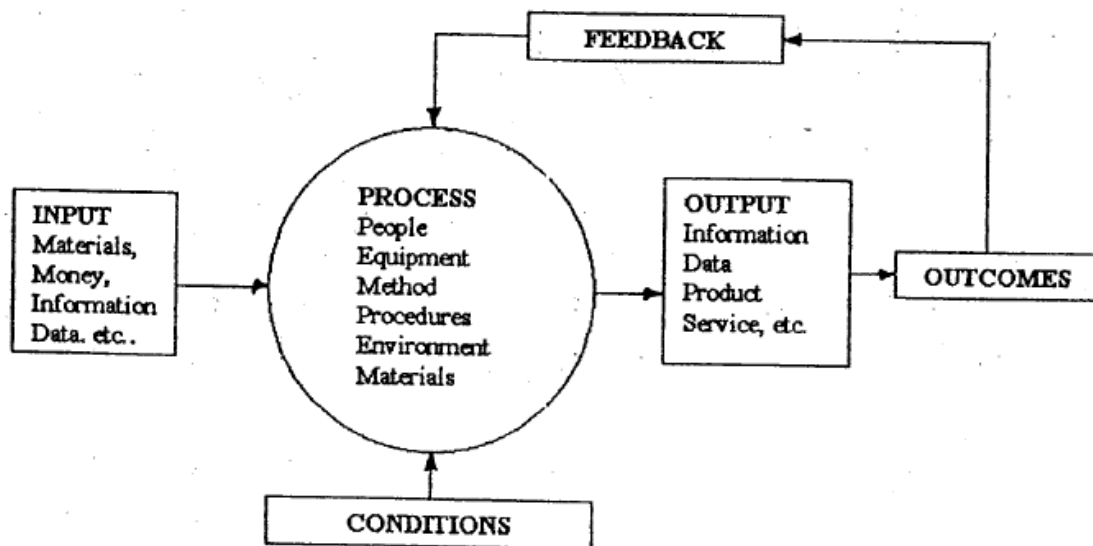
BASIC WAYS TO IMPROVE PROCESS
- To reduce resources
- To reduce errors
- To meet exceed customer needs
- To make process safer
- To make process more satisfying to the person doing it.

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**
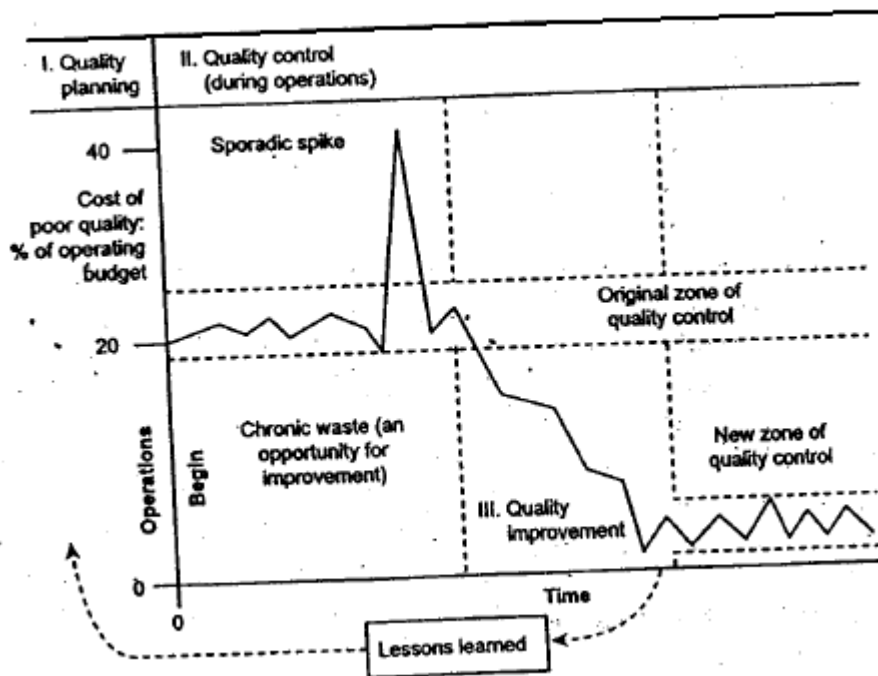
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QUALITY IMPROVEMENT

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.

SUMMARY OF JURAN'S QUALITY TRILOGY

Quality Planning	Quality Control	Quality Improvement
• Identify the customers • Determine the customer's needs • Develop product features • Establish quality goals • Develop a process • Prove process capability	• Choose control subjects • Choose unit of measurement • Establish measurement and standard of performance • Measure actual performance • Interpret the difference • Take action on the difference	• Prove need for improvement • Identify specific projects for improvement • Organize to guide the projects • Organize for diagnosis for discovery of cause • Diagonise to find the causes • Provide remedies • Prove that remedies are effective under operating conditions • Provide for control to hold gains

