KARPAGAM ACADEMY OF HIGHER EDUCATION

(Deemed to be University)
(Established Under Section 3 of UGC Act 1956)
Pollachi Main Road, Eachanari (Po),
COIMBATORE – 21

FACULTY OF ENGINEERING

DEPARTMENT OF MECHANICAL ENGINEERING

SUBJECT NAME: TOTAL QUALITY MANAGEMENT	SUBJECT CODE : 17BECC702	L	T	P	C
		3	2	0	4

INTENDED OUTCOMES:

- To understand the statistical approach for quality control.
- To create an awareness about the ISO and QS certification process and its need for the industries

UNIT I ESSENTIALS OF TQM

Definition of Quality, Dimensions of Quality, Quality Planning, Quality costs – Analysis Techniques for Quality Costs, Basic concepts of Total Quality Management, Historical Review, Principles of TQM, Leadership – Concepts, Role of Senior Management, Quality Council, Quality Statements, Strategic Planning, Deming Philosophy, Barriers to TQM Implementation.

UNIT II TQM PRINCIPLES

Customer satisfaction – Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement – Motivation, Empowerment, Teams, Recognition and Reward, Performance Appraisal, Benefits, Continuous Process Improvement – Juran Trilogy, PDSA Cycle, 5S, Kaizen, Performance Measures – Basic Concepts, Strategy, Performance Measure.

UNIT III TQM TOOLS

The seven tools of quality, Statistical Fundamentals – Measures of central Tendency and Dispersion, Population and Sample, Normal Curve, Control Charts for variables and attributes, Process capability, Concept of six sigma, New seven Management tools – APQP.

UNIT IV TQM TECHNIQUES

Benchmarking – Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD) – House of Quality, QFD Process, Benefits, Taguchi Quality Loss Function, Total Productive Maintenance (TPM) – Concept, Improvement Needs, FMEA – Stages of FMEA.

UNIT V QUALITY AND ENVIRONMENT SYSTEMS

Need for ISO 9000 and Other Quality Systems, ISO 9000:2000 Quality System – Elements, Implementation of Quality System, Documentation, Quality Auditing, TS 16949, ISO 14000 – Concept, Requirements and Benefits.

TEXT BOOK:

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Dale H.Besterfiled	Total Quality Management	Pearson Education, Inc.	2011

REFERENCES:

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Feigenbaum.A.V	Total Quality Control	McGraw Hill, New Delhi	2004
2	Oakland.J.S	Total Quality Management	Butterworth – Hcinemann Ltd., Oxford	2003
3	Narayana V. and Sreenivasan N.S	Quality Management – Concepts and Tasks	New Age International Ltd., New Delhi	2007
4	Zairi	Total Quality Management for Engineers	WoodHead Publishers, New Delhi	1996

WEB REFERENCES:

1. http://auciello.tripod.com/14tqm.html
2. http://www.fkm.utm.my/~shari/download/toc%20paper%20hilma%20tqm%20dis06.pdf
3. http://www.businessgyan.com/node/5409
4. http://www.accelper.com/pdfs/SS_Measurements_Concepts.pdf
5. http://tutor2u.net/business/strategy/benchmarking.htm
6. http://www.trst.com/iso2a.htm

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LESSON PLAN

Subject Name : TOTAL QUALITY MANAGEMENT Subject Code : 14BECC702

Sl. No.	Lecture Duration (Hr)	Topics to be Covered	Support Materials
		UNIT I ESSENTIALS OF TQM	
1.	1	• Introduction about TQM Subject.	T 14 & 25
2.	1	• Role of TQM in industry.	T-26
3.	1	• Definition of Quality.	T-19
4.	1	• Dimensions of Quality.	T-20
5.	1	• Quality Planning.	T-56
6.	1	• Quality costs and types.	T-185
7.	1	• Quality Cost analysis.	T-194
8.	1	• Basic concepts of TQM	T-13
9.	1	• Historical Review and Principles	T-29
10.	1	• Leadership and Role of Senior Management	T-43
11.	1	• Quality Statements, Strategic Planning	T-53
12.	1	• Deming Philosophy, Barriers to TQM Implementation	T-39
Total no. of Hours planned for unit - I			**12**
Sl. No.	**Lecture Duration (Hr)**	**Topics to be Covered**	**Support Materials**
		UNIT II TQM PRINCIPLES	
13.	1	• Customer satisfaction – Customer Perception of Quality, Complaints, Services.	T- 84
14.	1	• Customer Retention, Employee Involvement – Motivation	T-101
15.	1	• Empowerment, Team building	T-108
16.	1	• Recognition and Reward	T-125
17.	1	• Performance Appraisal and Benefits and benefits of organization	T-129

18.	1	• Juran's Trilogy.	T-140
19.	1	• Continuous Process Improvements and implement task.	T -142
20.	1	• PDSA Cycle, 5S, Kaizen Concepts	T-145
21.	1	• Performance Measures/ KPIS	T-179
22.	1	• Basic Concepts - Inputs	T-182
23.	1	• Strategy to achieve optimized output	T-182
Total no. of Hours planned for unit - II			**11 hrs**
Sl. No.	**Lecture Duration (Hr)**	**Topics to be Covered**	**Support Materials**
UNIT III TQM TOOLS			
24.	1	• The seven tools of quality	T-473
25.	1	• Statistical Fundamentals	T-484
26.	1	• Measures of central Tendency and Dispersion,	T-486
27.	1	• Population and Sample	T-487
28.	1	• Normal Curve structure	T-489
29.	1	• Control cycle Charts for variables and attributes.	T-491
30.	1	• Concepts of six sigma quality •	T-158
31.	1	• Process capability study	T-550
32.	1	• New seven Management tools	T-159
33.	1	• Advanced product quality plan APQP – Responsibility matrix	T-455
Total no. of Hours planned for unit - III			**10 hrs**
Sl. No.	**Lecture Duration (Hr)**	**Topics to be Covered**	**Support Materials**
UNIT IV TQM TECHNIQUES			
34.	1	• Benchmarking	T-220
35.	1	• Benchmarking Reasons	T-222

36.	1	• Benchmarking Process	T-224
37.	1	• Quality Function Deployment	T-230
38.	1	• House of Quality- Construction with case study.	T-327
39.	1	• QFD Process and Significance	T-329
40.	1	• QFD value engineering and benefits	T-350
41.	1	• Quality Loss Function – Taguchi method of analysis.	T-575
42.	1	• Total Productive Maintenance (TPM)	T-454
43.	1	• TPM concepts, Improvement needs OEE - calculations	T-389
44.		• FMEA – concepts and Stages.	T-395
45.		• FMEA - work sheet practice	T-412
Total no. of Hours planned for unit - III			**10 hrs**
Sl. No.	**Lecture Duration (Hr)**	**Topics to be Covered**	**Support Materials**
UNIT IV TQM TECHNIQUES			
46.	1	Need for ISO 9000 Quality and other quality Systems	T-268
47.	1	ISO 9000:2000 Quality System and elements.	T-270
48.	1	Implementation of Quality system	T-280
49.	1	ISO Documentation methods and auditing (Internal & External)	T- 285
50.	1	ISO TS 16949 – Concepts, elements, Requirements and benefits	T-268
51.	1	ISO 1400– Concepts, elements, Requirements and benefits	T-308
52.	1	Question bank revision	QB

Text Books : [1] Dale H.Besterfiled, Total Quality Management, Pearson Education, Inc. 2010

Reference Books : [2] Feigenbaum.A.V, Total Quality Control, McGraw Hill, New Delhi, 2003
[3] Oakland.J.S, Total Quality Management, Butterworth – Hcinemann Ltd., Oxford, 1993
[4] Narayana V. and Sreenivasan N.S, Quality Management – Concepts and Tasks New Age International Ltd., New Delhi 2005
[5] Zairi, Total Quality Management for Engineers , WoodHead Publishers, New Delhi , 1996

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1. http://auciello.tripod.com/14tqm.html
2. http://www.fkm.utm.my/~shari/download/toc%20paper%20hilma%20tqm%20dis06.pdf
3. http://www.businessgyan.com/node/5409
4. http://www.accelper.com/pdfs/SS_Measurements_Concepts.pdf
5. http://tutor2u.net/business/strategy/benchmarking.htm
6. http://www.trst.com/iso2a.htm

TOTAL NUMBER OF COURSE HOURS : 52 Hrs

UNIT I

ESSENTIALS OF TQM

1) What is Total Quality Management?

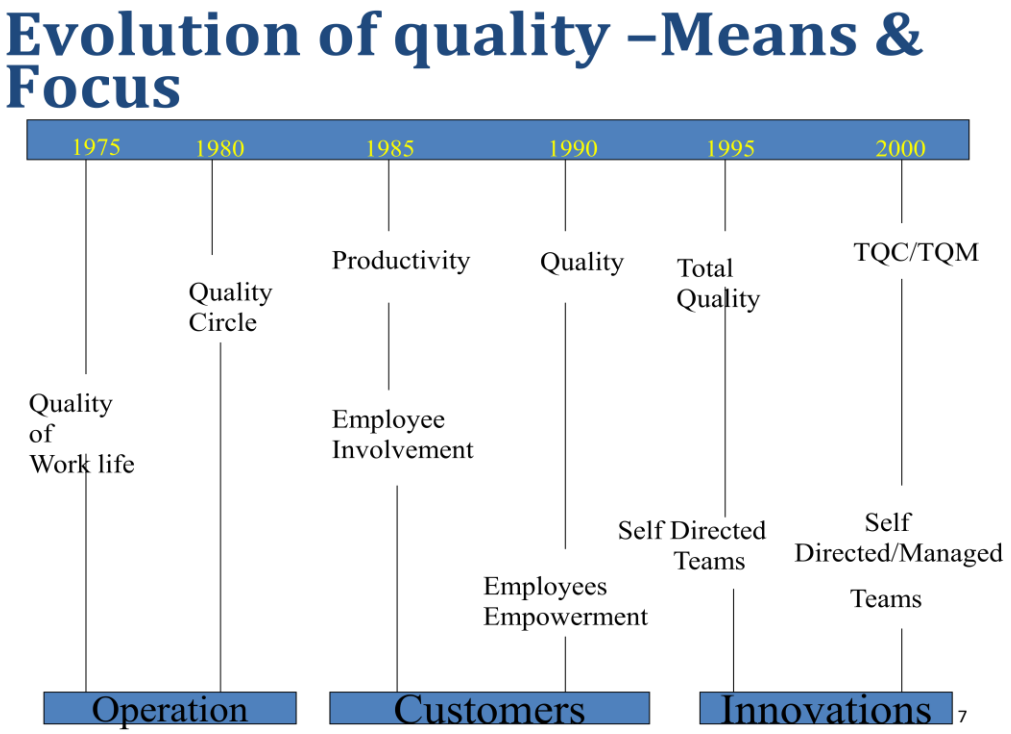
- **Total** – Made up of the whole (or) Complete.
- **Quality** – Degree of Excellence a product or service provides to the customer in present and future.
- **Management** – Act, art, or manner of handling , controlling, directing, etc.
- **TQM** is the art of managing the whole to achieve excellence.

2) What is the need for Quality Management?

Reasons for quality becoming a cardinal priority for most organizations:

- ***Competition*** – Today's market demand high quality products at low cost. Having `high quality' reputation is not enough! Internal cost of maintaining the reputation should be less.
- ***Changing customer*** – The new customer is not only commanding priority based on volume but is more demanding about the "quality system."
- ***Changing product mix*** – The shift from low volume, high price to high volume, low price have resulted in a need to reduce the internal cost of poor quality.
- ***Product complexity*** – As systems have become more complex, the reliability requirements for suppliers of components have become more stringent.
- ***Higher levels of customer satisfaction*** – Higher customer's expectations are getting spawned by increasing competition.

3) Discuss the evolution of Quality Movement. Evolution of quality –Means & Focus



Evolution of Quality Management

Inspection	**Salvage, sorting, grading, blending, corrective actions, identify sources of non-conformance**
Quality Control	**Develop quality manual, process performance data, self-inspection, product testing, basic quality planning, use of basic statistics, paperwork control.**
Quality Assurance	**Quality systems development, advanced quality planning, comprehensive quality manuals, use of quality costs, involvement of non-production operations, failure mode and effects analysis, SPC.**
TQM	**Policy deployment, involve supplier & customers, involve all operations, process management, performance measurement, teamwork, employee involvement.**

4) Define Quality.

Definition of quality

Today, there is no single universal definition of quality.

- Some people view quality as performance to standards.
- Others view it as —meeting the customer's needs
- Satisfying the customer.

Let's look at some of the more **common definitions of quality**.

- **Conformance to specifications measures how well the product or service meets the targets and tolerances determined by its designers.**

5) What are the dimensions of Quality?

The 9 Dimensions of Quality

- Performance
- Features
- Conformance
- Reliability
- Durability
- Service
- Response- of Dealer/ Mfgr. to Customer
- Aesthetics – of product
- Reputation- of Mfgr./Dealer

6) What are the basic concepts of TQM?

TQM six basic Concepts

1) Management commitment to TQM principles and methods & long term Quality plans for the Organization
2) Focus on customers – internal & external
3) Quality at all levels of the work force.
4) Continuous improvement of the production/business process.
5) Treating suppliers as partners
6) Establish performance measures for the processes.

7) **List the effects of poor Quality.**

Effects of poor Quality

1) Low customer satisfaction
2) Low productivity, sales & profit
3) Low morale of workforce
4) More re-work, material & labor costs
5) High inspection costs
6) Delay in shipping
7) High repair costs
8) Higher inventory costs
9) Greater waste of material

8) **What are the benefits of Quality?**

Benefits of Quality

1) Higher customer satisfaction
2) Reliable products/services
3) Better efficiency of operations
4) More productivity & profit
5) Better morale of work force
6) Less wastage costs
7) Less Inspection costs
8) Improved process
9) More market share
10) Spread of happiness & prosperity
11) Better quality of life for all.

9) **Explain Deming 's Philosophy in detail.**

Deming's Philosophy (14 Points)

1) Create and publish aims/purpose of firm
2) Learn the new philosophy
3) Understand purpose of inspection
4) Stop awarding business on price alone
5) Improve constantly and forever the system
6) Institute training
7) Teach and institute leadership
8) Drive out fear, create trust and a climate for innovation
9) Optimize efforts of teams, groups and staff areas
10) Eliminate exhortations for the work force
11) Eliminate numerical quotas for workforce and MBO
12) Remove barriers that rob people of pride of workmanship
13) Encourage education and self-empowerment for everyone
14) Take action to accomplish the transformation

10) **What are the contributions of Quality Gurus for the Quality Movement?**

CONTRIBUTIONS BY QUALITY GURUS

To fully understand the TQM movement, we need to look at the philosophies of notable individuals who have shaped the evolution of TQM. Their philosophies and teachings have contributed to our knowledge and understanding of quality today.

Walter A. Shewhart

Walter A. Shewhart was a statistician at Bell Labs during the 1920s and 1930s. Shewhart studied randomness and recognized that variability existed in all manufacturing processes. He developed quality control charts that are used to identify whether the variability in the process is random or due to an assignable cause, such as poor workers or miscalibrated machinery. He stressed that eliminating variability improves quality. His work created the foundation for today's statistical process control, and he is often referred to as the ―grandfather of quality control.

W. Edwards Deming is often referred to as the ―father of quality control.

He was a statistics professor at New York University in the 1940s. After World War II he assisted many Japanese companies in improving quality. The Japanese regarded him so highly that in 1951 they established the *Deming Prize,* an annual award given to firms that demonstrate outstanding quality. It was almost 30 years later that American businesses began adopting Deming's philosophy. A number of elements of Deming's philosophy depart from traditional notions of quality. The first is the role management should play in a company's quality

11) **What are the barriers to implementing TQM?**

Lack of management commitment. – Management must consistently apply the principles of TQM.

Inability to change organizational culture- People change if their needs are met. Remove fear & instill trust.

Improper planning – Implementation plan ; modify plan as the plan evolves

Lack of continuous training and education – Training & education are ongoing process

Incompatible organizational structure and isolated individuals and department – Use of multi-functional teams can break down the barriers of TQM implementation

I**neffective measurement techniques and lack of access to data and results -** Key characteristics of organizations have to be measured for effective decision making.

Paying inadequate attention to internal and external customers – Organizations must understand the changing needs & expectations of customers

Inadequate use of empowerment and team work – Teams needs training & individuals should be empowered to make decisions.

Failure to continually improve – It is tempting to sit back and rest. Lack of continuous improvement would tamper the progress. Even if you are in right track, you will get run over if you just sit there.

Definition of TQM:

Total Quality Management *is a management approach that tries to achieve and sustain long term organizational success by encouraging employee feedback and participation, satisfying customer needs and expectations, respecting societal values and beliefs, and obeying governmental statutes and regulations.*

Five Pillars of TQM are,

- Product
- Process
- System
- People
- Leadership

Benefits of TQM:

Customer satisfaction oriented benefits:

1. Improvement in product quality
2. Improvement in product design
3. Improvement in production flow
4. Improvement in employee morale and quality consciousness
5. Improvement in product service
6. Improvement in market place acceptance

Economic improvement oriented benefits:

1. Reduction in operating costs
2. Reduction in operating losses
3. Reduction in field service costs
4. Reduction in liability exposure

MULTIPLE CHOICE QUESTIONS:

Questions	opt1	opt2	opt3	opt4	answer
Customer needs, customer positioning, gap analysis, closing the gap are called	strategic planning	quality statements	TQM elements	TQM pillars	strategic planning
Institute leadership and institute training comes under	TQM pillars	quality statements	Deming's statement	leadership	Deming's statement
Who are all involved in Quality council	CEO	senior manager	consultant	all the options above are true	all the options above are true
Features, service, response and aesthetics are	Quality costs	Dimensions of quality	Quality functions	quality planning statement	Dimensions of quality
Juran's definition for quality is	Quality is conformance to requirements	quality is fitness for use	quality is in its essence ,a way of managing the organization	quality is correcting and preventing loss	quality is fitness for use
The word Aesthetics means	quality of the product	exterior finish of the product	life of the product	failure of the product	exterior finish of the product
Who is not related to triple role concept	customer	supplier	processor	manager	manager
Quality costs include	cost of prevention	cost of appraisal	cost of external ad internal failures	all the options are true	all the options are true
Cost of down time , cost of appraisal and rework are	cost of prevention	cost of appraisal	cost of internal failures	cost of external failure	cost of internal failures
Cost of warranty claims and commissioning failures are coming under	cost of prevention	cost of appraisal	cost of internal failures	cost of external failure	cost of external failure
Ronald Fisher created the foundation for -------- in 1930	ANOVA	Dmaic	DFM	FMEA	ANOVA
Most commonly used analysis technique in quality is	trend analysis	pareto analysis	economic analysis	both a&b	Trend analysis & pareto analysis
Widely used quality definition is	quality is conformance to requirements	quality is fitness for use	quality is in its essence ,a way of managing the organization	quality is correcting and preventing loss	quality is conformance to requirements
General definition (Juran 1974) for quality is	quality is conformance to	quality is fitness for use	The meaning of excellence	The best product that can be	quality is fitness for use

	requirements			produced with the material given	
Durability,reliability, aesthetics are called	quality planning	Dimensions of quality	quality costs	all the options are true	Dimensions of quality
Measurable parameters are	size	weight	IQ	all the options are true	all the options are true
Dimensions of Quality is	4	9	5	3	9
Mr.Crossby developed this concept	Trilogy	Zero defect	Robust Design	Control charts	Zero defect
Quality circle concepts for involvement by workers was invented by --------	Ishikawa	Feigenbaum	Deming	Shewhart	Ishikawa
The Seven habits of Highly effective people Book written by	Feinbaun	Stephen Covey	Crossby	Deming	Stephen Covey
Vision Statement is ---------- declaration of Aspiration of tommorrow.	Yearly	Long	basic	Short	Short
Non-conformance quality costs include	rework	inspection	scrap	rework and scrap	rework and scrap
conformance quality costs include	Training	waiting	inspection	training and inspection	training and inspection
Appraisal cost include ----------.	Machine cost	Documentation cost	Inspection Gauges cost	Travelling cost	Inspection Gauges cost
Which of the following is a non-conformance quality costs	Training	inspection	down time	documentation	down time
Audit, calibration, test and measurement costs are	prevention costs	appraisal cost	internal cost	external cost	appraisal cost
Planning, preparation,training costs are	prevention costs	appraisal cost	internal cost	external cost	prevention costs
Rework, redesign,modification costs are	prevention costs	appraisal cost	internal failure cost	external failurecost	internal failure cost
Equipment failure, downtime costs are called	prevention costs	appraisal cost	internal failure cost	external failurecost	external failurecost
Quality policy is a tequirement of	ISI 2194	ISO/QS 9000	IATF 2000	TS 16949	ISO/QS 9000
Strategic planning has ---------- Steps	12	9	10	7	7
Quality leader will always do -------- rather than control	Appreiciate	Empower	guide	establish	Empower

Which of the habit refer to the mission statement	Think win-win	Begin with end in the mind	Put first things first	Be proactive	Put first things first
Which of the follwing is not a part of Deming's Philosophy	Ethical thinking	Drive fear	Management by objective	Abolish Quotas	Ethical thinking
Herberg's two factor theory is also called as	positive motivation theory	negative motivation theory	motivation-hygiene theory	none of these	motivation-hygiene theory
Which of the following is a hygiene factor	achievement	recognition	working condition	advancement &growth	working condition
Benefits of teamwork are	improved integration	improved communication	improved integration and communication	Improved work	improved integration and communication
The word objective means	long -term planning	short-term planning	both a&b	Middle term planning	short-term planning
The word goal is referred as	long -term planning	short-term planning	both a&b	Middle term planning	long -term planning
Father of qualty revolution ----------	Deming	Shewart	Juran	Crossby	Deming
Senior Mangers should ---------- the subordinates /Teams	Empower	coach	motivate	quide	Empower
Sharpen the saw indicates	Think win-win	Renewal of skill /Knowledge	Understanding concepts	Synergize	Renewal of skill /Knowledge
Quality policy statement is approved by	CEO	senior manager	Union Leader	Consultant	CEO
Quality leader will always give more attention to ----------.	External customers feedback	Internal customers feedback	Senior Manger's view	Worker's opinion	External customers feedback
Agility of the organisation depends on ---------.	Rapid change in culture	No change	Attitude of the employees	Value of the employee	Rapid change in culture

UNIT II
TQM PRINCIPLES

1) Define Leadership.

LEADERSHIP

A leader is one who instills purposes, not one who controls by brute force. He strengthens and inspires the followers to accomplish shared goals.

Leaders

- Shape the Organization's value
- Promote the Organization's value
- Protect the Organization's value and
- Exemplifies the Organization values

CHARACTERISTICS OF QUALITY LEADERS :

1. They give priority attention to external and internal customers and their needs.
2. They empower, rather than control, subordinates.
3. They emphasis improvement rather than maintenance.
4. They emphasis prevention.
5. They emphasis collaboration rather than competition.
6. They train and coach, rather than direct and supervise.
7. They learn from the problems.
8. They continually try to improve communications.
9. They continually demonstrate their commitment to quality.
10. They choose suppliers on the basis of quality, not price.
11. They establish organizational systems to support the quality effort.
12. They encourage and recognize team effort.

LEADERSHIP CONCEPTS :

A leader should have the following concepts

1. People, Paradoxically, need security and independence at the same time.
2. People are sensitive to external and punishments and yet are also strongly self - motivated.
3. People like to hear a kind word of praise. Catch people doing something right, so you can pat them on the back.
4. People can process only a few facts at a time; thus, a leader needs to keep things simple.
5. People trust their gut reaction more than statistical data.

6. People distrust a leader's rhetoric if the words are inconsistent with the leader's actions.

THE 7 HABITS OF HIGHLY EFFECTIVE PEOPLE :

1. Be Proactive
2. Begin with the End in mind
3. Put First Things First
4. Think Win – Win
5. Seek First to Understand, then to Be Understood
6. Synergy
7. Sharpen the Saw (Renewal)

2) What are the role of Senior Mnagement in Quality Implementation?

ROLE OF SENIOR MANAGEMENT

1. Management by Wandering Around (MBWA).
2. Strategy of problem solving and decision making.
3. Strong information base.
4. Recognition and Reward system.
5. Spending most of the time on Quality.
6. Communication.
7. Identify and encourage potential employee.
8. Accept the responsibility.
9. To play a role model.
10. Remove road blocks.
11. Study TQM and investigate how TQM is implemented elsewhere.
12. Establish policies related to TQM.
13. Establish 'priority of quality' and 'customer satisfaction' as the basic policy.
14. Assume leadership in bringing about a cultural change.
15. Check whether the quality improvement programmes are conducted as planned.
16. Become coaches and cheer leaders to implement TQM.
17. Generate enthusiasm for TQM activities.
18. Visit other companies to observe TQM functioning.
19. Attend TQM training programme.
20. Teach others for the betterment of society and the surroundings.

3) Explain in detail how Quality council is formed and its duties.

QUALITY COUNCIL

A quality council is established to provide overall direction.

The council is composed of

- Chief Executive Officer
- Senior Managers
- Coordinator or Consultant
- A representative from the Union

Duties of the council are

- Develop the core values, vision statement, mission statement and quality policy statement
- Develop the strategic long term plan with goals and Annual Quality Improvement Program with objectives
- Create the total education and training plan
- Determine and monitor the cost of poor quality
- Determine the performance measures
- Determine projects those improve the process
- Establish multifunctional project and work group teams
- Revise the recognition and rewards system

A typical meeting agenda will have the following items

- Progress report on teams
- Customer satisfaction report
- Progress on meeting goals
- New project teams
- Benchmarking report

Within three to five years, the quality council activities will become ingrained in the culture of the organization.

4) What are the Quality Statements? Explain.

Quality statements include, Vision Statement, Mission Statement, and Quality Policy Statement. They are the part of strategic planning process.

QUALITY STATEMENTS

VISION STATEMENT :

- It is a short declaration of what an organization aspires to be tomorrow. Successful visions are timeless, inspirational, and become deeply shared within the organization., such as IBM's service.

Example :

Disney Theme Park	-	Happiest place on earth
Polaroid	-	Instant photography

- Successful visions provide a succinct guideline for decision making

MISSION STATEMENT :

It answers the following questions

- Who we are?
- Who are the customers?
- What we do?
- How we do it?

It describes the function of the organization. It provides a clear statement of purpose for employees, customers & suppliers

A simpler mission statement is

"To meet customers transportation and distribution needs by being the best at moving their goods on time, safely and damage free"

- National Railways

QUALITY POLICY STATEMENT :

It is guide for everyone in the organization as to how they should provide products and services to the customers.

Common characteristics are

- Quality is first among equals
- Meet the needs of the internal & external customers
- Equal or exceed competition
- Continuously improve the quality
- Utilize the entire workforce

5) Explain Strategic Quality Planning and Seven Steps to achieve it.

STRATEGIC QUALITY PLANNING

Goals – Long term planning (Eg : Win the war)

Objectives – Short term planning (Eg : Capture the bridge)

Goals should

- Improve customer satisfaction, employee satisfaction and process
- Be based on statistical evidence
- Be measurable
- Have a plan or method for its achievement
- Have a time frame for achieving the goal
- Finally, it should be challenging yet achievable

SEVEN STEPS TO STRATEGIC QUALITY PLANNING :

1. **Customer needs** - Discover the future needs of the customer.
2. **Customer positioning** - Planners determine where the organization wants to be in relation to the customers.
3. **Predict the future** – Demographics, economic forecasts, and technical assessments or projection are tools for predicting the future.
4. **Gap Analysis** – Identify the gaps between current state and the future state of the organization. An analysis of core values and concepts are excellent techniques for pinpointing the gaps.
5. **Closing the Gap** – A plan has to be developed to close the gap by establishing goals and responsibilities.
6. **Alignment** – Once a plan is developed it must be aligned with the vision, mission, and core valuesand concepts of the organization.
7. **Implementation** – Resources must be allocated to collecting data, designing changes, and overcoming resistance to change.

TQM IMPLEMENTATION :

- Begins with Management Commitment
- Leadership is essential during every phase of the implementation process and particularly at the start
- Senior Management should develop an implementation plan
- Timing of the implementation process is very important
- Formation of Quality Council
- Active involvement of Middle Managers and First Line Supervisors is essential
- Early discussions with the Union is a must

- Communicate TQM to the entire organization
- Training on quality awareness and problem solving
- Customer, Employee and Supplier surveys must be conducted to benchmark
- The council establishes the project teams and work groups and monitors their progress

6) Who is the Customer?

External Customer -- those who receive the final products. Occurs normally at the organizational level
Internal Customers -- occur at the process and cross-departmental levels within the company
Identifying Customers:

- ❑ What parts or products are produced?
- ❑ Who uses our parts or products?
- ❑ Who do we call, correspond/interact with?
- ❑ Who supplied the inputs to the process?

CUSTOMER PERCEPTION OF QUALITY :

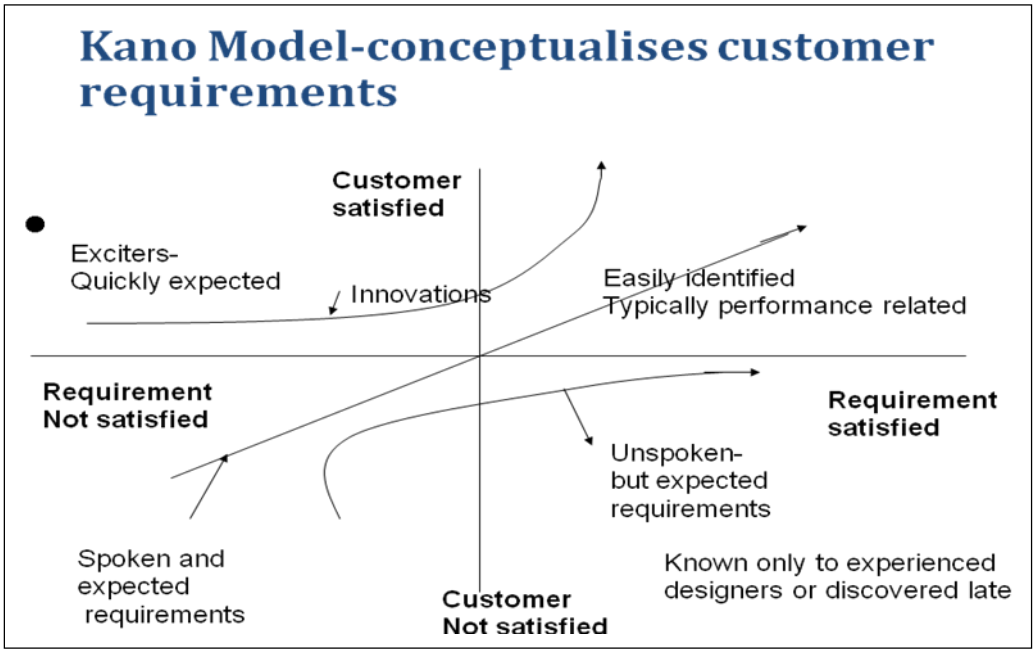
1. Performance
2. Features
3. Service
4. Warranty
5. Price
6. Reputation

7) How needs are translated into customer requirements?

The Kano model conceptualized customer requirements. The model represents three major areas of customer satisfaction first the diagonal line represents explicit requirements. They include written and verbal requirements which are performance related. The second area represents innovations (curved line in the upper left corner) – creative ideas excite and delight the customer.

The third area (lower right corner) represents unstated or unspoken requirements. The following diagram illustrates the Kano model which conceptualizes the customer requirements.

Just meeting the customer‘s needs is not enough; the organization must exceed the customer’s needs.



8) What are the tools used to collect customer Feedback?

FEEDBACK (INFORMATION COLLECTING TOOLS):

Feedback enables organization to

- Discover customer satisfaction
- Discover relative priorities of quality
- Compare performance with the competition
- Identify customer needs
- Determine opportunities for improvement

Listening to the voice of the customer can be accomplished by numerous information collecting tools.

1. Comment Card

2. Customer Questionnaire

To make surveys more useful, it is best to remember eight points

- Clients and Customers are not the same
- Surveys raise customers expectations
- How you ask a question will determine how the question is answered
- The more specific the question, the better the answer
- You have only one chance and only 15 minutes

- The more time you spend in survey development, the less time you will spend in data analysis and interpretation
- Who you ask is as important as what you ask
- Before the data are collected, you should know how you want to analyse and use the data

3. Focus Groups

These groups are very effective for gathering information on customer expectations and requirements.

4. Toll – Free Telephone Numbers
5. Customer Visits
6. Report Card
7. The Internet and Computers
8. Employee Feedback
9. Mass Customization

9) How customer complaints are used for process improvement?

USING CUSTOMER COMPLAINTS :

Actions an organization can take to handle complaints are as follows

- Investigate customers experiences by actively getting feed back, both positive and negative, and then acting on it promptly
- Develop procedures for complaint resolution that include empowering front – line personnel.
- Analyze complaints, but understand that complaints do not always fit into neat categories.
- Work to identify process and material variations and then eliminate the root cause. "More inspection" is not corrective action.
- 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 results of all investigations and solutions, to all people in the organization.
- Provide a monthly complaint report to the quality council for their evaluation and, if needed, the assignment of process improvement teams.
- Identify customers' expectations beforehand rather than afterward through complaint analysis.

10) What are the elements and characteristics of customer service?

SERVICE QUALITY

Customer service is the set of activities an organization uses to win and retain customer's satisfaction. It can be provided before, during, or after the sale of the product or exist on its own.
Elements of customer service are

Organization

1. Identify each market segment.
2. Write down the requirements.
3. Communicate the requirements.
4. Organize processes.
5. Organize physical spaces.

Customer Care

6. Meet the customer's expectations.
7. Get the customer's point of view.
8. Deliver what is promised.
9. Make the customer feel valued.
10. Respond to all complaints.
11. Over – respond to the customer.
12. Provide a clean and comfortable customer reception area.

Communication

13. Optimize the trade – off between time and personal attention.
14. Minimize the number of contact points.
15. Provide pleasant, knowledgeable and enthusiastic employees.
16. Write document in customer friendly language.

Front-Line people

17. Hire people who like people.
18. Challenge them to develop better methods.
19. Give them the authority to solve problems.
20. Serve them as internal customers.
21. Be sure they are adequately trained.
22. Recognize and reward performance.

Leadership

23. Lead by example.
24. Listen to the front-line people.
25. Strive for continuous process improvement.

CHARACTERISTICS AND EXPECTATIONS :

Characteristic	Expectation
Delivery	Delivered on schedule in undamaged condition
Installation	Proper instructions on setup, or technicians supplied for complicated products
Use	Clearly-written training manuals or instructions provided on proper use
Field repair	Properly-trained technicians to promptly make quality repairs
Customer Service	Friendly service representatives to answer questions
Warranty	Clearly stated with prompt service on claims

11) What is customer retention?

CUSTOMER RETENTION

It means "retaining the customer" to support the business. It is more powerful and effective than customer satisfaction.

For Customer Retention, we need to have both "Customer satisfaction & Customer loyalty".

The following steps are important for customer retention.

1. Top management commitment to the customer satisfaction.
2. Identify and understand the customers what they like and dislike about the organization.
3. Develop standards of quality service and performance.
4. Recruit, train and reward good staff.
5. Always stay in touch with customer.
6. Work towards continuous improvement of customer service and customer retention.
7. Reward service accomplishments by the front-line staff.
8. Customer Retention moves customer satisfaction to the next level by determining what is truly important to the customers.
9. Customer satisfaction is the connection between customer satisfaction and bottom line.

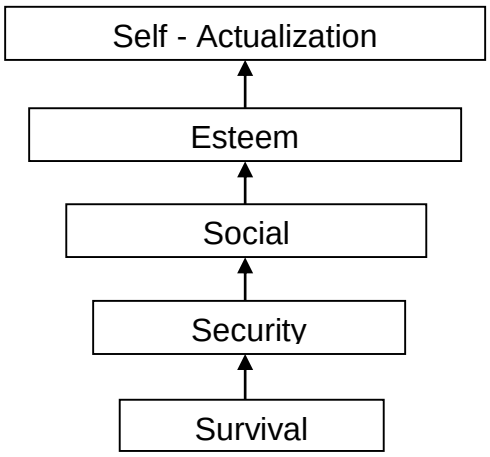
12) Explain in detail Maslow's hierarch of needs.

EMPLOYEE INVOLVEMENT

- Employee involvement is one approach to improve quality and productivity.
- It is a means to better meet the organization's goals for quality and productivity.

MOTIVATION

MASLOW'S HIERARCHY OF NEEDS :



Maslow has set up a hierarchy of five levels of basic needs. Beyond these needs, higher levels of needs exist. These include needs for understanding, esthetic appreciation and purely spiritual needs. In the levels of the five basic needs, the person does not feel the second need until the demands of the first have been satisfied, nor the third until the second has been satisfied, and so on. Maslow's basic needs are as follows:

Physiological Needs

These are biological needs. They consist of needs for oxygen, food, water, and a relatively constant body temperature. They are the strongest needs because if a person were deprived of all needs, the physiological ones would come first in the person's search for satisfaction.

Safety Needs

When all physiological needs are satisfied and are no longer controlling thoughts and behaviors, the needs for security can become active. Adults have little awareness of their

security needs except in times of emergency or periods of disorganization in the social structure (such as widespread rioting). Children often display the signs of insecurity and the need to be safe.

Needs of Love, Affection and Belongingness

When the needs for safety and for physiological well-being are satisfied, the next class of needs for love, affection and belongingness can emerge. Maslow states that people seek to overcome feelings of loneliness and alienation. This involves both giving and receiving love, affection and the sense of belonging.

Needs for Esteem

When the first three classes of needs are satisfied, the needs for esteem can become dominant. These involve needs for both self-esteem and for the esteem a person gets from others. Humans have a need for a stable, firmly based, high level of self-respect, and respect from others. When these needs are satisfied, the person feels self-confident and valuable as a person in the world. When these needs are frustrated, the person feels inferior, weak, helpless and worthless.

Needs for Self-Actualization

When all of the foregoing needs are satisfied, then and only then are the needs for self-actualization activated. Maslow describes self-actualization as a person's need to be and do that which the person was "born to do." "A musician must make music, an artist must paint, and a poet must write." These needs make themselves felt in signs of restlessness. The person feels on edge, tense, lacking something, in short, restless. If a person is hungry, unsafe, not loved or accepted, or lacking self-esteem, it is very easy to know what the person is restless about. It is not always clear what a person wants when there is a need for self-actualization.

The hierarchic theory is often represented as a pyramid, with the larger, lower levels representing the lower needs, and the upper point representing the need for self-actualization. Maslow believes that the only reason that people would not move well in direction of self-actualization is because of hindrances placed in their way by society. He states that education is one of these hindrances.

13) What is Herzber's Two-factor theory? Compare it with Maslow's theory.

Herzberg extended the general work of Maslow by using empirical research to develop his theory on employee motivation. He found that people were motivated by recognition, responsibility, achievement advancement and the work itself. These factors were labeled ***motivators***. His research showed that bad feelings were associated with low salary, minimal fringe benefits, poor working conditions, ill-defined organizational policies, and mediocre technical supervision. These job-related factors were labeled ***dissatisfiers***. Dissatisfiers are often extrinsic in nature and motivators are intrinsic. Strong levels of motivation result in good job performance. Herzberg's dissatisfiers are maslow's lower levels and motivators are similar to the upper levels.

14) How to develop a motivated Work Force?

Managers must create an environment for individuals to motivate themselves.

Some of the concepts to achieve a motivated work force are:

(1) Know thyself - Managers must understand their own motivations, strengths and weaknesses. This can be achieved by appraisal by peers and subordinates.

(2) Know your employee – The Manager must direct his efforts toward satisfying the employees' goals and well-being.

(3) Establish positive attitude – Feedbacks must be positive and constructive.

(4) Share the goals – A motivated work force needs well defined goals which address individual and organizational needs.

(5) Monitor progress – goal setting includes a road map detailing a journey with periodic mile stones and individual assignments.

(6) Develop interesting work – Managers should make the work interesting by making job rotations, job enlargements, and job enrichment.

(7) Communicate effectively –Employees should be clearly communicated about knowledge about their work unit rather than "grapevine" information.

(8) Celebrate success – recognizing employee achievements is the most powerful tool in the manger's tool box.

EMPLOYEE WANTS :

Factor	Employee Rating	Manager Rating
Interesting work	1	5
Appreciation	2	8
Involvement	3	10
Job security	4	2
Good Pay	5	1
Promotion/ growth	6	3
Good working conditions	7	4
Loyalty to employees	8	7
Help with personal problems	9	9
Tactful discipline	10	6

ACHIEVING A MOTIVATED WORK FORCE :

The building of a motivated work force if for the most part an indirect process. Concepts to achieve a motivated work force are as follows:

1. Know thyself.
2. Know your employees.
3. Establish a positive attitude.
4. Share the goals.
5. Monitor progress.
6. Develop interesting work.
   - Job rotation
   - Job enlargement
   - Job enrichment
7. Communicate effectively
8. Celebrate success.

EMPLOYEE SURVEYS :

Employee surveys help managers assess the current state of employee relations, identify trends, measure the effectiveness of program implementation, identify needed improvements, and increase communication effectiveness.