PDSA CYCLE

It is also called as Deming Cycle or Deming Wheel. Developed by Walter A. Shewart and popularized by Edward Deming
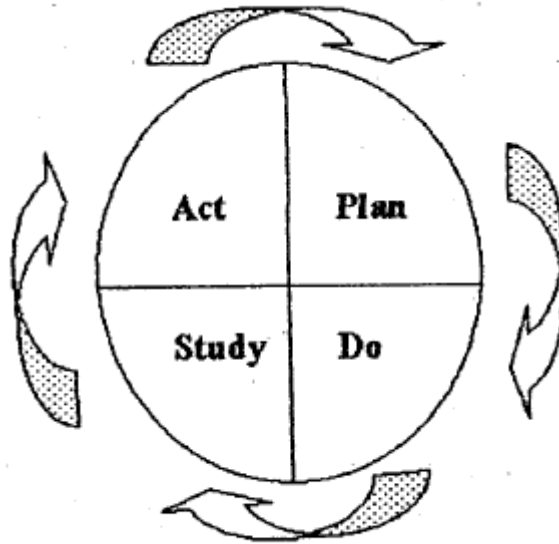
PLAN
- Identify the problem, plan and opportunities
- Observe and analyze
- Isolate the real causes
- Determine corrective actions

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

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
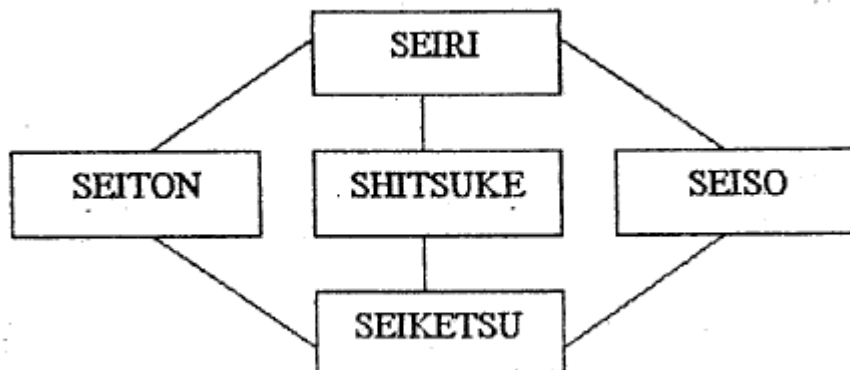
OBJECTIVES OF 5S

- 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
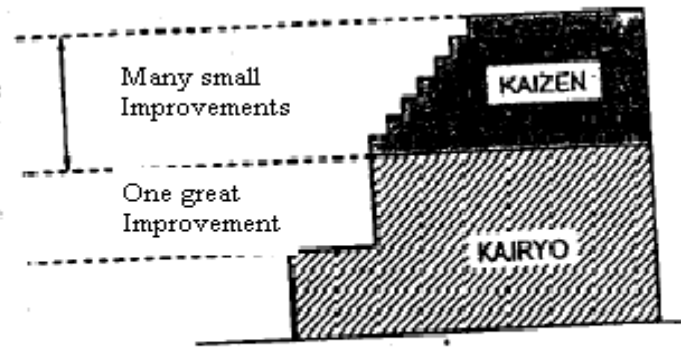- Less accidents
- More time to improvement.

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
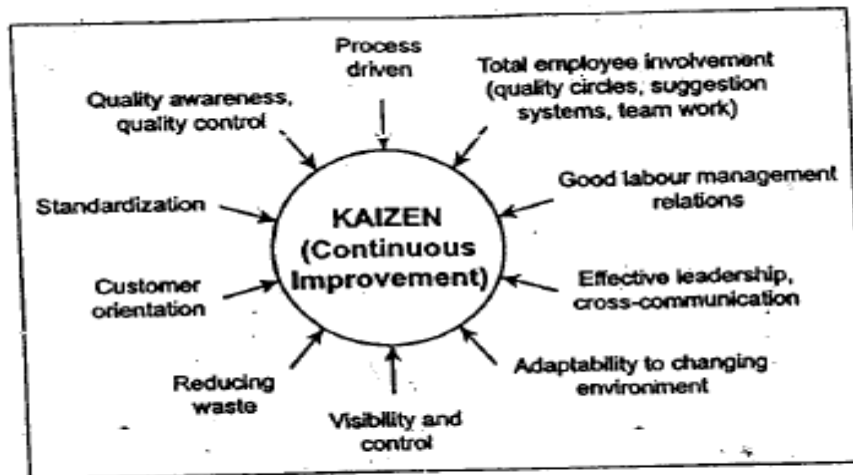
Various aspects of Kaizen Philosophy

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 conflit 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

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 an non adversarial contract with respect to quality, quality, 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 end 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. .

JAPANES 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

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 completer 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

QUALITY PERFORMANCE	MAXIMUM POINTS	Supplier A ACTUAL POINTS	Supplier B ACTUAL POINTS	Supplier C ACTUAL POINTS	Supplier D ACTUAL POINTS	Supplier E 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	– 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	– 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 = ((production quantity – number of defects) / production quantity) × 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	– service rating – on-time delivery – quality performance – SPC charts – billing accuracy – average lead time – just-in-time delivery target
4. Research and Development	– 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'.

5. *Human Resources*	– % 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
6. *Marketing / Sales*	– sales growth – market growth – % delivery completed – sales expense to revenue – new customers – sales income to number of sales people – order accuracy
7. *Administration*	– 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

DEMING PHILOSOPHY

1. Create and publish the aims and purpose of the organization
2. Learn the new philosophy
3. understand the purpose of inspection
4. stop awarding business based on price alone
5. Improve constantly and forever the system
6. Institute training
7. Teach and Institute leadership
8. Drive out fear and create a climate for innovation
9. Optimize the efforts of teams,. Groups and staff areas
10. Eliminate exhortations for the work force
11. Eliminate numerical quotas for the work force
12. Remove barriers that rob people of pride of workmanship
13. Encourage education and self improvement for every one
14. Take action to accomplish the transformation