STEP 1 : The Quality Council to create a multifunctional team
STEP 2 : The Team will develop survey instrument
STEP 3 : Administer the survey
STEP 4 : Results are compiled and analyzed
STEP 5 : Determine areas for improvement

15) What is empowerment?

EMPOWERMENT

Empowerment is investing people with authority. It's purpose is to tap the enormous reservoir of potential contribution that lies within every worker.

The two steps to empowerment are

1. To arm people to be successful through coaching, guidance and training.
2. Letting people do by themselves.

The principles of empowering people are given below.

1. Tell people what their responsibilities are.
2. Give authority.
3. Set standards for excellence.
4. Render training.
5. Provide knowledge and information.
6. Trust them.
7. Allow them to commit mistakes.
8. Treat them with dignity and respect.

Three dimensions of empowerment are

- Capability
- Alignment and
- Trust

16) What is a Team and Team work?

TEAMS

- Employee involvement is optimized by the use of teams.
- A ***team*** is defined as a group of people working together to achieve common objectives or goals.
- ***Teamwork*** is the cumulative actions of the team during which each member of the team subordinates his individual interests and opinions to fulfill the objectives or goals of the group.

WHY TEAMS WORK :

1. Many heads are more knowledgeable than one.
2. The whole is greater than the sum of its members.
3. Team members develop a rapport which each other.
4. Teams provide the vehicle for improved communication.

TYPES OF TEAMS :

1. Process improvement team.
2. Cross – functional team.
3. Natural work teams.
4. Self – Directed / Self – Managed work teams.

17) What are the characteristics of successful teams?

CHARACTERISTICS OF SUCCESSFUL TEAMS:

1. Sponsor
2. Team Charter
3. Team Composition
4. Training
5. Ground Rules
6. Clear Objectives
7. Accountability
8. Well-Defined decision procedure
9. Resources
10. Trust
11. Effective Problem Solving
12. Open Communication
13. Appropriate Leadership
14. Balanced Participation
15. Cohesiveness

18) Explain in detail team member roles?

TEAM MEMBER ROLES:

TEAM LEADER

- Ensures the smooth and effective operation of the team.
- Facilitates the team process.
- Serves as a Contact Point.
- Organizes the implementation of changes.
- Prepares the meeting agenda.

FACILITATOR

- Supports the leader.
- Focuses on the team process.
- Acts as a resource to the team.
- Provides feedback to the team.

RECORDER

- Documents the main ideas of the team's discussion, the issues raise, decisions made, action items etc.
- Presents the documents and distributes the MOM.
- Participates as a team member.

TIMEKEEPER

- Ensures that the team maintains the schedule.
- Participates as a team member.

TEAM MEMBER

- Contributes best, without reservation.
- Respects other people's contributions.
- Listens carefully and asks questions.
- Works for consensus on decisions.
- Supports the decision of the team.
- Understands and is committed to the team objectives.
- Respects and is tolerant of individual differences.
- Acknowledges and works through conflict openly.
- Carries out assignments.

DECISION MAKING METHODS:

1. Non-decision.
2. Unilateral decision.
3. Handclasp decision.
4. Minority-rule decision.
5. Majority-rule decision.
6. Consensus.

19) What are the common barriers to the team's progress?

COMMON 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.
- No time to do improvement work.

20) What is the need for recognition and reward? Differentiate both.

RECOGNITION AND REWARD

Recognition is a process by which management shows acknowledgement of an employee's outstanding performance.

Various ways for Recognition and Rewards are

1. Recognition can be expressed using verbal and written praise.
2. Rewards may be in the form of certificates and plaques.
3. Reward is normally in the form of cinema tickets, dinner for family etc.

4. The financial compensation (for recognition) can be paid in terms of increased salaries, commissions, gain sharing etc.
5. The efforts of employees can be recognized by promotions, special job assignments etc.
6. A letter of appreciation from the CEO or the Top Management will increase the employee's involvement.
7. Reward may be delayed but recognition should be in a timely basis.
8. Rewards should be appropriate to the improvement level.
9. People like to be recognized than any reward.
10. Special forms of recognition include pictures on the bulletin board, articles in newsletters, letter to families etc.
11. Supervisors can give on-the-spot praise for a job which is done well.

EFFECTS OF RECOGNITION AND REWARD SYSTEM:

1. Recognition and reward go together for letting people know that they are valuable members for the organization.
2. Employee involvement can be achieved by recognition and reward system.
3. Recognition and reward system reveals that the organization considers quality and productivity as important.
4. It provides the organization an opportunity to thank high achievers.
5. It provides employees a specific goal to achieve.
6. It motivates employees to improve the process.
7. It increases the morale of the workers.

21) What is performance appraisal? Explain its importance, benefits and different formats used.

PERFORMANCE APPRAISAL

The performance appraisal is used to let employees know how they are performing. The performance appraisal becomes a basis for promotions, increase in salaries, counseling and other purposes related to an employee's future.

IMPORTANCE OF PERFORMANCE APPRAISALS:

1. It is necessary to prevail a good relationship between the employee and the appraiser.
2. Employee should be informed about how they are performing on a continuous basis, not just at appraisal time.
3. The appraisal should highlight strength and weakness and how to improve the performance.
4. Employee should be allowed to comment on the evaluation and protest if necessary.
5. Everyone should understand that the purpose of performance appraisal is to have employee involvement.
6. Errors in performance evaluations should be avoided.
7. Unfair and biased evaluation will render poor rating and hence should be eliminated.

BENEFITS OF EMPLOYEE INVOLVEMENT:

Employee involvement improves quality and increases productivity because

- Employees make better decisions using their expert knowledge of the process
- Employees are better able to spot and pin-point areas for improvement.
- Employees are better able to take immediate corrective action.
- Employee involvement reduces labour / management friction.
- Employee involvement increases morale.
- Employees have an increased commitment to goals because they are involved.

22) What is steps used in the continuous process improvement?

Continuous process improvement is designed to utilize the resources of the organization to achieve a quality-driven culture.

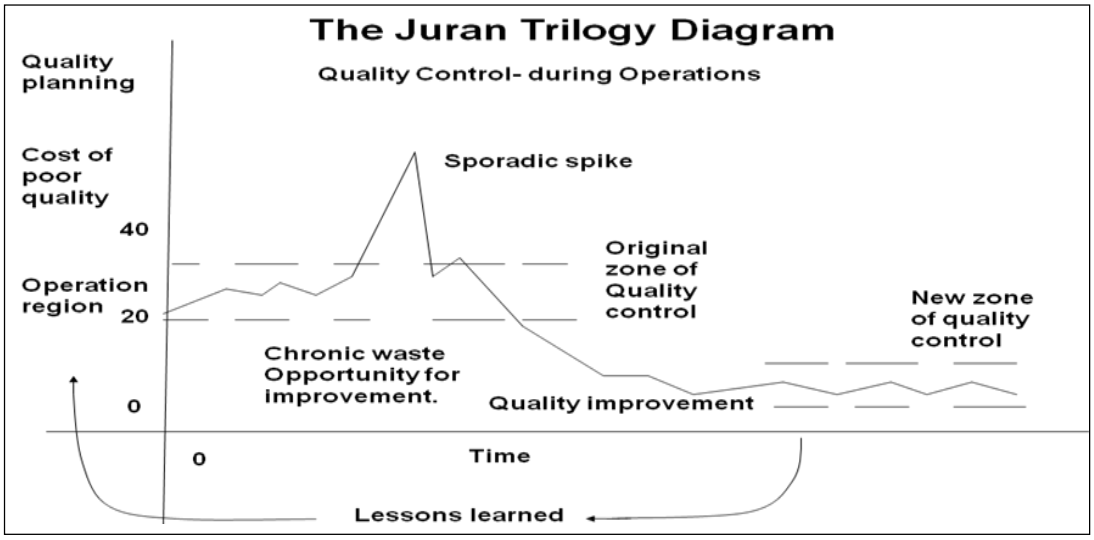
Improvement is made by

- Viewing all work as process.
- Making all process effective, efficient and adaptable.
- Anticipating changing customer needs.
- Controlling in-process performance using measures such as scrap reduction, control charts etc.
- Eliminating waste and re-work.
- Eliminating non-value added activities.
- Eliminating non-conformities.
- Using Benchmarking.
- Incorporating learned lessons into future activities.
- Using technical tools such as SPC, benchmarking, experimental design, QFD etc.

There are five basic ways for improvement.

- Reduce resources.
- Reduce errors.
- Meet or exceed expectations of downstream customers.
- Make the process safer.
- Make the process more satisfying to the person doing it.

23) Explain in details Juran's Trilogy.



THE JURAN TRILOGY

1. **PLANNING**
   - Determine internal & external customers.
   - Their needs are discovered.
   - Develop product / service features.
   - Develop the processes able to produce the product / service features.
   - Transfer plans to operations.
2. **CONTROL**

Control is used by operating forces to help meet the product, process and service requirements.

It consists of the following steps

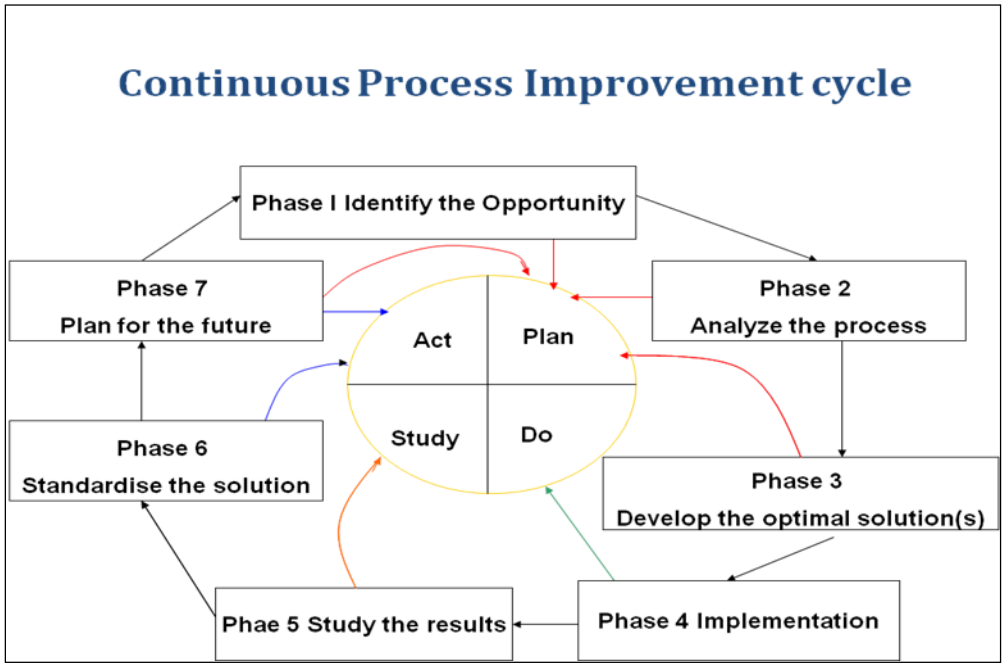
1. Determine items to be controlled.
2. Set goals for the controls.
3. Measure actual performance.
4. Compare actual performance to goals.
5. Act on the difference.

3. IMPROVEMENT

Aims to attain levels of performance that are higher than current levels.
It consists of the following steps

- Establishment of quality council.
- Identify the improvement projects.
- Establish the project teams with a project leader.
- Provide the team with the resources.

24) Explain with a diagram PDSA Cycle.



THE PDCA CYCLE:

PROBLEM SOLVING METHOD:

1. IDENTIFY THE OPPORTUNITY

- Identify the Problem
  - Pareto analysis of external alarm signals.
  - Pareto analysis of internal alarm signals.
  - Proposals from key insiders.
  - Proposals from suggestion schemes.
  - Field study of user's needs.
  - Comments of key people outside the organization.
  - Customer surveys.
  - Employee surveys.
  - Brainstorming by work groups.
- Form the Team
  - Team should be selected.
  - Goals and milestones are established.
- Define the Scope.

Criteria for a good problem statement is as follows

- It clearly describes the problem.
- It states the effect.
- It focuses on what is known, unknown etc.
- It emphasizes the impact on the customer.

2. ANALYZE THE CURRENT PROCESS

The objective is to understand the process and how it is currently performed.

Step 1: The team to develop a process flow diagram.

Step 2: The target performance measures are defined.

Step 3: Collection of all available data and information.

Common items of data and information are

1. Customer information
2. Design information
3. Process information
4. Statistical information
5. Quality information
6. Supplier information

3. DEVELOP THE OPTIMAL SOLUTION(S)

This phase has the objective of establishing potential and feasible solutions and recommending the best solution to improve the process.

- Creativity plays the major role, and brainstorming is the principal technique.
- There are three types of creativity:
  i. Create new processes
  ii. Combine different processes
  iii. Modify the existing process

4. IMPLEMENT CHANGES

This phase has the objective of preparing the implementation plan, obtaining approval and implementing the process improvements.

- Approval of the quality council.
- Obtain the advice and consent of departments, functional areas, teams, individuals etc.
- Monitor the activity.

5. STUDY THE RESULTS

This phase has the objective of monitoring and evaluating the change by tracking and studying the effectiveness of the improvement efforts.

6. STANDARDIZE THE SOLUTION

- Institutionalize by positive control of the process.
- The quality peripherals – the system, environment and supervision must be certified.
- Operators must be certified.

7. PLAN FOR THE FUTURE

The objective is to achieve improved level of process performance.

- Regularly conduct reviews of progress by the quality council.
- Establish the systems to identify area for future improvements.
- Track performance with respective internal & external customers.
- TQM tools and techniques are used to improve quality, delivery and cost.

25) Explain in detail 5-S method.

5-S: HOUSEKEEPING

5-S MEANS EVERYTHING IN ITS PLACE

SEIRI	CLEARING
SEITON	ARRANGING
SEISO	SWEEPING
SEIKETSU	CLEANLINESS
SEITSUKE	DISCIPLINE

- There can be no TQM without 5-S.
- A dirty factory cannot produce quality products.
- Clutter hides problems. A neat workplace promotes easy discovery of abnormalities.

5-S CONTRIBUTES	SAFETY
	QUALITY
	PRODUCTIVITY
5-S	VISUAL CONTROL

The First S: SEIRI : CLEARING

Take out unnecessary items and throw them away

Factory Floor	Office	Home
♦ Machines to be scrapped	♦ Used / Broken pens	♦ Broken toys
♦ Rejected material	♦ Useless paper	♦ Old clothes
♦ Expired goods	♦ Old diaries	♦ Broken suitcases
♦ Broken tools, pallets, bins, trolleys.	♦ Broken furnitures	
♦ Old notices		

Consequences of not practicing SEIRI :

- ➢ The unwanted clutters up the place and the wanted are hard to find.
- ➢ Every place can only hold so much.
- ➢ Clutter sometimes causes misidentification.

The Second S : SEITON : ARRANGING

Arrange everything in proper order so that it can be easily picked up for use.

Factory Floor	Office	Home
♦ Unlabelled tool crib	♦ Unlabelled file cabinet	♦ Clutter
♦ Cluttered shelves lockers etc.	♦ Cluttered drawer, shelves, book cases, tables	♦ No orderly arrangement in the rooms
♦ Stores – no clear location system.	♦ Records & documents Not arranged well	
♦ Things on the floor	♦ File heaps and papers	

Consequences of not practicing SEITON :

- Things are seldom available when needed.
- Items are "lost' in stores.
- Items – defectives and good ones get mixed up.
- Accidents or near-accidents occur due to clutter.
- Visual control of the shop floor is not possible.
- Sometimes, production is lost because an item required is available but cannot be found.
- In some offices, Critical Excise records or tax records may not be traceable. This can lead to finance loss, prosecution or embarrassment.

The Third S : SEISO : SWEEPING

Sweep your workplace thoroughly so that there is no dust anywhere.

Factory Floor	Office	Home
♦ Dirty machines	♦ Dirty table & furniture	♦ Dirty furniture, floor,
♦ Dust on product parts, R.Mtls.		window, grills, bookshelves.
♦ Dirty jigs, fixtures	♦ Dirty office equipments	
♦ Dirty walls, roofs	♦ Littered floor	
♦ Littered floor	♦ Dirty windows	

Consequences of not practicing SEISO :

- Most machines are affected by dust & dirt and hence their performance may go down.
- Dust and dirt on products, materials, packing boxes etc. will affect either their performance quality or their aesthetic look.
- Unpleasant to work in.

The Fourth S : SEIKETSU : CLEANLINESS

Washing with a strong overtone of keeping things disinfected as well as free of hazardous chemicals.

Factory Floor	Office	Home
♦ Handling hazardous chemicals	♦ Free of pests	♦ Pest control
♦ Control of fumes, hazardous dust.	♦ Personal hygiene	♦ Personal hygiene
♦ Disinfecting, Personal hygiene		

Consequences of not practicing SEIKETSU :

- Good health and safety require the practice of Seiketsu.
- Hazardous chemicals, dusty chemicals, fumes etc. can make it a dangerous place to work in.
- Washing thoroughly and cleaning a place makes the workplace pleasant.
- Personal hygiene is essential for healthy workforce.

The Fifth S : SHITSUKI : DISCIPLINE

Discipline especially with regard to safety rules and punctuality.

Consequences of not practicing SEIKETSU :

- If discipline is not practiced, then the first 4-S would backslide.
- Lack of Shitsuki means not following the standards. Then, all activities related to safety and quality will be affected.

IMPLEMENTING 5-S

1. Top Management resolve and training.
2. Formation of a top level team.
3. Understanding current circumstances.
4. Establishing priorities and targets.
5. Forming sub-teams and training.
6. Major cleaning.
7. Establishing improvement plans in each priority area.
8. Implementing the plan.
9. Verifying results.
10. Standardizing.
11. Establishing full control.
12. Looking for further improvements.

26) What is Kaizen?

KAIZEN

Kaizen is a Japanese word for the philosophy that defines management's roles in continuously encouraging and implementing small improvements involving everyone.

It focuses on simplification by breaking down complex progress into their sub – processes and then improving them.

The Kaizen improvement focuses on the use of:

- Value – added and non – value work activities.
- Muda, which refers to the seven classes of waste – over-production, delay, transportation, processing, inventory, wasted motion, and defective parts.
- Principles of motion study and the use of cell technology.
- Principles of materials handling and use of one – piece flow.
- Documentation of standard operating procedures.
- The five S's for workplace organization.
- Visual management.
- Just – in – time principles.
- Poka – Yoke.
- Team dynamics.

27) What is Re-engineering?

RE-ENGINEERING

"Reengineering is the *fundamental* rethinking and *radical* redesign of business *processes* to achieve *dramatic* improvements in critical, contemporary measures of performance such as cost, quality, service, and speed."

28) Differentiate reengineering and Continuous improvement.

Reengineering & Continuous Improvement--*Differences*

	Reengineering	Continuous Improvement
Differences		
Level of change	Radical	Incremental
Starting point	Clean slate	Existing process
Participation	Top-down	Bottom-up
Typical scope	Broad, cross-functional	Narrow, within functions
Risk	High	Moderate
Primary enabler	Information technology	Statistical control
Type of change	Cultural and structural	Cultural

29) What is a Process?

A specific ordering of work activities across time and space, with a beginning, an end, and clearly identified inputs and outputs: a structure for action

30) What is a Business Process?

A group of logically related tasks that use the firm's resources to provide customer-oriented results in support of the organization's objectives

31) What is supplier partnership?

Customers and suppliers have the same goal – to satisfy the end user. The better the supplier's quality, the better the supplier's long term position, because the customer will have a better quality. Customers and suppliers must work together to maximize their return on investment.

SUPPLIER PARTNERSHIP

The suppliers should be treated as partners to achieve the same quality level as attained within the organization.

The following forces need Supplier Partnership to improve quality, reduce costs and increase market share.

Deming Philosophy (Deming's 4th point)

- Just-in-time
- Continuous process improvement
- ISO 9000

CUSTOMER – SUPPLIER RELATIONS:

Dr. Kaoru Ishikawa has given ten principles of customer-supplier relations. They are

1. Both the customer and supplier are fully responsible for the control of quality.
2. Both the customer and supplier should be independent of each other.
3. The customer is responsible for providing the supplier with clear and sufficient requirements so that the customer can know precisely what to produce.
4. Both the customer and supplier should enter into a non-adversarial contract.
5. The supplier is responsible for providing the quality that will satisfy the customer.
6. Both the customer and supplier should decide the method to evaluate the quality of the product or services.
7. Both the customer and supplier should establish in the contract the method by which they can reach an amicable settlement in case of any dispute.
8. Both the customers and supplier should continually exchange information.
9. Both the customer and supplier should perform business activities.
10. Both the customer and supplier should have the best interest of the end user in mind.

PARTNERING

Partnering is a relationship between two or more parties based upon trust, dedication to common goals.

The benefits of partnering are

- Improved quality
- Increased efficiency
- Lower cost
- Increased opportunity for innovation
- Continuous improvement

The three key elements to a partnership relationship are

- Long term commitment
- Trust
- Shared Vision

SOURCING

The three types of sourcing are

- Sole sourcing
- Multiple sourcing
- Single sourcing

32) What are the conditions that form the basis for supplier selection?

SUPPLIER SELECTION

The suppliers should be selected with the following ten conditions

The supplier should understand clearly the management philosophy of the organization.

1. The supplier should have stable management system.
2. The supplier should maintain high technical standards.
3. The supplier should provide the raw materials and parts which meet quality specifications required by the purchaser.
4. The supplier should have the required capability in terms of production.
5. The supplier should not leak out the corporate secrets.
6. The supplier should quote right price and should meet the delivery schedule. The supplier should be accessible with respect to transportation and communication.
7. The supplier should be sincere in implementing the contract provisions.
8. The supplier should have an effective quality system such as ISO / QS 9000.
9. The supplier should be renowned for customer satisfaction.

SUPPLIER CERTIFICATION:

A certified supplier is one which, after extensive investigation, is found to supply material of such quality that is not necessary to perform routine testing.

The Eight criteria for supplier certification are

1. No product related lot rejections for atleast 1 year.
2. No non-product related rejections for atleast 6 months.
3. No production related negative incidents for atleast 6 months.
4. Should have passed a recent on-site quality system evaluation.
5. Having a fully agreed specifications.
6. Fully documented process and quality system.
7. Timely copies of inspection and test data.
8. Process that is stable and in control.

33) What is the need for supplier rating?

SUPPLIER RATING:

Supplier Rating is done

- To obtain an overall rating of supplier performance.
- To communicate with suppliers regarding their performance.
- To provide each supplier with a detailed and true record of problems for corrective action.
- To enhance the relationship between the buyer and the supplier.

34) What are the factors that contribute to a good customer supplier relationship?

RELATIONSHIP DEVELOPMENT:

For establishment of supplier relationship, the following are necessary.

(a) Partnering
(b) Supplier selection
(c) Principles of customer / supplier relations
(d) Certification
(e) Periodic rating

For relationship development, the following are necessary.

(a) Inspection
- 100% inspection
- Sampling
- Audit
- Identity check

(b) Training
(c) Teams

(d) Recognition and Reward

35) What are performance measures?

Performance measures are required for the managers for managing an organization perfectly.

Performance measures are used to achieve the following objectives.

- To establish performance measures and reveal trend.
- To identify the processes to be improved.
- To determine the process gains and losses.
- To compare the actual performance with standard performance.
- To provide information for individual and team evaluation.
- To determine overall performance of the organization.
- To provide information for making proper decisions.

WHAT SHOULD BE MEASURED?

Human resources

1. Lost time due to accidents, absenteeism.
2. Employee turnover.
3. Employee satisfaction index.
4. Training cost per employee.
5. Number of grievances.

Customers

1. Number of complaints from customers.
2. Number of on-time deliveries.
3. Warranty data.
4. Dealer satisfaction.

Production

2. Inventory.
3. SPC Charts.
4. Amount of scrap / rework.
5. Machine down time.

Research and Development

2. New product time to market.
3. Design change orders.
4. Cost estimating errors.

Suppliers

2. On-time delivery.
3. Service rating.
4. Quality performance.
5. Average lead time.

Marketing / Sales

1. Sales expense to revenue.
2. New product sales to total sales.
3. New customers.

Administration

1. Revenue per employee.
2. Purchase order error.
3. Billing accuracy.
4. Cost of poor quality.

STRATEGY :

The quality council has the overall responsibility for the performance measures.It ensures that all the measures are integrated into a total system of measures.

A typical system contains the following function

- Quality
- Cost
- Flexibility
- Reliability
- Innovation

PERFORMANCE MEASURE PRESENTATION :

There are six basic techniques for presenting performance measures. They are

1. Time series graph.
2. Control charts.
3. Capability Index.
4. Taguchi's loss function.
5. Cost of poor quality.
6. Malcolm Baldrige National Quality Award.
   In MBNQA, five categories are analyzed. They are

   a) Manufacturing
   b) Service
   c) Small business
   d) Health care
   e) Education

MULTIPLE CHOICE QUESTIONS:

Questions	opt1	opt2	opt3	opt4	answer
Customer Satisfaction is illustrated by	Taylor's model	Ishikawa model	Teboul model	shewart model	Teboul model
A product service should satisfies the ----------.	Employee beyond his expectations	Employer beyond his expectations	Customer beyond his expectations	All the options are true	Customer beyond his expectations
An American Society for Quality (ASQ) Survey on end user's first priority rank was	Price	Performance	Service	Reputation	Performance
Customer feedback is not ----------	Monthly effort	One time efffort	Annual effort	weekly effort	One time efffort
Quality planning is an essential activity that decides its success	In the market place	In the design place	In the production place	efficiency	In the market place
To make Surveys more useful,it is best to remember that Customers are ----------	Always the same	Not always the same	sometimes the same	never the same	Not always the same
End Customer complaints are ----------	Pro active	Re active	not effective	not reliable	Re active
Indian Railways have completely revolutionized in ----------	Last 10 Years	Last 2 Years	Last 5 Years	Last 15 Years	Last 10 Years

Kano model represented for ----------	Qulality improvement	Process Development	Customer Satisfaction	Market research	Customer Satisfaction
Customer retention creates ----------	business	profit	Market share	Loyalty	Loyalty
As per MASLOW'S Hierarchy theory the needs are divided into _____	2	3	4	5	5
Which of the following is not included in the Team management wheel	prompting	storming	organizing	advising	storming
The followings are stages of team development	norming	maintenance	forming	linking	linking
Employee recognition is essential to	improve employee morale	create satisfied work place	create highly motivated work place	all the options are true	all the options are true
Plan, do, check, act indicates the	PDCA cycle	PDSA cycle	5w2h method	all of the above	PDCA cycle
PDSA means	plan, do check, act	plan,do study, act	Plan, desire, study, act	Plan, discipline, study, act	plan,do study, act
The japanese termSEIRI means	tidiness	orderliness	cleanliness	discipline	orderliness
The word SEISO means	tidiness	orderliness	cleanliness	discipline	cleanliness
The word SEITON means that	tidiness	orderliness	cleanliness	discipline	orderliness
The japanese term SEIKETSU means	tidiness	orderliness	standardization	discipline	standardization
The word SHITSUKE means	tidiness	orderliness	cleanliness	discipline	discipline
The term _____ means tidiness	SEIRI	SEITON	SEISO	SEIKETSU	SEIRI
The japanese term _____means that orderliness	SEIRI	SEITON	SEISO	SEIKETSU	SEITON

The term _____ means cleanliness	SEIRI	SEITON	SEISO	SEIKETSU	SEISO
The japanese term _____means that standardization	SEIRI	SEITON	SEISO	SEIKETSU	SEIKETSU
The term _____ means that discipline	SEIRI	SEITON	SHITSUKE	SEIKETSU	SHITSUKE
SEIRI,SEITON, SEISO, SEIKETSU,HITSUKE are	English terms	Chinese terrms	Japanese terms	American terms	Japanese terms
_____ is a short declaration of what an organisation aspires to be tomorrow.	Vision statement	mission statement	quality policy statement	Juran statement	Vision statement
_____ is usually one paragraph or less in length, is easy to understand, and describes the function of the organisation.	Vision statement	Vision statement	quality policy statement	Juran statement	Vision statement
_____ is a guide for everyone in the organisation as to how they should provide products and services to the customers.	Vision statement	mission statement	quality policy statement	Juran statement	quality policy statement
_____ is the process of influencing the activities of an individual or a group towards the achievement of a goal in a given situation.	Leadership	Team	CEO	Executive	Team
As per six basic concepts required for a successful TQM programe, suppliers are treated as_____	Owners	Employees	Partners	Leaders	Partners
_____ is a measure of product's life having both	Conformance	Reliability	Durability	Service	Reliability

economic and technical dimensions.					
_____ is resolution of problem and complaints, ease of repair.	Conformance	Reliability	Durability	Service	Service
_____ is Human to human interface, such as the courtesy of the dealer.	Response	Reliability	Durability	Service	Response
_____ Developed loss function concept that combines cost, target and variation into one metric	Juran	Ishikawa	Crosby	Taguchi	Taguchi
The quality circle is a small group of people doing similar work meet regularly	To identify analyze and solve problems	To inspects the product	To sell the product	To manufacture the product	To identify analyze and solve problems
A supplier rating system is also referred as a _____	plan card system	Score card system	process card system	card system	Score card system
_____ refers to maintaining and improving the growth of the customer-supplier relationship	partner development	management development	Relationship development	employee development	Relationship development
_____ is the process of retaining the existing customers.	Customer retention	Customer plan	Customer satisfaction	Customer perception	Customer retention

Types of customers_____	Domestic and export customer	Internal and external customers	New and old customers	buyers	Internal and external customers
_____ is the ease of keeping the product operable.	Maintainability	availability	reliability	service	Maintainability
Who are the most important people in the business_____	suppliers	employees	Customers	partners	Customers
The organisation depends on _____	suppliers	employees	Customers	partners	Customers
_____ is a process whereby management shows acknowledgement of an employee's outstanding performance.	Recognition	empowerment	Recommendation	Motivation	Recognition
_____ is the process of including people inner drives and action towards certain goals and committing his energies to achieve these goals.	Recognition	empowerment	Recommendation	Motivation	Motivation

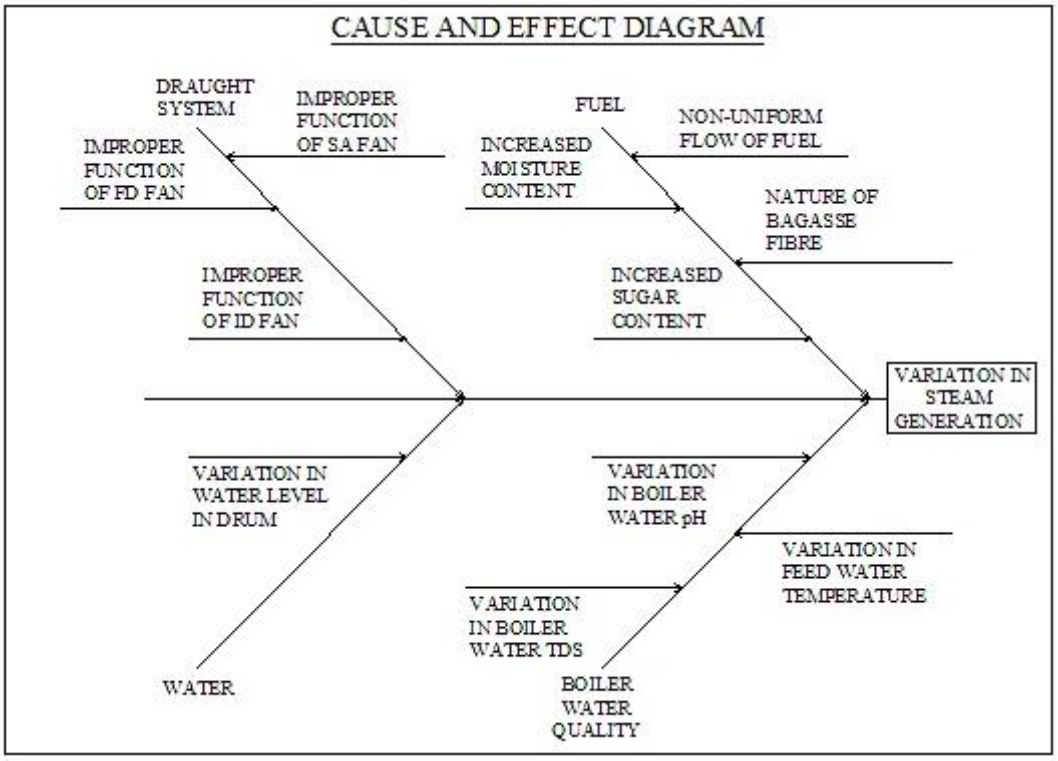
_____ is a systematic and objective assessment or evaluation of performance and contribution of an individual.	Performance appraisal	empowerment	Motivation	Recognition	Performance appraisal
_____ is the process of continuous improvements in small increments that make the process more efficient, effective, controllable and adequate.	Deming	Juran	Crosby	Kaizen	Kaizen
tao findout dissatisfiers,the best sarting point is -----	Market research	Brainstoming	Benchmarking	Customer complaints	Customer complaints
MBO is a Deming's Philosophy ,which derives ----------	Eliminate Management by Objective	Remove barriers	Not to Eliminate Management by Objective	Drive out fear	Eliminate Management by Objective
Which of the following is not coming under MASLOW'S five basic needs	safety	social	feature	esteem	feature
Which of the following is a barrier to team progress	lack of planning	appreciation	motivation	responsibility	lack of planning
Types of customers are	external& internal customer	Regular customer /usual customer	delighted and satisfied customer	rare /occasional customer	external& internal customer

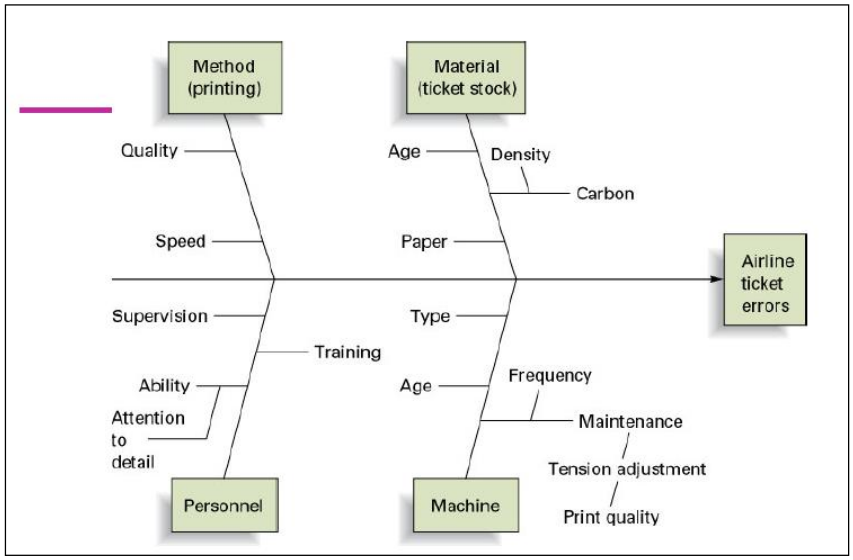
The customer who uses the product or service is called	internal customer	external customer	Middle customer	Preferred customer	external customer
The worker who makes the product or who are living with the machines	internal customer	external customer	both a&b	none of these	internal customer
Customer complaint is necessary to	to discover customer satisfaction	to compare performance with the competition	to determine opportunities for improvement	all the options are true	all the options are true
Tools used for collecting customer complaints are	comment cards	report cards	toll free numbers	all the options are true	all the options are true
An effective employee involvement technique include	Recognition	teamwork& leadership	appraisal	all the options are true	all the options are true
Synergy in 7 habits of effective	Individual work	Working as team	Manager and workers	all the options are true	Working as team
Which of the following denotes the social need	achivement	responsibility	respect	food	respect
security needs include	food,clothing ,sleep	shelter,warmth,self-defence	friendship,love,respect	status,recognition,responsibility	shelter,warmth,self-defence
Which of the following is related to Ego needs	adequate wage	job security	linking colleagues	promotion opportunities	promotion opportunities
which of the following is self actualization need	status	responsibility	achievement	respect	achivement
Basic needs include	food,clothing ,sleep	shelter,warmth,self-defence	friendship,love,respect	status,recognition,responsibility	food,clothing ,sleep

UNIT III
TQM TOOLS

TQM TOOLS (SEVEN TOOLS OF QUALITY)

1. **PARETO DIAGRAM**
2. **FLOW DIAGRAM**
3. **CAUSE AND EFFECT DIAGRAM**





STEPS IN CONSTRUCTING A CAUSE & EFFECT DIAGRAM :

a. Define the problem or effect to be analyzed.
b. Form the team to perform the analysis. Often the team will uncover potential causes through brainstorming.
c. Draw the effect box and the centerline.
d. Specify the major potential cause categories and join them as boxes connected to the centerline.
e. Identify the possible causes and classify them into the categories in step d. Create new categories, if necessary.
f. Rank order the causes to identify those that seem most likely to impact the problem.
g. Take corrective action.

4. CHECK SHEETS

CHECK SHEET

Product : Bicycle

Nonconformity Type	Check	Total
Blister	~~IIII~~ ~~IIII~~ ~~IIII~~ ~~IIII~~ I	21
Light spray	~~IIII~~ ~~IIII~~ ~~IIII~~	15
Drips	~~IIII~~ ~~IIII~~ ~~IIII~~ ~~IIII~~ ~~IIII~~	25
Others	~~IIII~~ ~~IIII~~ ~~IIII~~ ~~IIII~~ ~~IIII~~	25
TOTAL		86

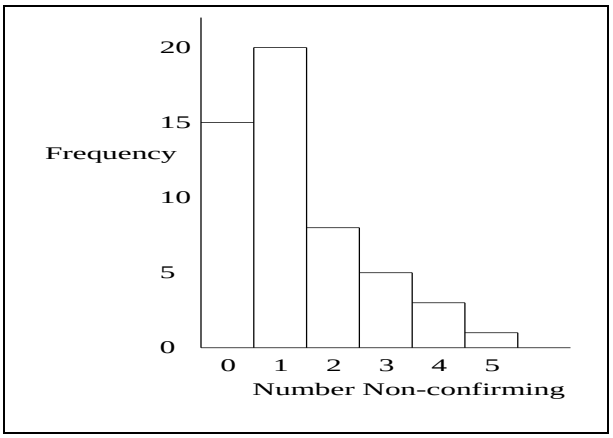
5. HISTOGRAM

Number of Errors

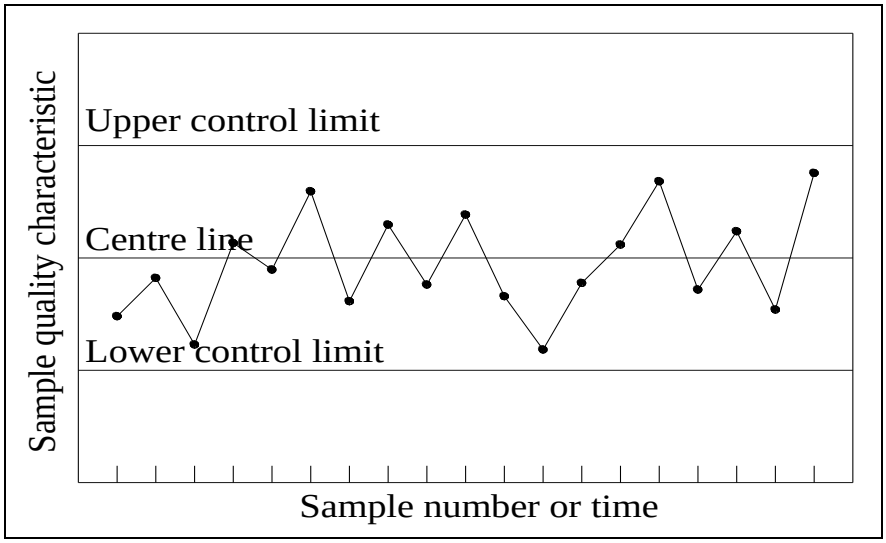
0	1	3	0	1	0	1	0
1	5	4	1	2	1	2	0
1	0	2	0	0	2	0	1
2	1	1	1	2	1	1	
0	4	1	3	1	1	1	
1	3	4	0	0	0	0	
1	3	0	1	2	2	3	

Tally of Number of Errors

Number Non-conforming	Tabulation	Freq.
0	~~IIII~~ ~~IIII~~ ~~IIII~~	15
1	~~IIII~~ ~~IIII~~ ~~IIII~~ ~~IIII~~	20
2	~~IIII~~ III	8
3	~~IIII~~	5
4	III	3
5	I	1



6. CONTROL CHARTS

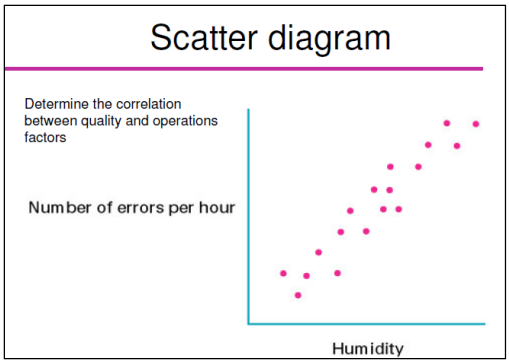


A typical control chart

7. SCATTER DIAGRAM

In scatter diagram, three types of co-relations exist.

i. Positive correlation.
ii. Negative correlation.
iii. No correlation.



CONTINUOUS PROCESS IMPROVEMENT

The basic ways for a continuous process improvement are Reduce resources

- Reduce errors
- Meet or exceed expectations of downstream customers
- Make the process safer
- Make the process more satisfying to the person doing it.

Phases of a Continuous Process Improvement Cycle are

a) Identify the opportunity
b) Analyze the process
c) Develop the optimal solutions
d) Implement
e) Study the results
f) Standardize the solution
g) Plan for the future

JURAN TRILOGY

Three components of the Juran Trilogy are

i. Planning
ii. Control
iii. Improvement

PDSA CYCLE

The steps in the PDSA cycle are
The basic **Plan-Do-Study-Act** is an effective improvement technique.

- Plan carefully what is to be done
- Carry out the Plan

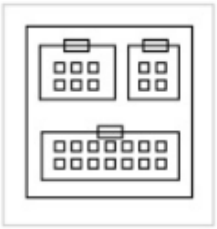
- Study the results
- Act on the results by identifying what worked as planned and what didn't

The new seven management tools

1) ***Affinity Diagram***
2) ***Interrelatioship Digraph***
3) ***Tree Diagram***
4) ***Matrix Diagram***
5) ***Prioritation matrices***
6) ***Process Decision Program Chart***
7) ***Activity network Diagram***

The seven tools

Affinity Diagram

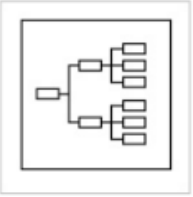


This tool takes large amounts of disorganized data and information and enables one to organize it into groupings based on natural relationships. It was created in the 1960s by Japanese anthropologist Jiro Kawakita. Its also known as KJ diagram,after Jiro Kawakita. Affinity diagram is a special kind of brainstorming tool.

Interrelationship Diagraph

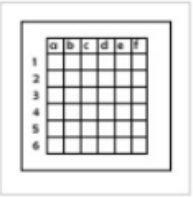
This tool displays all the interrelated cause-and-effect relationships and factors involved in a complex problem and describes desired outcomes. The process of creating an interrelationship diagraph helps a group analyze the natural links between different aspects of a complex situation.

Tree Diagram



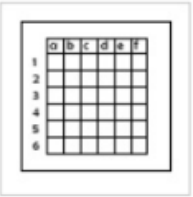
This tool is used to break down broad categories into finer and finer levels of detail. It can map levels of details of tasks that are required to accomplish a goal or task. It can be used to break down broad general subjects into finer and finer levels of detail. Developing the tree diagram helps one move their thinking from generalities to specifics.

Prioritization Matrix



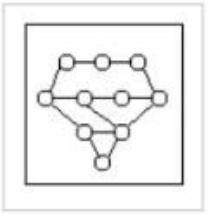
This tool is used to prioritize items and describe them in terms of weighted criteria. It uses a combination of tree and matrix diagramming techniques to do a pair-wise evaluation of items and to narrow down options to the most desired or most effective.

Matrix Diagram



This tool shows the relationship between items. At each intersection a relationship is either absent or present. It then gives information about the relationship, such as its strength, the roles played by various individuals or measurements. Six differently shaped matrices are possible: L, T, Y, X, C, R and roof-shaped, depending on how many groups must be compared.

Activity Network Diagram



This tool is used to plan the appropriate sequence or schedule for a set of tasks and related subtasks. It is used when subtasks must occur in parallel. The diagram enables one to determine the critical path (longest sequence of tasks). (See also PERT diagram.)

Further reading

- Brassard, M. (1996) The Memory Jogger Plus+. ISBN 1-879364-83-2.
- Seven New Management and Planning Tools [1]

External links

- American Society for Quality [2] - official Web site
- The 'New' Tools [3] from Vanderbilt University
- A Periodic Table of Visualization Methods for Management [4]
- Visualization Methods Exploration [5]

Benchmarking

Benchmarking is a systematic method by which organizations can measure themselves

against the best industry practices. The essence of benchmarking is the process of borrowing ideas and adapting them to gain competitive advantage. It is a tool for continuous improvement.

BENCHMARKING PROCESS

1. Planning
2. Analysis
3. Integration
4. Action
5. Maturity

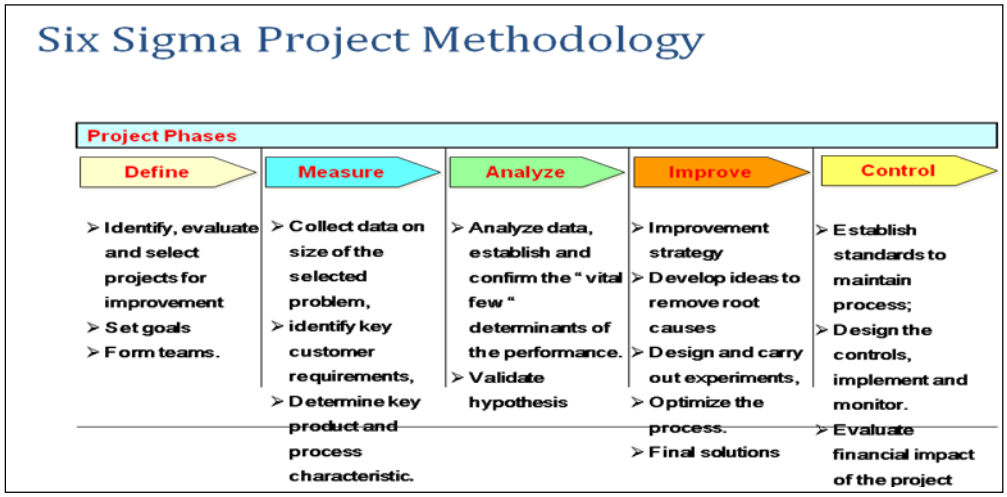
(i) Relevance of 6-sigma concept in achieving quality output in a process.
(ii) Example of a company practicing six-sigma concept.

Six Sigma Definitions

- Business Definition
  - ✓ A break through strategy to significantly improve customer satisfaction and shareholder value by reducing variability in every aspect of business.
- Technical Definition
  - ✓ A statistical term signifying **3.4** defects per million opportunities.

SIGMA SCALE OF DEFECTS(1.5 σ shift)

SIGMA	DEFECT RATE (PPM)	COST OF POOR QUALITY (% Sales)	Competitive Level
6σ	3.4	< 10%	World Class
5σ	233	10%-15%	World Class
4σ	6,210	15%-20%	High Quality
3σ	66,807	20%-30%	Industry Average
2σ	3,08,537	30%-40%	Industry Average
1σ	6,90,000	> 40%	Non-Competitive



Six Sigma Project Methodology

- ☐ DMAIC (Define)
- ➢ Define (What is important?)
  - ✓ Base-lining and benchmarking processes
  - ✓ Decomposing processes into sub-processes
  - ✓ Specifying customer satisfaction goals/sub-goals (requirements)
- ➢ Support tools for Define step:
  - ✓ Benchmarking
  - ✓ Baseline
  - ✓ Voice of Customer (Win Win)
  - ✓ Voice of Business (Win Win)
  - ✓ Quality Function Deployment & etc.
- ☐ DMAIC (Measure)
- ➢ Measure (How are we doing?)
  - ■ Identifying relevant metrics based on engineering principles and models
    - ☐ Performance measurement: throughput, quality (statistically, mean and variation)
    - ☐ Cost (currency, time, and resource)
    - ☐ Other example of measurement: response times, cycle times, transaction rates, access frequencies, and user defined thresholds
- ➢ Support tools for Measure step:

  7 Basic tools: Flow chart, Check Sheets, Pareto diagrams, Cause/Effect diagrams, Histograms, and Statistical Process Control (SPC).

  Defect Metrics

  Data Collection Forms, Plan, Logistics
- ☐ DMAIC (Analyze)
- ➢ Analyze (What's wrong?)

  Evaluate the data/information for trends, patterns, causal relationships and "root cause"

  Example: Defect analysis, and Analysis of variance

  Determine candidate improvements
- ➢ Support tools for Analyze step:

Cause/Effect diagram
Failure Modes & Effects Analysis
Decision & Risk Analysis
Statistical Inference
Control Charts
Capability Analysis and etc.

- ☐ DMAIC (Improve)
- ☐ Improve (What needs to be done?)

Making prototype or initial improvement
Measure and compare the results with the simulation results
Iterations taken between Measure-Analyze-Improve steps to achieve the target level of performance

- ☐ Support tools for Improve step:

Design of Experiments
Modeling
Tolerancing
Robust Design
DMAIC (Control)

- ➢ Control (How do we guarantee performance?)

Ensuring measurements are put into place to maintain improvements

- ➢ Support tools for Control step:

Statistical Controls: Control Charts, Time Series methods
Non-Statistical Controls: Procedural adherence, Performance Mgmt., Preventive activities

Six Sigma Case Study-I

Six sigma project: web design.

Define: Design a web site that ranks in the top ten (10) on all major search engines and directories.

Measure: Enter "six sigma" and check ranking in search engines.

Analyze: URL name, title of pages, and other factors are major ranking criteria. Reciprocal links and other routine activities aid in search engine ranking.

Improve: Purchase URL with six sigma included, optimize each page, develop reciprocal links, and perform other regular activities required to maintain traffic and ranking.

Control: Monitor ranking on search engines weekly. You can check on the success of this project by entering "six sigma" in the search field of your favorite search engine. The titles and descriptions may vary , the URL link is the performance measure.

Six Sigma Case Study-II

Six sigma project: water treating.

Define: Water treating unit in 15 years had never been able to handle the nameplate capacity. Treatment chemical costs were higher than other types of treatment units.

Measure: Confirmed flow rate through the system vs. nameplate.

Analyze: Measure system evaluation and found many measurements that were off by over 100%. Hourly operations identified key variables in the operation of the unit and the acceptable range of each. Conducted three different Designed Experiments.

Improve: Corrected the measurement problems. Found set of operating variables that produced 107% of nameplate capacity at higher quality with lower chemical use. Chemical

use reduced by $180K per year.

Control: Hourly operations trained, procedures modified, process to check measurement instituted. Model for changes in inlet water conditions.

MULTIPLE CHOICE QUESTIONS:

Questions	opt1	opt2	opt3	opt4	answer
check sheet is also known as _____	process sheet	tally sheet	check list	control chart	tally sheet
_____ is a form for systematic data gathering and registering to get clear view of the facts	check sheet	control chart	scatter diagram	pareto diagram	check sheet
_____ is a bar cahrt/diaagram showing a distribution of variable quantities or characteristics	histogram	check sheet	scatter diagram	pareto diagram	histogram
_____ is a metohd of analysis of data by grouping it in different ways	scatter diagram	control chart	stratification	histogram	stratification
A graph that displays data taken over time and the variations of this data is known as_____	histogram	check sheet	scatter diagram	pareto diagram	scatter diagram
in statistics, data can be categorised into_____ types	1	2	3	4	2
three measures of central tendency generally used are_____	mean,range,mode	mean,median,mode	range,mean divation,standard deviation	range,mode,standard deviation	mean,median,mode
three measures of dispersion generally used are	mean,range,mode	mean,median,mode	range,mean divation,standard deviation	range,mode,standard deviation	range,mean divation,standard deviation
the cumulative frequency curve is also called as_____	mean	ogive	attribute	mode	ogive
basic types of control charts used are_____	variable chart	attribute chart	both variable and attribute	number chart	both variable and attribute
_____ monitor the number of defects or fraction defect rate present in the sample	controlchart for variables	control chart for attributes	scatter diagram	both 1&2	control chart for attributes
_____ is used to show relations between individual items in two sets of factors	tree diagram	matrix diagram	arrow diagram	Line diagram	matrix diagram

the purpose of _____is to explore the ways and means to achieve the objective, develop a list of alternative means and to present them in visual understandable form.	tree diagram	matrix diagram	arrow diagram	Line diagram	tree diagram
_____ diagram is a graphic description of the sequential steps that must be completed before a project can be completed.	tree diagram	matrix diagram	arrow diagram	Line diagram	arrow diagram
_____ refers to those quality characteristics that confirm to specifications or do not conform to specifications.	attribute	variable	six sigma	5 S	attribute
_____ can be defined as an unknown pattern of variation from which known sample has been drawn.	population	sample	sampling	variables	population
_____ can be defined as a collection of related observations.	information	statistics	analysis	data	data
_____ can be defined as processed data.	information	statistics	analysis	data	information
processes, materials, operators, miscellaneous factors are the sources	attribute	variations	dispersion	statistics	variations
fraction defective is mathematically expressed as	p=np/n	n=np/p	p=np/p	p=n/p	p=np/n
When subgroup size is constant,_____ chart is preferred over p-chart.	c	u	np	p	np
number of phases in six sigma process?	2	4	5	6	5
_____ diagram is a tool for finding causes to problem.	tree diagram	matrix diagram	relationship	arrow	relationship
affinity diagram is used to	provide a visual representation of large amount of ideas	determine logical priorities	understand and organize problems that are not clear	Find the faults	Find the faults

_____ chart monitors the dispersion or precision of the process	R	σ	u	c	R
when the sub group is varies sample to sample, then _____ chart is used.	R	u	c	p	u
it is the probability of rejecting a good lot which other wise would have been accepted. It is	consumer's risk	producer's risk	both 1&2	Marketting strategy	producer's risk
it is the probability of accepting a defective lot which other wise would have been rejected. It is	consumer's risk	producer's risk	both 1&2	Marketting strategy	consumer's risk
the ratio of the number of defective articles found in any inspection to the total number of artickes actually inspected is known as	defect	six sigma	affinity	fraction defective	fraction defective
causes for assignable causes of variations are	difference among machines	difference among materials	difference among workers	all of the given options	all of the given options
types of variations	chance causes of variation	assignable causes of variation	None	chance causes of variation and assignable causes of variation	chance causes of variation and assignable causes of variation
_____ causes of variations are longer in magnitude and can be easily traced and detected.	assignable	chance	operator	Defects	assignable
_____ chart shows the variation of process.	R	σ	u	c	σ
_____ chart is used to monitor the centering of the process to control its accuracy	$\overline{x}$	R	σ	u	$\overline{x}$
seven tools of quality	check sheet,control charts, scatter diagrams	histograms,pareto diagrams, stratification analysis	cause and effect diagram	all of the given options	all of the given options
cause and effect diagram is also known as	pareto diagram	scatter diagram	fishbone diagram	Arrow diagram	fishbone diagram

cause and effect diagram is used to	analyse cause and effect relationship	to facilitate the search for solutions of related problems	to standardise existing and proposed operations	all of the given options	all of the given options
_____ is defined as the science that deals with the collection ,tabulation,analysis,interpretation,and presentation of quantitative data.	histogram	statistics	information	chart	statistics
attribute data is also known as	discrete data	continuous data	variable data	attribute datas	discrete data
variable data is also known as	discrete data	continuous data	attribute data	variable data	continuous data
_____ of a distribution is a numerical value that describes the central position of the data	measure of central tendency	frequency distrbution	frequency curve	datas	measure of central tendency
_____ is defined as that value of the variable which occurs most frequently.	mean	median	mode	range	mode
the difference between the largest and smallest observation is known as	mean	median	mode	range	range
types of population	finite	infinite	hypothetical	all of the given options	all of the given options
normal curve is also known as	gaussian	probability	both 1&2	frequency distribution	probability
purposes of p chart	to discover, identify and correct causes of bad quality	to facilitate the search for solutions of related problems	to standardise existing and proposed operations	all of the above	to discover, identify and correct causes of bad quality
c chart is based on	poisson distribution	poission ratio	both 1&2	frequency distribution	poisson distribution
PDPC stands for	process decision programme chart	process development programme chart	programme development process chart	process development programme chart	process decision programme chart
the main purpose of arrow diagrams are	to show the paths to complete a project	to find the shortest time possible for the project	to display graphically simiultaneous activities	all of the given options	all of the given options

PDPC is also known as	decision tree	treediagram	matrix data analysis	affinity diagram	decision tree
_____ proposed seven tools of quality	Dr.Juran	Mike Robinson	Prof.Ishikawa	Philip crosby	Prof.Ishikawa
Seven elemental tools are based on the _____	Statistical techniques	Attirbutes	frequency curve	Frequencey distribution	Statistical techniques
The seven basic tools are used to facilitate successful accomplishment of_____ objecives	Production improvement	Protection improvement	Quality improvement	For more profit	Quality improvement
The value which occurs most frequently____	Mean	Median	mode	Range	mode
Attributes refers to those quality characteristics that conform to_____	Specification	Numbers	Dimension	Problem	Specification
Six sigma allows for only_____ defects per million opportunities	3.4	3.5	3.3	4.3	3.4
Six sigma was started by_____in 1987	Deming	General motors	Motorola	Hindustan motors	Motorola
The objective of the six sigma is _____	Zero defect	Null defect	No error	Allowable error	Zero defect
The matrix data analysis is used for_____	Planning	Indentifying alternatives	identifying faults	Quantifying relationships	Quantifying relationships

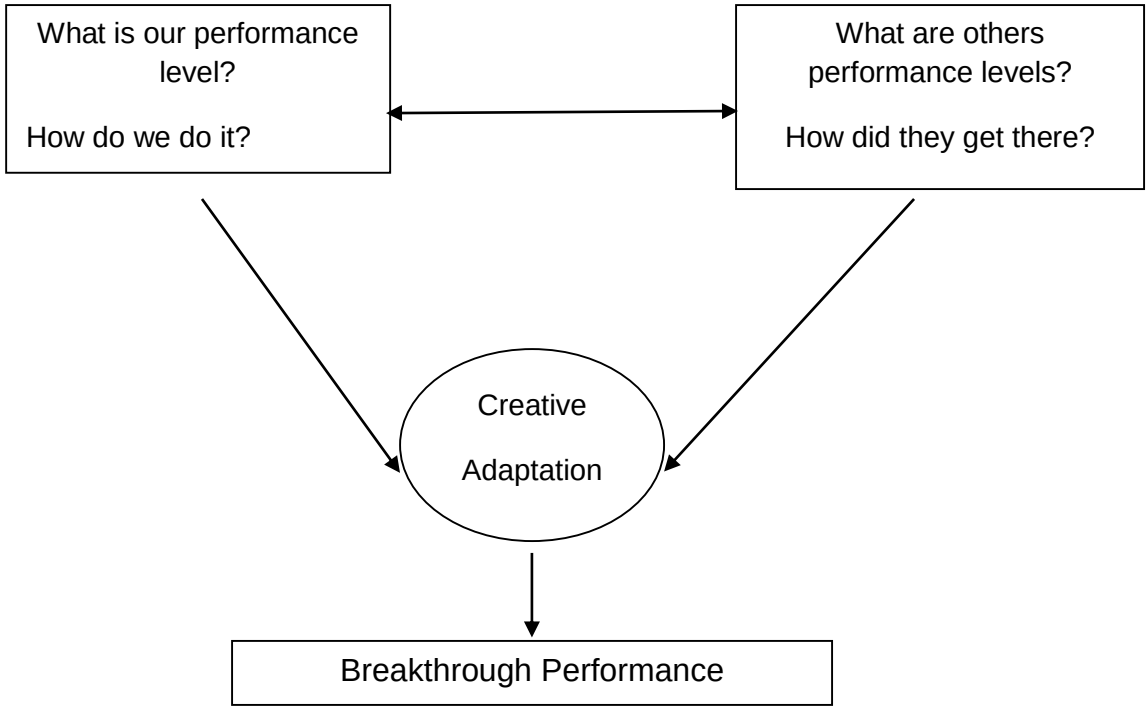
UNIT IV
TQM TECHNIQUES

1. What is Bench marking?

Benchmarking is a systematic method by which organizations can measure themselves against the best industry practices.

- Benchmarking is a systematic search for the best practices, innovative ideas, and highly effective operating procedures.

BENCHMARKING CONCEPT



REASONS TO BENCHMARK:

- It is a tool to achieve business and competitive objectives
- It can inspire managers (and Organizations) to compete
- It is time and cost effective
- It constantly scans the external environment to improve the process
- Potential and useful technological breakthroughs can be located and adopted early

PROCESS OF BENCHMARKING

The following six steps contain the core techniques of Benchmarking

1. **Decide what to benchmark**
   - Benchmarking can be applied to any business or production process
   - The strategy is usually expressed in terms of mission and vision statements
   - Best to begin with the mission and critical factors
   - Choosing the scope of the Benchmarking study
   - Pareto analysis – what process to investigate
   - Cause and Effect diagram – for tracing outputs back
2. **Understand current performance**
   - Understand and document the current process
   - Those working in the process are the most capable of identifying and correcting problems
   - While documenting, it is important to quantify
   - Care should be taken during accounting information
3. **Plan**
   - A benchmarking team should be chosen
   - Organizations to serve as the benchmark need to be identified
   - Time frame should be agreed upon for each of the benchmarking tasks

There are three types of benchmarking

a. Internal
b. Competitive
c. Process

4. **Study Others**

Benchmarking studies look for two types of information

- How best the processes are practiced
- Measurable results of these practices

Three techniques for conducting the research are

- Questionnaires
- Site visits
- Focus groups

5. **Learn from the data**

Answering a series of questions like

- Is there a gap between the organization's performance and the performance of the best-in-class organizations?
- What is the gap? How much is it?
- Why is there a gap? What does the best-in-class do differently that is better?
- If best-in-class practices were adopted, what would be the resulting improvement?

Benchmarking studies can reveal three different outcomes

- Negative gap
- Parity
- Positive gap

6. Using the findings

The objective is to close the gap. For this

- Findings must be communicated to the people within the organization
- Action plans must be developed to implement new processes

Groups that must agree on the change

- Process owners
- Upper management

Steps for the development and execution of action plans are

1. Specify tasks
2. Sequence tasks
3. Determine resources needs
4. Establish task schedule
5. Assign responsibility for each task
6. Describe expected results
7. Specify methods for monitoring results

PITFALLS AND CRITICISMS OF BENCHMARKING:

- Idea of copying others
- It is not a cure or a business philosophy
- Some process have to be benchmarked repeatedly
- It is not a substitute for innovation

2. What is Quality Function Deployment (QFD)? Explain its uses.

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

QFD TEAM:

There are two types of teams namely

1. Team for designing a new product

2. Team for improving an existing product

BENEFITS OF QFD :

1. Improves Customer satisfaction
   - Creates focus on customer requirements
   - Uses competitive information effectively
   - Prioritizes resources
   - Identifies items that can be acted upon

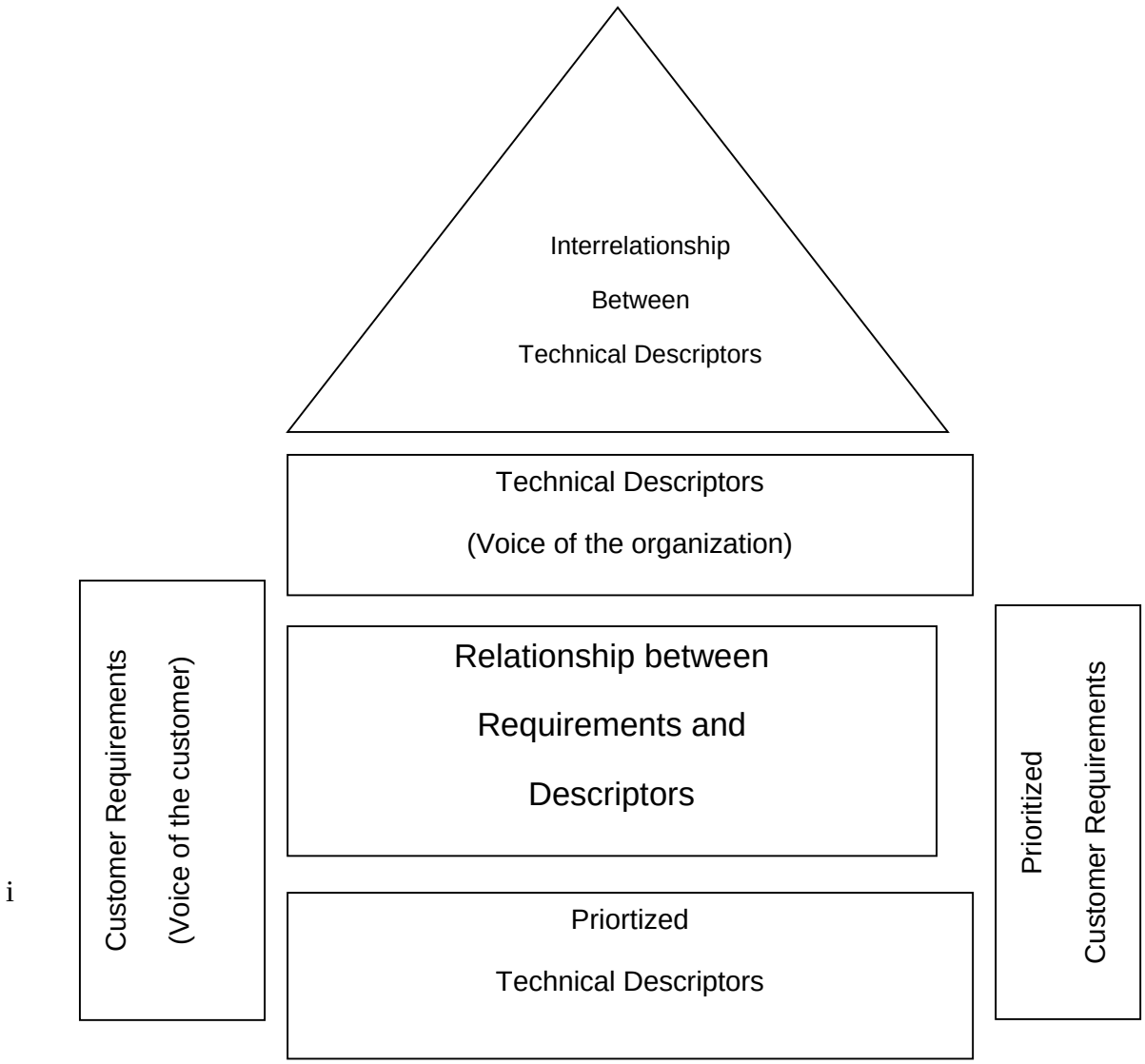
2. Reduces Implementation Time
   - Decreases midstream design changes
   - Limits post introduction problems
   - Avoids future development redundancies
   - Promotes Team Work

- Based on consensus
- Creates communication
- Identifies actions

3. Provides Documentation
   - Documents rationale for design
   - Adds structure to the information
   - Adapts to changes (a living document)

3. What is House of Quality? Explain how it is constructed.

HOUSE OF QUALITY :



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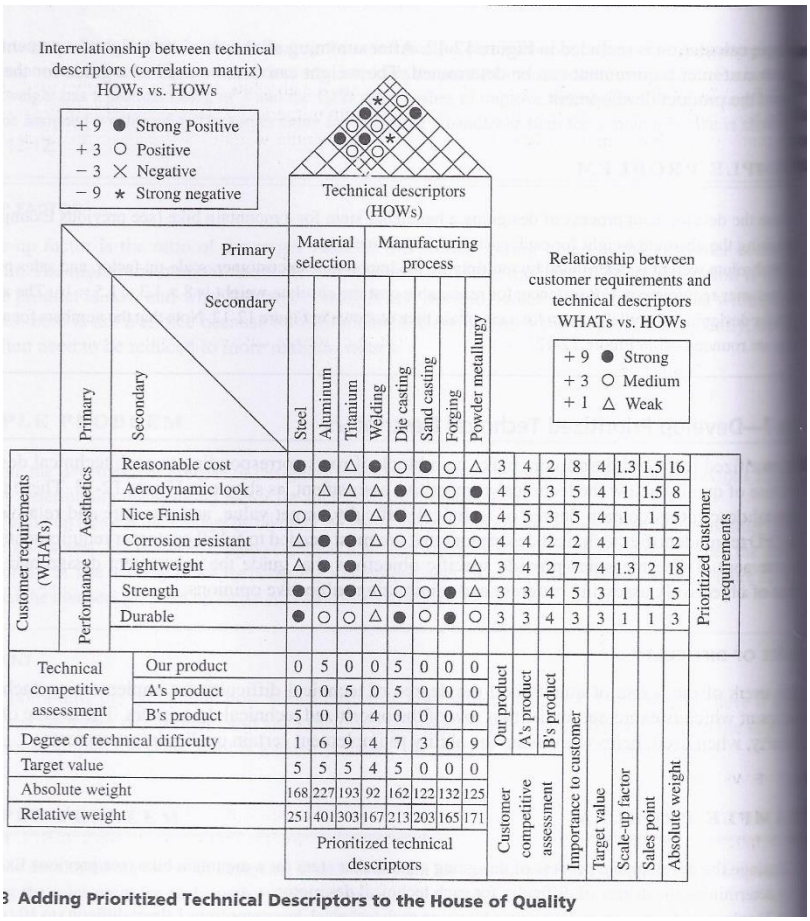


Adding Prioritized Technical Descriptors to the House of Quality

THE STEPS IN BUILDING A HOUSE OF QUALITY ARE :

1. List Customer Requirements (WHAT's)
2. List Technical Descriptors (HOW's)
3. Develop a Relationship Matrix Between WHAT's and HOW's
4. Develop an Inter-relationship Matrix between HOW's
5. Competitive Assessments
    a. Customer Competitive Assessments
    b. Technical Competitive Assessments
6. Develop Prioritized Customer Requirements
7. Develop Prioritized Technical Descriptors

4. What is Taguchi's Loss Function?

TAGUCHI'S
QUALITY
LOSS
FUNCTION

INTRODUCTION

Taguchi Methods is a statistical methods developed largely by GENICHI TAGUCHI to improve quality of manufactured goods.

The philosophy of off-line quality control.

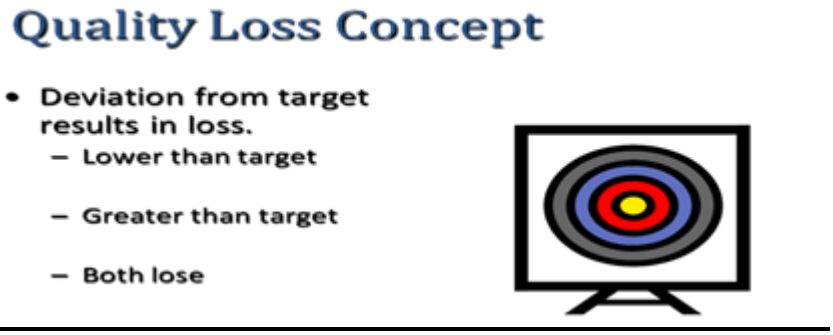
Innovations in the design of experiments.

Taguchi Loss Function Definition

Taguchi defines Quality as "the *loss imparted by the product to society from the time the product is shipped."*

LOSS = Cost to operate, Failure to function, maintenance and repair cost, customer satisfaction, poor design.

Product to be produced "being within specification"



Taguchi's Vs Traditional Approach

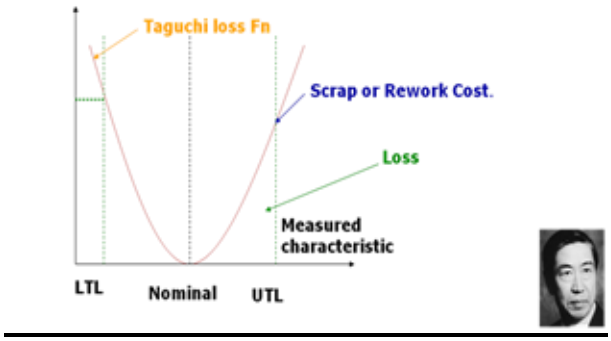
Taguchi's Quadratic Quality Loss Function

Quality Loss Occurs when a product's deviates from target or nominal value.

Deviation Grows, then Loss increases.

Taguchi's U-shaped loss Function Curve.

Taguchi's U-shaped loss Function Curve.



Formula to find Taguchi's Loss Fn

Taguchi uses Quadratic Equation to determine loss Curve

$$L(x) = k(x-N)^2$$

Where **L (x)** = Loss Function,

k = C/d² = Constant of proportionality,

where, C – Loss associated with sp limit

d - Deviation of specification from target value

x = Quality Features of selected product,

N = Nominal Value of the product and

(x-N) = Tolerance

Problem

A part dimension on a power tool is specified as 32.25±0.25.Company records show±0.25 exceeded & 75% of the returned fo replacement. Cost of replacement is Rs.12, 500.Determine **k** & QLF.

Solution:

Expected Cost of repair

C = 0.75(12500) = Rs 9,375

k = C/d²= 9375/(90.25)² = Rs 1,50,000

QLF =L (x) 1,50,00(x-N)

Quality Loss Function II

$$L(y) = k(y-m)^2$$

$L(y)$ = Loss

k = constant = $\frac{\text{cost to correct}}{\text{tolerance}^2}$

y = reported value

m = mean value (average)

(Taguchi On Robust Technology p. 22)

Example continued:

$k = \$150/2^2 = \$37.50$

$L(y) = 37.50 (15-10)^2$

$= 37.50 (5)^2$

$= 37.50 (25)$

$= \$937.50$ is loss for the month of November

Example:

- Company C received an average of 10 complaints per month last year. In November they received 15 complaints (y). Management sets an acceptable level at 2 (tolerance).
- It costs the company $50 directly per complaint to correct the problems. They determined the cost in lost sales to be $100.
- Total cost per complaint: $150

Taguchi's Quality Loss Function concept combines cost, target and variation in one metric with specifications being of secondary importance.

Taguchi has defined quality as the loss imparted to society from the time a product is shipped. Societal losses include failure to meet customer requirements, failure to meet ideal performance and harmful side effects.

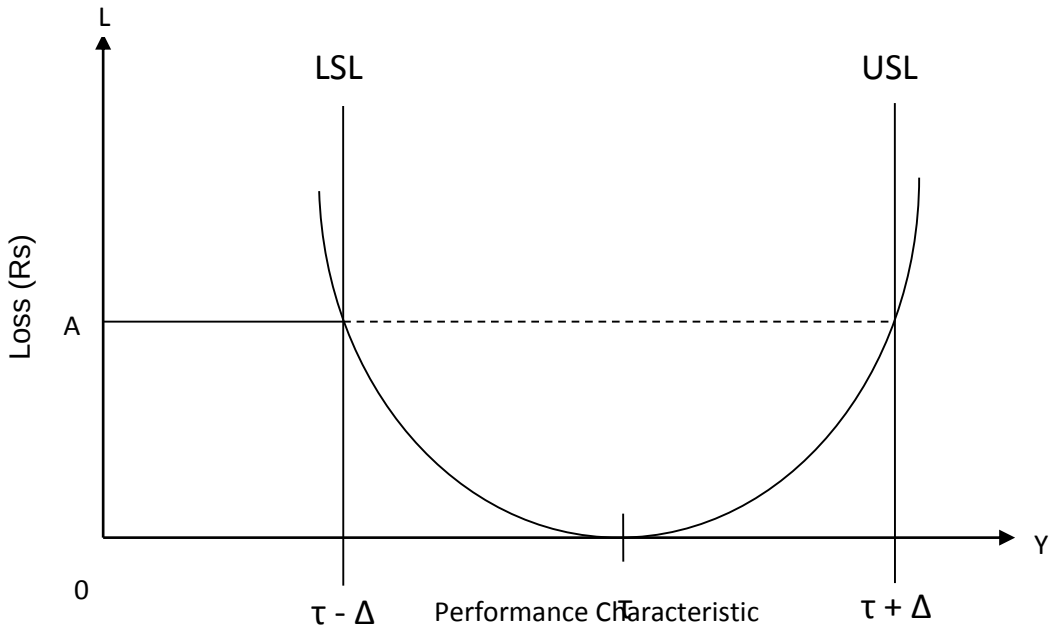
- CUSTOMERS PERCEIVE QUALITY AS MEETING THE TARGET RATHER THAN JUST MEETING THE SPECIFICATIONS.
  There are three common quality loss functions

1. Nominal - the - best.
2. Smaller - the - better.
3. Larger - the - better.

NOMINAL – THE – BEST :

Although Taguchi developed so many loss functions, many situations are approximated by the quadratic function which is called the **Nominal – the – best** type.

The quadratic function is shown in figure. In this situation, the loss occurs as soon as the



Quadratic Loss Function

performance characteristic, y, departs from the target τ.

At τ, the loss is Rs. 0.

At LSL (or) USL, the loss is Rs. A.

The quadratic loss function is described by the equation $L = k (y - \tau)^2$.

Where,

L = cost incurred as quality deviates from the target.

y = Performance characteristic

τ = target

k = Quality loss coefficient.

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

Thus,

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

SMALLER – THE – BETTER :

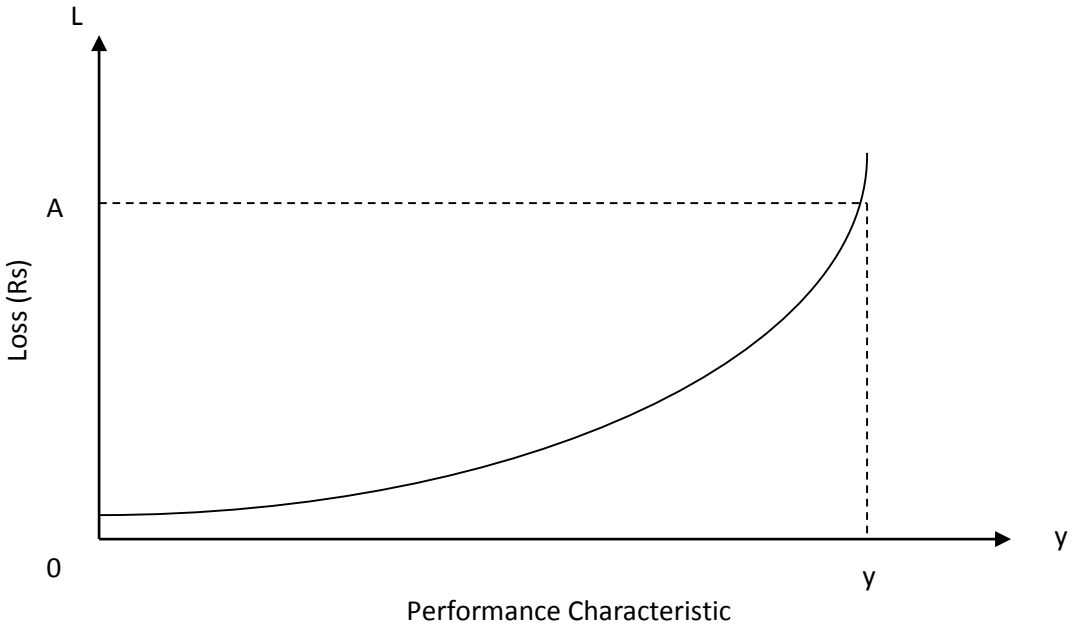
The following figure shows the smaller – the – better concepts.

The target value for **smaller – the – better** is 0. There are no negative values for the performance characteristic.

The radiation leakage from a microwave appliance, the response time for a computer, pollution from an automobile, out of round for a hole etc. are the performance characteristics for this concept.

LARGER – THE – BETTER :

The following figure shows the concept of the Larger – the – better.



Smaller-the-better

4. **Define TPM(Total Productive Maintenance). Explain in detail TPM steps.**

TPM in three words:

Total = All individuals in the organization working together.

Productive = production of goods that meet or exceed customer's expectations.

Maintenance = keeping equipment and plant in good condition at all times.

Why TPM:

- Avoid wastage in quickly changing economic environment.
- Producing goods with out reducing product quality.
- Reduce cost for production
- Produce a low batch quantity at the earliest time.
- Goods send to the customer must be non defective.

Principles of TPM

- Use Overall Equipment Effectiveness (OEE) as a compass for success.
- Improve existing planned maintenance systems
- Work toward zero losses
- Providing training to upgrade operations and maintenance skills
- Involve everyone and utilize cross-functional teamwork

Total Productive Maintenance (TPM) is defined as keeping the running plant and equipment at its highest productive level with the co-operation of all areas of the organization.

Predictive and Preventive maintenance are essential to building a foundation for a successful TPM environment. **Predictive Maintenance** is the process of using data and statistical

tools to determine when a piece of equipment will fail. **Preventive Maintenance** is the process of periodically performing activities such as lubrication on the equipment to keep it running.

OBJECTIVES OF TPM :

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

TPM PHILOSOPHY – CONCEPT OF TPM :

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

TPM has the following steps:

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

   Loss measurements to identify improvement needs are

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

5. Performance goals should be formulated.
6. An implementation plan should be developed.
7. Autonomous worth groups should be established.

5. What is FMEA?

FMEA is an analytical technique that combines the technology and experience of people in identifying foreseeable failure modes of a product or process and planning for its elimination.

FMEA is a "before-the-event" action requiring a team effort to easily and inexpensively alleviate changes in design and production.

It is a group of activities comprising the following:

1. Recognize the potential failure of a product or process.
2. Identify actions that eliminate / reduce the potential failure.
3. Document the process.

Two important types of FMEA are

- Design FMEA
- Process FMEA

6. What are the types of FMEA?

There are several types of FMEA : design FMEA, process FMEA, equipment FMEA, maintenance FMEA, concept FMEA, service FMEA, system FMEA, environmental FMEA, and others.

7. What Is A Failure Mode?

- A **Failure Mode** is:
  - The way in which the component, subassembly, product, input, or process could fail to perform its intended function
    - Failure modes may be the result of upstream operations or may cause downstream operations to fail
  - Things that could go wrong

Why

- Methodology that facilitates process improvement
- Identifies and eliminates concerns early in the development of a process or design
- Improve internal and external customer satisfaction
- Focuses on prevention
- FMEA may be a customer requirement
- FMEA may be required by an applicable Quality System Standard

INTENT OF FMEA:

- Continually measuring the reliability of a machine, product or process.
- To detect the potential product - related failure mode.
- FMEA evaluation to be conducted immediately following the design phase.

BENEFITS OF FMEA:

- Having a systematic review of components failure modes to ensure that any failure produces minimal damage.
- Determining the effects of any failure on other items.
- Providing input data for exchange studies.
- Determining how the high-failure rate components can be adapted to high-reliability components.
- Eliminating / minimizing the adverse effects that failures could generate.
- Helping uncover the misjudgments, errors etc.
- Reduce development time and cost of manufacturing.

8. Explain the methodology used for FMEA.

- **FMEA Procedure**

1. For each process input (start with high value inputs), determine the ways in which the input can go wrong (failure mode)
2. For each failure mode, determine effects
    - Select a severity level for each effect
3. Identify potential causes of each failure mode
    - Select an occurrence level for each cause
4. List current controls for each cause
    - Select a detection level for each cause
5. Calculate the Risk Priority Number (RPN)
6. Develop recommended actions, assign responsible persons, and take actions
    - Give priority to high RPNs
    - MUST look at severities rated a 10
7. Assign the predicted severity, occurrence, and detection levels and compare RPNs

- **FMEA Inputs and Outputs**

  - Severity, Occurrence, and Detection
  - Severity
    - Importance of the effect on customer requirements
  - Occurrence
    - Frequency with which a given cause occurs and creates failure modes
    - Detection
    - The ability of the current control scheme to detect or prevent a given cause

- **Rating Scales**
  - There are a wide variety of scoring "anchors", both quantitative or qualitative.
  - Two types of scales are 1-5 or 1-10
  - The 1-5 scale makes it easier for the teams to decide on scores
  - The 1-10 scale may allow for better precision in estimates and a wide variation in scores (most common)
  - **Rating Scales**
  - **Severity**
    - 1 = Not Severe, 10 = Very Severe
  - **Occurrence**
    - 1 = Not Likely, 10 = Very Likely
  - **Detection**
    - 1 = Easy to Detect, 10 = Not easy to Detect
  - Risk Priority Number (RPN)
  - RPN is the product of the severity, occurrence, and detection scores.

Summary

An FMEA:

- Identifies the ways in which a product or process can fail
- Estimates the risk associated with specific causes
- Prioritizes the actions that should be taken to reduce risk

9. Explain with an example Process FMEA document.

The basic philosophy behind process FMEA document is shown in the following document. Process FMEA is an analytical Technique utilized by a manufacturing Responsible Engineering Team as a means to assure that, to the extent possible, potential failure modes and associated causes /mechanisms have been considered and addressed.

The FMEA Form

Process/Product Failure Modes and Effects Analysis Form (FMEA)

Process or Product Name:		Prepared by:	Page ___ of ___
Responsible:		FMEA Date (Orig): _____ (Rev): _____	

Process Step / Input	Potential Failure Mode	Potential Failure Effects	SEVERITY	Potential Causes	OCCURRENCE	Current Controls	DETECTION	RPN	Actions Recommended	Resp.	Actions Taken	SEVERITY	OCCURRENCE	DETECTION	RPN
What is the process step and input under investigation?	In what ways does the Key Input go wrong?	What is the impact on the Key Output Variables (Customer Requirements)?		What causes the Key Input to go wrong?		What are the existing controls and procedures (inspection and test) that prevent either the cause or the Failure Mode?			What are the actions for reducing the occurrence of the cause, or improving detection?		What are the completed actions taken with the recalculated RPN?				
								0							0
								0							0
								0							0
								0							0
								0							0

Identify failure modes and their effects

Identify causes of the failure modes and controls

Prioritize

Determine and assess actions

Process or Product Name:	Using a Cell Phone	Prepared by: Ed the Expert	Page 1 of 1
Responsible:	Phyllis the Phone Owner	FMEA Date (Orig): February 22, 2006	(Rev): March 11, 2006

Process Step/Input	Potential Failure Mode	Potential Failure Effects	SEV	Potential Causes	OCC	Current Controls	DET	RPN	Actions Recommended	Resp.	Actions Taken	PSEV	POCC	PDET	PRPN
What is the process step/ Input under investigation?	In what ways does the key input go wrong?	What is the impact on the key output variables (customer requirements) or internal requirements?	How severe is the effect to the customer?	What causes the key input to go wrong?	How often does cause or failure mode occur?	What are the existing controls that prevent either the cause or the failure mode?	Can we detect failure before next step?		What are the actions for reducing the RPN. Should have actions only on high RPN's or easy fixes.	Who is responsible for the recommended action?	What actions have been taken and date completed?				
Make a call	Battery is dead	Can not make the call	7	Long calls on long drives	10	-Reminder beep -Battery symbol	7	490	Car phone charger	Phyllis		7	1	7	49
Make a call	Poor signal	Call interrupted with static	5	Out of phone range	3	-Antenna symbol -Stay in range	7	105	New phone service	Ed		5	1	7	35
Receive a call	Poor signal	Call interrupted with static	5	Out of phone range	3	-Antenna symbol -Stay in range	7	105	New phone service	Ed		5	1	7	35
Make a call	Battery is dead	Can not make the call	7	Bad battery will not hold charge	1	None	10	70				7	1	10	70
Receive a call	Battery is dead	Can not receive call	7	Bad battery will not hold charge	1	None	10	70				7	1	10	70
								0							0

FMEA TEAM:

Engineers from

- Assembly
- Manufacturing
- Materials
- Quality
- Service
- Supplier
- Customer

FMEA DOCUMENTATION:

The purpose of FMEA documentation is

- To allow all involved Engineers to have access to others thoughts
- To design and manufacture using these collective thoughts (promotes team approach)

MULTIPLE CHOICE QUESTIONS

Questions	opt1	opt2	opt3	opt4	answer
Benchmarking is a ……of searching out	Performance Measure	Continuous Improvement Process	Measure of Dispersions	Process Capability	Continuous Improvement Process
Benchmarking helps a company to achieve	Business and Competitive objectives	Supplier Selection	Relationship Development	Competitors Performance	Business and Competitive objectives
Benchmarking helps in setting goals and objectives by considering factors from	External Environment	Internal Environment	External and Internal Environment	none of the given options	External Environment
Benchmarking is time as well as cost effective because	using Existing technique	Inventing new ways of achieving the end result	Companies are actually imitating what their competitors have done	none of the given options	Companies are actually imitating what their competitors have done
Communicate the benchmarking findings to the	employees	Managers	Management	Suppliers	employees
Initiater of Quality function deployment	Robert Camp	Dr.D.Clausing	D.T.Kearns	Dr.Mizuno	Dr.Mizuno
The objective of quality function deployment is	To understand the customer requirements	To translate the voice of customer in the product	To make the system robust in design to achieve customer satisfaction in totals	All of the given options	All of the given options

QFD is systematic and structured planning tool which is used to convert the voice of the customers in to appropriate	Quality Product	Technical Requirement	Quality Product & Technical Reqyurement	none of the given options	Technical Requirement
QFD objective is achieved by companies by incorporating the voice of the customers in to	Process planning process	Product Planning Process	Parts development Process	Production Development Process	Product Planning Process
QFD helps in removing the	Product Error	Process Error	Design Error	Quality Error	Design Error
Once QFD is implemented then the amount of time and money spend on…….&……..	Rework and Modification	Rejection and rework	Redesigning and modification	Rejection and Modification	Redesigning and modification
QFD starts with	Market Research	Product Research	Product Research	Product Quality	Market Research
The first and foremost planning tool used in QFD is the	Quality In House	House of quality	quality houses	relationship matrix	House of quality
The rating will give an idea about ability of a company to implement the particular	Technical Descriptor	Tools	Technical Descriptor and Tools	Technical Descriptors and tools	Technical Descriptor
Absolute weight of each technical descriptor can be found out by	Product of the corresponding row values	Product of the corresponding row values	Product of the corresponding diagonal values	none of the given options	Product of the corresponding row values
Quality Loss Function concept was introduced by	Dr.Taguchi	Dr.D.Clausing	D.T.Kearns	Dr.Mizuno	Dr.Taguchi
Factors that contribute to societal loss is	Product not meeting the customer requirement	Does not function in the ideal way it has to do	Produces harmful side effects	All of these	All of these
The quadratic loss function is given by the following equation	L=k(y-ɔ)	L=k(y-ɔ)4	L=k(y-ɔ)2	L=k(y-ɔ)8	L=k(y-ɔ)2

In OEE Calculation, the Plant and machinery existance is measured by	Availability	Performane	Usability	Qulaity rate	Availability
Objective of carrying out TPM is	Maintaining the equipment in condition till the life of the equipment	Improving the capacity of the equipment	Continuous Improvement	All of the given options	All of the given options
The successful implementation of TPM depend on how good the	Employees is getting data from Top level management	Top level management is in getting data from employees	Employees is getting data from Top level management & Top level Management is in getting data from employees.	none of the given options	Top level management is in getting data from employees
The first step in achieving TPM is to give more decision making power to the	Employees in production & Maintenance Department	Maintenance Department	Production	Management	Employees in production & Maintenance Department
In TPM Training starts with	Employee	Managers	Top level Management	Both a&b	Top level Management
Factors contribute to Production Loss are	Down Time Losses	Losses due to slow speed	Loss due to poor quality	All of the given options	All of the given options
The factor come under Planned down time loss	Start up loss	Due to lack of raw material	Loss due to change in speed	Due to poor quality	Due to poor quality
Down time loss can be found out using formula	EA=(To/Tpo)×100	EA=To/100	EA=Tpo/100	EA=(To+Tpo)/100	EA=(To/Tpo)×100

Losses due to slow speed can be calculated by using	PE=(C×N/To)×100	PE=C×100	PE=N×100	PE=To×100	PE=(C×N/To)×100
Loss due to poor quality can be measured by	Q=(N-R/N)×100	Q=N×100	Q=R/N×100	Q=N-R×100	Q=(N-R/N)×100
FMEA Means	Failure Mode and Effect Analysis	Failure Model and Effect Analysis	Failure Method And Effect Analysis	none of the given options	Failure Mode and Effect Analysis
Most powerful method available for measuring the reliability of the process or Product is	FMEA	SPC	taguchi	Both FMEA and SPC	Both FMEA and SPC
FMEA attempts to find out the potential	Process Related Failure	Product related Failure	Process Related Failure & Product related failure	none of the given options	Product related Failure
FMEA uses ……..&……criteria in combination with severity criteria to develop risk prioritization of corrective action	Occurrence	Occurrence and detection Probability	detection	none of the given options	Occurrence and detection Probability
FMEA is an Important step in …….& Preventing problem that may occur in manufacturing process	defraging	Debugging	bugging	matrix	Debugging
……..should be carried out as soon as failure is identified	creative action	sudden reaction	none of the given options	Corrective action	Corrective action

FMEA also allows the engineers to document all the thoughts and actions carried out to ensure a …….&…….Product	safe	reliable	safe & Reliable	none of the given options	safe & Reliable
……..helps in determining the impact of why failure on other items in the product or process	FMEA	SPC	FMEA & SPC	none of the given options	FMEA
Total Product Maintenance has 5 goals which of the following is not a goal of TPM	Maximize equipment effectiveness.	Develop a system of productive maintenance for the life of the equipment,	Maximize The product Quality	Actively involve all employees	Maximize The product Quality
Cost of dissatisfaction, repair cost and warranty cost are elements of cost in the	Taguchi Loss Function	Pareto chart	ISO 9000 Quality	Process Chart	Taguchi Loss Function
Taguchi Quality loss function is based on a	Linear Equation	Binomial Distribution	Quadratic Equation	Negative Exponential Distribution	Negative Exponential Distribution
The Taguchi method include three major concept these includes all of the following except	Quality Loss Function	Quality Robustness	Target oriented quality	Employee Involvement	Employee Involvement
Quality function deployment refer to	Making design decision Concurrently	Improving quality with in the function	Improving Quality	All of the given options	All of the given options

The loss function of taguchi depends up on the nature of quality characteristics and classified as	Normal the Best	Smaller the better	Larger the better and percentage	All of the given options	All of the given options
QFD is the method to ensure quality by	incorporating the customer requirements	incorporating the Design changes	incorporating the process changes	None of the above	incorporating the customer requirements
The house of quality is a matrix for QFD and the component of the house is	Quality customer service	Product characteristics	Technical evaluation	All of the given options	All of the given options
The voice of customer for product development will includes	Product planning	Part development	Process planning	All of the given options	All of the given options
QFD benefits includes	Customer Driver	Promotes team work	Provide documentation	All of the given options	All of the given options
Genichi Taguchi introduces for quality is	Team work of employee	Inspection method	Assign value and tolerance for product and process	None of the given options	Assign value and tolerance for product and process
Taguchi's method have the approach of	System design	Parameter design	Tolerance design	All of the given options	All of the given options
The symbols to represent the degree of relationship between the customer requirement and technical descriptors is	A solid circle	A single circle	A triangle	All of the given options	All of the given options
In techniques of quality function the FMEA refers to	failure mode effect analysis	failure Model Effect Analysis	failure mode ensure analysis	none of the given options	failure mode effect analysis
The design FEMA identifies	EXPECTED FAILURE MODE	KNOWN FAILURE MODE	KNOWN AND EXPECTED FAILURE MODE	None of the given options	KNOWN AND EXPECTED FAILURE MODE

The process of FEMA identifies	EXPECTED FAILURE MODE	KNOWN FAILURE MODE	POTENTIAL FAILURE MODE	None of the given options	POTENTIAL FAILURE MODE
The stages in analyzing FEMA is	specify the possibility of failure	quantity of risk of failure	Correcting high risk cause	All of the given options	All of the given options
FMEA is a …….. technique	Analytical	graphical	Analytical & Graphical	None of the given options	Analytical

UNIT V
QUALITY AND ENVIRONMENT SYSTEMS

1. **Give an overview and evolution of of IS 9000 series of standards.**

The International Organization of Standardization (ISO) was founded in 1946 in Geneva, Switzerland. The development of International Standards is to facilitate the exchange of goods and services worldwide. ISO consists of more than 90 country members.

The ISO Technical Committee (TC) developed a series of International Standards for Quality Systems, which were first published in 1987. The standards (**ISO 9000, 9001, and 9004**) were intended to be advisory and developed for use in **two-party contractual situations** and **internal auditing**.

These standards were adopted by European Community and have been accepted worldwide with emphasis on quality and economic competitiveness.

The fourth edition of ISO 9001 was released in the year 2008 and it replaces the third edition (ISO9001: 2000), which have been amended to clarify the points in the text and also to enhance the compatibility with ISO 14001: 2004.

Most countries have adopted ISO 9000 series as their national standards.

2. **Explain briefly the scope and purpose of ISO 9000 Series standards.**

The ISO 9000 series Standards is generic in scope. By design, the series can be tailored to fit any organization‘s needs. Whether it is large or small, a manufacturer or a service organization. It can be applied to construction, engineering, health care, legal, and other professional services as well as the manufacturing of anything from nuts and bolts to spacecraft. Its purpose is to unify quality terms and definitions used by industrialized nations and use those terms to demonstrate the supplier’s capability of controlling the processes.

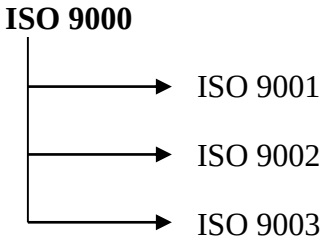
In very simplified terms, the standards require an organization to say what it is doing to ensure quality, then do what it says, and, finally document or prove that it has done what it said.

3. **Briefly describe the ISO 9000 Series of Standards.**

ISO 9000: 2005 - Quality Management Systems (QMS) – Fundamentals and Vocabulary discusses the fundamental concepts related to QMS and provides the terminology used in the other two standards.

***ISO 9001:* 2008 – Quality Management Systems (QMS) –** Requirements is the standards used registration by demonstrating conformity of the QMS to customers, regulatory and organization's own requirements.

ISO 9004: 2000- Quality Management Systems (qms) – *GUIDELINES FOR PERFORMANCE IMPROVEMENT* provides guidelines that an organization can use to establish a QMS focused on improving performance.



ISO 9001

Design, Development, Production, Installation & Servicing

ISO 9002

Production, Installation & Servicing

ISO 9003

Inspection & Testing

ISO 9004

Provides guidelines on the technical, administrative and human factors affecting the product or services.

BENEFITS OF ISO 9000 STANDARDS:

- Achievement of international standard of quality.
- Value for money.
- Customer satisfaction.
- Higher productivity.
- Increased profitability
- Improved corporate image
- Access to global market
- Growth of the organization
- Higher morale of employees

CLAUSES (ELEMENTS) OF ISO 9000 (During the year 1987)

1. Management Responsibility
   - Adequate resources for the verification activities
   - Need for trained personnel
   - Work and verification activities including audits
   - A Management Representative to be identified
   - Review the Quality System performance and customer complaints periodically

2. Quality System
3. Contract review
4. Design Control
5. Documents Control
6. Purchasing
7. Purchaser – Supplied Product
8. Product Identification and Traceability
9. Process Control
10. Inspection and Testing
11. Inspection Measuring and Test Equipment
12. Inspection and Test Status
13. Control of Non – Conforming Product
14. Corrective Action
15. Handling, Storage, Packaging and Delivery
16. Quality Records
17. Internal Quality Audits
18. Training
19. Servicing
20. Statistical Techniques

CLAUSES (ELEMENTS) OF ISO 9000 (During the year 2000)

I. Scope
II. Normative Reference
III. Terms and Definitions
IV. Quality Management System (QMS)
   - ❖ General Requirements
   - ❖ Documentation

V. Management Responsibility
   - ❖ Management Commitment
   - ❖ Customer Focus
   - ❖ Quality Policy
   - ❖ Planning
   - ❖ Responsibility, Authority and Communication
   - ❖ Management Review

VI. Resource Management
   - ❖ Provision of Resources
   - ❖ Human Resources
   - ❖ Infrastructure
   - ❖ Work Environment

VII. Product Realization
   - ❖ Planning of Product Realization
   - ❖ Customer related processes
   - ❖ Design and Development
   - ❖ Purchasing
   - ❖ Production and Service Provision
   - ❖ Control of Monitoring and Measuring devices

VIII. Monitoring and Measurement
- ❖ General
- ❖ Monitoring and Measurement
- ❖ Control of Non-Conforming Product
- ❖ Analysis of Data
- ❖ Improvement

4. Discuss in detail the steps that are necessary to implement a Quality Management System.

IMPLEMENTATION OF QUALITY MANAGEMENT SYSTEM :

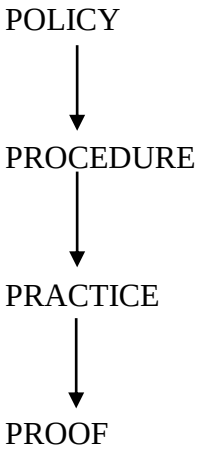
1. Top Management Commitment
2. Appoint the Management Representative
3. Awareness
4. Appoint an Implementation Team
5. Training
6. Time Schedule
7. Select Element Owners
8. Review the Present System
9. Write the Documents
10. Install the New System
11. Internal Audit
12. Management Review
13. Pre-assessment
14. Registration

PITFALLS OF SUCCESSFUL IMPLEMENTATION:

1. Using a generic documentation program or another organization's documentation program
2. Over-documentation or documentation that is too complex
3. Using External Consultants without involvement
4. Neglecting to obtain top management's involvement
5. Developing a system that does not represent what actually occurs

DOCUMENTATION

In every organization, the quality system must be documented properly. The documentation of the system can be seen as a hierarchical format as shown.



5. What are Quality Audits? Explain in detail the types of audits.

Quality Audit

Systematic, independent and documented process for obtaining audit evidence and evaluating it objectively to determine the extent to which audit criteria are fulfilled.

Types of audit

- 3 types
  - **Process audits**
  - **Product audits**
  - **System audits**

Process audits

- Evaluation of the content and effectiveness of specific processes and work activities
- To confirm the process parameters and improve capability of the process
- To ensure the realization of process quality characteristics
- To ensure improvement of process control during service provision
- Product audits

-To identify opportunities for improvement to establish the quality level of units before final inspection and testing

-To establish the capability of the inspection function

-To determine the usefulness of inspection/tests

- Audits are distinguished by the party requesting:
- 1st party audit (internal audits) – the auditee audits its own quality system according to a quality standard.
- 2nd part audits (supplier audits) – the customer audits the supplier's quality system
- 3rd party audits – these are external certification audits by an independent institution in order to certify the quality system

Products audits

Investigation of products conformance to specified characteristics

-To obtain additional neutral assessment of product's level of quality

-To obtain additional assurance that specified quality requirements are met

System audits

- Evaluation all the elements of the quality system in order to:-
- Verify usefulness, suitability and effectiveness
- Verify adequate documentation
- Verify compliance with requirements
- Determine weak points

Purpose of audits

- Registration / certification audit
- Verify that the organization's QMS meet the requirements of ISO 9001 : 2000

Internal audit

- Identify opportunities for improvement
- Maintain ISO 9001 certification

6. What are the objectives of internal audit?

Objectives of the internal audit

- To verify conformance to applicable standards
- To verify conformance to documented procedures
- To verify effectiveness of the processes in the system
- To identify opportunities to improve the system
- Creating and environment for successful audits (1)

7. Discuss in detail the purpose of Quality Auditing.

QUALITY AUDITING

The term Audit refers to a regular examination and checking of accounts or financial records, settlement or adjustment of accounts.

It also refers to checking, inspection and examination of Production Processes.

PURPOSE OF QUALITY AUDIT:

- To establish the adequacy of the system.
- To determine the effectiveness of the system.
- To afford opportunities for system analysis.
- To help in problem solving.
- To make decision making easier etc.

TYPES OF QUALITY AUDIT:

1. First – Party Audit.
2. Second – Party Audit.
3. Third – Party Audit.

Quality audit can also be classified on the basis of the area taken into account for the audit such as

- System Audit.
- Process Audit.
- Product Audit.
- Adequacy Audit.
- Compliance Audit.

8. Discuss the evolution of ISO 14000, the Environmental Management Systems (EMS).

ISO 14000 – ENVIRONMENTAL MANAGEMENT SYSTEM (EMS)

The overall aim of the Environmental Management systems is **to provide protection to the environment** and **to prevent pollution.**

- The success of ISO 9000 along with increased emphasis on Environmental issues were instrumental in ISO's decision to develop Environmental Management Standards.
- In 1991, ISO formed the Strategic Advisory Group on the Environment (SAGE) which led to the formation of Technical Committee (TC) 207 in 1992.
- Mission of TC207 is to develop standards for an Environmental Management System (EMS) which was identified as ISO 14000.
- TC 207 has Established six sub-committees
    - Environmental Management System (EMS)
    - Environmental Auditing (EA)
    - Environmental labeling (EL)
    - Environmental Performance Evaluation (EPE)
    - Life-Cycle Assessment (LCA)
    - Terms & Definitions

Environmental Management System (EMS):

EMS has two Evaluation Standards. They are

1. Organization Evaluation Standards
2. Product Evaluation Standards

REQUIREMENT OF ISO 14001

There are six elements

1. **GENERAL REQUIREMENTS**
   - EMS should include policy, planning implementation & operation, checking & corrective action, management review.
2. **ENVIRONMENTAL POLICY (Should be based on mission)**
   - The policy must be relevant to the organization's nature.
   - Management's Commitment (for continual improvement & preventing pollution).
   - Should be a framework (for Environmental objectives & Targets).
   - Must be Documented, Implemented, & Maintained.
3. **PLANNING**
   - Environmental Aspects
   - Legal & other Requirements
   - Objectives & Targets
   - Environmental Management Programs
4. **IMPLEMENTATION & OPERATION**
   - Structure & Responsibility
   - Training, Awareness & Competency
   - Communication
   - EMS Documentation
   - Document Control
   - Operational Control
   - Emergency Preparedness & Response
5. **CHECKING & CORRECTIVE ACTION**
   - Monitoring & Measuring
   - Nonconformance & Corrective & Preventive action
   - Records
   - EMS Audit
6. **MANAGENMENT REVIEW**
   - Review of objectives & targets
   - Review of Environmental performance against legal & other requirement
   - Effectiveness of EMS elements
   - Evaluation of the continuation of the policy

9. Discuss in detail ISO 14000 series standards , its scope, concepts and steps in its implementation.

ISO 14000: Environmental Standards

ISO 14000

The International Organization for Standards published its Quality Management System (ISO9000) in 1987. ISO9000 became an instant worldwide success.

In 1991, ISO formed **Strategic Advisory Group** on the **Environment (SAGE)**. The purpose of formation of this group was worldwide increase in emphasis of management of environmental issues a part of quality management systems. This group proposed the formation of Technical Committee to develop standards that deal with environmental management system. This technical committee, TC 207 developed the standards called ISO14000.

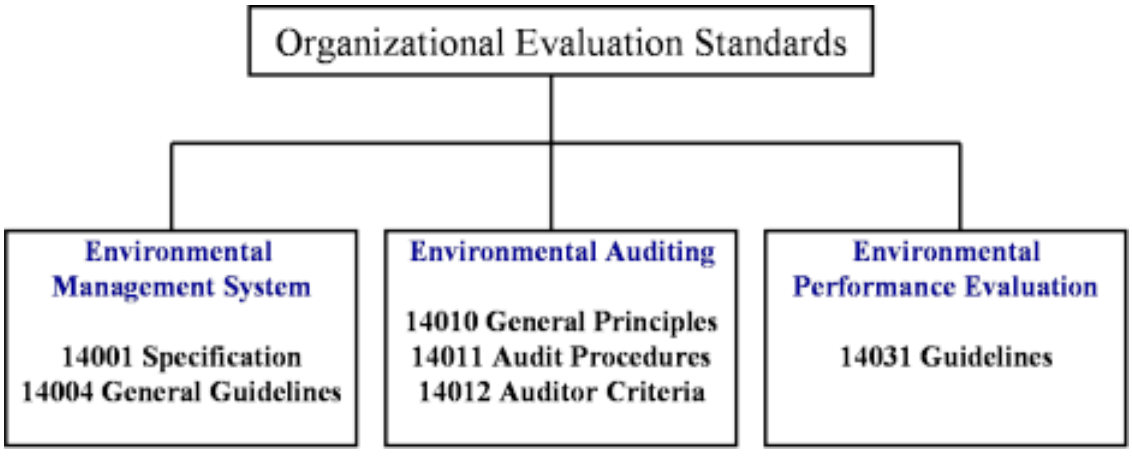
The EMS is part of a comprehensive management system that addresses with the overall business activities, including its products and services, affect the environment.

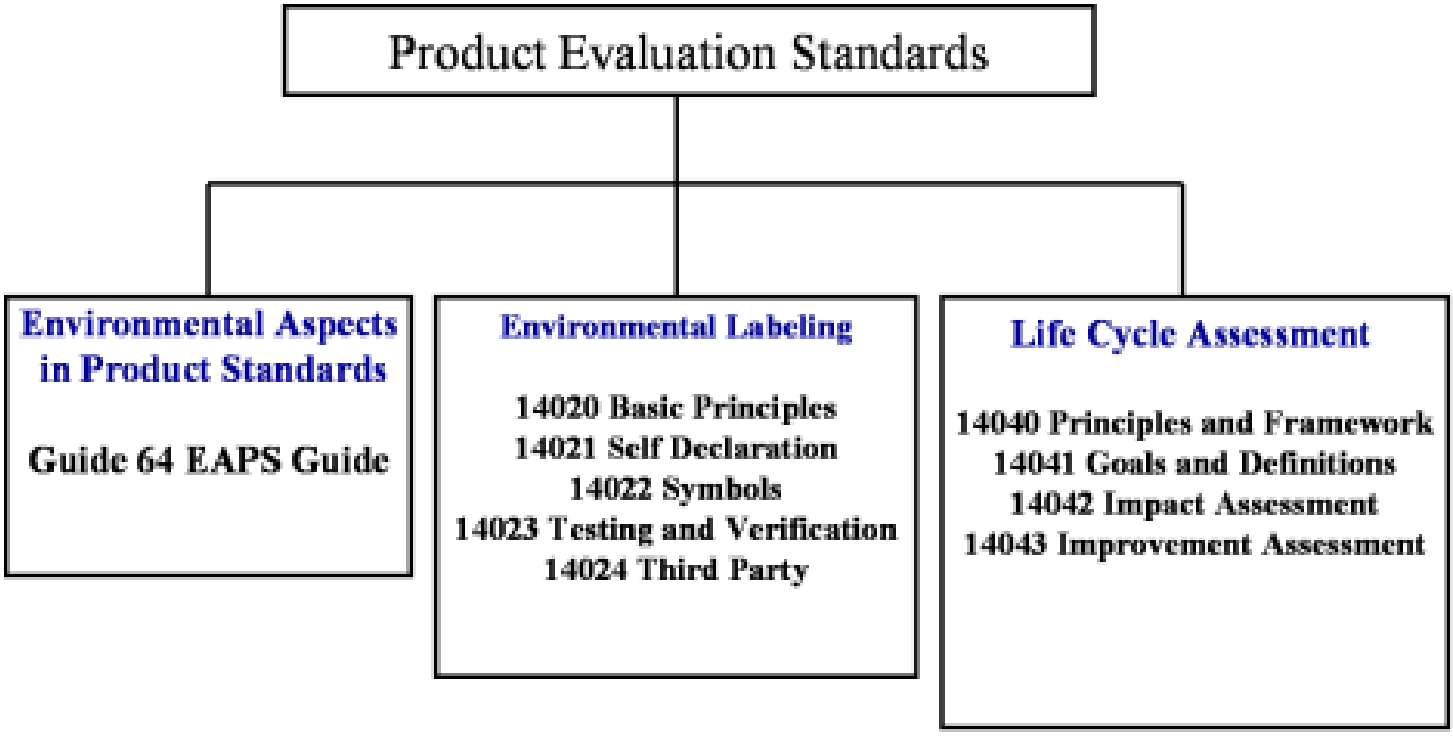
ISO14000 Series Standards

ISO14000 is a generic standard. When we state the term generic, we mean that- like ISO9000-it is not an industry specific standard.

The series is divided into two separate areas-the organization evaluation standards and the product evaluation standards. The first deals with Environmental Management System (EMS), Environmental Auditing (EA), and Environmental Performance Evaluation (EPE), whereas later deals with Environmental Aspects in Product Standards (EAPS), Environmental Labeling (EL), and Life-Cycle Assessment (LCA).

See following figures to understand the division of standards as mentioned above:



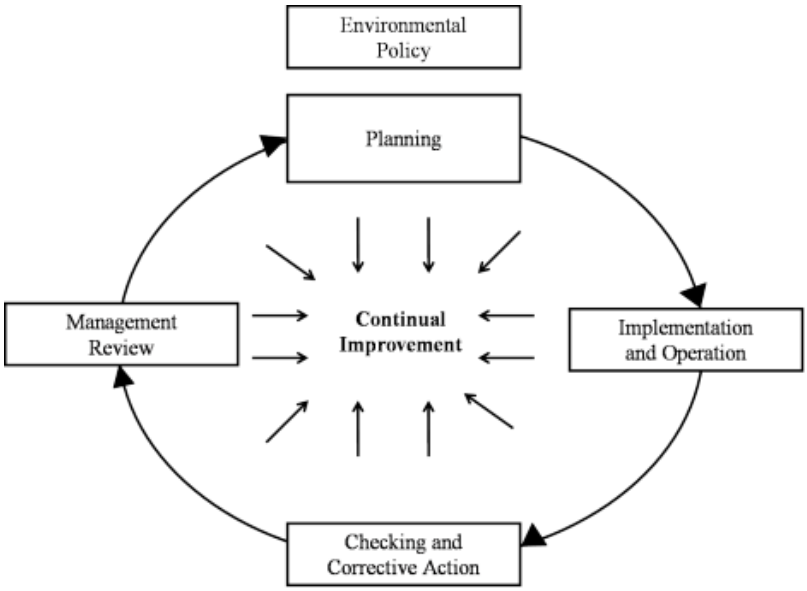


Concepts of ISO 14001:2004 Standards

In this post we will particularly discuss ISO 14001:2004 because this standards is the heart of all the environmental standards. This standard provides organizations with the elements of for an environmental systems, which can be integrated into other management systems to help achieve environmental and economic goals.

This standard provide guidelines for registration and/or self-declaration of the organization's environmental management systems. This standard is written in a manner that it can be applicable to all types and sizes of organizations. This standard is also capable to accommodate diverse geographical, cultural, and social conditions.

The demonstration of successful implementation of the system can be used to assure other parties that an appropriate EMS is in place. The basic approach to Environmental System can be understood with the help of following diagram:



Environmental Management System Model

ISO 14001:2004 works as follows:

- As stated earlier in this post that ISO14000 is generic in nature. It does not intend to specify the level of environmental performance of an organization. If that had been the case, ISO would have written it according to the specific activity of each business.
- However, ISO has developed many other environmental standards that deal with specific environmental standards. These standards are beyond the scope of ISO14001:2004 standards at the moment.
- ISO14001:2004 provide a framework to the organizations so that they could communicate about EMS matters with the other stakeholders including customers, environmental regulators, the public and so forth.
- It also provides framework to the organizations-irrespective of their current level of environmental maturity-to remain committed for environmental management and its continual improvement as well.

10. What are the benefits of EMS?

BENEFITS OF ENVIRONMENTAL MANAGEMENT SYSTEM :

GLOBAL BENEFITS

- Facilitate trade & remove trade barrier
- Improve environmental performance of planet earth
- Build consensus that there is a need for environmental management and a common terminology for EMS

ORGANIZATIONAL BENEFITS

- Assuring customers of a commitment to environmental management
- Meeting customer requirement
- Improve public relation
- Increase investor satisfaction
- Market share increase
- Conserving input material & energy
- Better industry/government relation
- Low cost insurance, easy attainment of permits & authorization.

MULTIPLE CHOICE QUESTIONS:

Questions	opt1	opt2	opt3	opt4	answer
ISO is only responsible for ……&…….. International Standards	Creating and publishing	creating but not publishing	publishing	None of the given options	Creating and publishing
ISO 9000 is not a …….registration	Product	bi-product	Product & biproduct	None of the given options	Product
ISO 9000 standards ……..Basically have ……requirements	two	three	four	All of the given options	three
ISO 9000 audit system include first party audit and ……audit	first party audit	second party audit	Third Party Audit	All of the given options	Third Party Audit
First Party Audit is performed…… by trained person	Internally	Externally	none of the given	both internally and externally	Internally
Second party audit which are performed by a customer at a……. location	partners	suppliers	customers	None of the given options	suppliers
Inherent in ISO 9000 standard is concept of a …….contractual relationship	Two-party	third party	both a&b	None of the given options	Two-party
ISO 9000 provides a foundation and complementary approach to quality by focusing on ……documentation and maintenance of appropriate records	Process	cycle	circular	regular	Process

The Standards by foundation for TQM program by concentrating on	Implementing Quality Controls	Documenting various process and procedures	Ensuring that the appropriate quality emphasis is established and followed	All of the given options	All of the given options
ISO registration brings	Better Documentation	Greater Quality	Positive Cultural Change	All of the given options	All of the given options
Document and data control standards require a system of	Document Revision	Document Distribution	Removal of obsolete documents	All of the given options	All of the given options
Which one is not a ISO series	ISO 9000:2000	ISO 9001:2000	ISO 9002:2000	ISO 9004:2000	ISO 9002:2000
TL 9000 quality system came out for	Telecommunication Industry	Oil industry	sugar industry	foundry	Telecommunication Industry
Which is not a environmental auditing standards	14031	14010	14011	14021	14031
IS 14004 entitled EMS for	General Guidelines	Specification	Audit Procedures	Auditor Criteria	General Guidelines
Quality Management System Deals	Ensuring quality of outgoing product	Ensuring maintenance free of machine	Reducing the lead time of process	None of the given options	Ensuring quality of outgoing product
A good Quality Management System consist of	Well defined organisation structure	Resources for ensuring quality	Responsibilities for process	All of the given options	All of the given options
ISO stands for	International standards organisation	International organisation for standards	Indian organisation for standards	None of the given options	International organisation for standards
International organisation for standards was funded in the year	1970	1946	1990	1975	1946
ISO was founded in the year 1946in	Japan	USA	Geneva, Switzarland	India	Geneva, Switzarland

BIS refers to	Bureau of International standards	British information system	Bureau of Indian standards	None of the given options	Bureau of Indian standards
The structure of ISO 9000-2000 consists of	ISO 9000-2000	ISO 9001-2000	ISO 9004-2000	All of the given options	All of the given options
In 9000-2000 Describes the	QMS-Fundamentals and vocabulary	QMS-Requirements	QMS-Guidance for performance improvement	All of the given options	QMS-Fundamentals and vocabulary
In 9001-2000 Describes the	QMS-Fundamentals and vocabulary	QMS-Requirements	QMS-Guidance for performance improvement	All of the given options	QMS-Requirements
In 9004-2000 Describes the	QMS-Fundamentals and vocabulary	QMS-Requirements	QMS-Guidance for performance improvement	All of the given options	QMS-Guidance for performance improvement
Elements of ISO 9000-2000 includes	Scope, terms and definitions	Quality management system	Management responsibility	All of the given options	All of the given options
Elements of ISO 9000-2000 also includes	Resource management	Product realization	Measurement, analysis and improvement	All of the given options	All of the given options
The quality management system documentation includes	Quality policy and objectives	Documented procedure required by ISO 9000	Document needed to ensure effective, planning and operations	All of the given options	All of the given options
The organisation establishes and maintains quality manual that includes	the scope of QMS	Document procedure	Interaction between the process of QMS	All of the given options	All of the given options
The management commitment in QMS includes	Establishing quality policy	Establishing quality objects	Conducting management reviews	All of the given options	All of the given options

The input to management review includes	Results of audits	Customer feed back	Recommendations for improvements	All of the given options	All of the given options
The output from the measurement review includes	Improvement of QMs	Improvement of product related to customer requirements	Resource needs	All of the given options	All of the given options
The infrastructure needed to achieve conformity to product includes	Building and workplace	Process equipments	Supporting services	All of the given options	All of the given options
The implementation of a quality system ISO 9000-2000 requires	Top management commitment	Appoint the management representative	Awareness	All of the given options	All of the given options
In implementation ISO 9000-2000 it also includes	Training and time schedule	Review the present systems	Preparation of the document	All of the given options	All of the given options
The slogan “whatever you do, Document it. Whatever you document Do it”. refers to	QMS	TQM	ISO	TPM	ISO
The system documentation can be classified as	Policies	procedures	Work instructions and records	All of the given options	All of the given options
The objectives of quality audits includes	To provide an opportunity to improve the quality system	To meet the statutory requirements	To provide an guidance for the all electiveness of the quality system	All of the given options	All of the given options

The audits can be classified into	System audit	Process and product audit	Compliance audit	All of the given options	All of the given options
The benefits of ISO 9000& ISO 14001 includes	Increase income revenues	Improved quality	Improved supply schedules	All of the given options	All of the given options
The ISO/TS 16949 will be applicable to	Machine tool suppliers	Farm machinery suppliers	Automotive suppliers	None of the given options	Automotive suppliers
The ISO 14000 family is primarily concerned with	Marketing management	Quality management	Environmental management	Industrial	Environmental management
Benefits of ISO 14000 can be categorized as	Global benefits	Organizational benefits	Economical benefits	All of the given options	All of the given options
In ISO 14000- Economical benefits includes	Reduce Raw materials	Reduce energy consumption	Improved efficiency	All of the given options	All of the given options
The equivalent Indian standard for ISO 8402 is	IS 13999	IS 14000	IS 14001	IS 14011	IS 13999
The loss function of taguchi depends upon the nature of quality characteristics and classified as	Normal the best	Smaller the better	Larger the better and percentage	All of the given options	All of the given options
The series of ISO 14000 are designed to	Environmental Management system	Environmental Auditing	Environmental Performance Evaluation	All of the given options	All of the given options

Documents to be prepared by most organization in quality system	Quality policy Manual	Quality system Procedures	Work Instructions	All of the given options	All of the given options
Which is not a stage of an audit	Audit Planning	Audit Performance	Audit Reporting	Audit Check	Audit Check
The terminologies used in ISO 14000 Standards	Environment Aspects	Environmental Impact	Environmental Objective	All of the given options	All of the given options
……..covers terms and definition that are common to both organization and product areas	ISO 14001	ISO 14050	ISO 14011	ISO 14004	ISO 14050
ISO /TS 16949 certification is applicable only for	Aerospace suppliers	Marine suppliers	Food industry suppliers	Automotive suppliers	Automotive suppliers
In ISO 9000 the Eighth clause is applicable for	Normative reference	Resorce management	Measurement ,Analysis and improvement	Product and service realization	Measurement ,Analysis and improvement
Purchase peocess in ISO9000 indicated in --------- Clause.	7.1.9	7.6	7.4	7.1.3	7.4