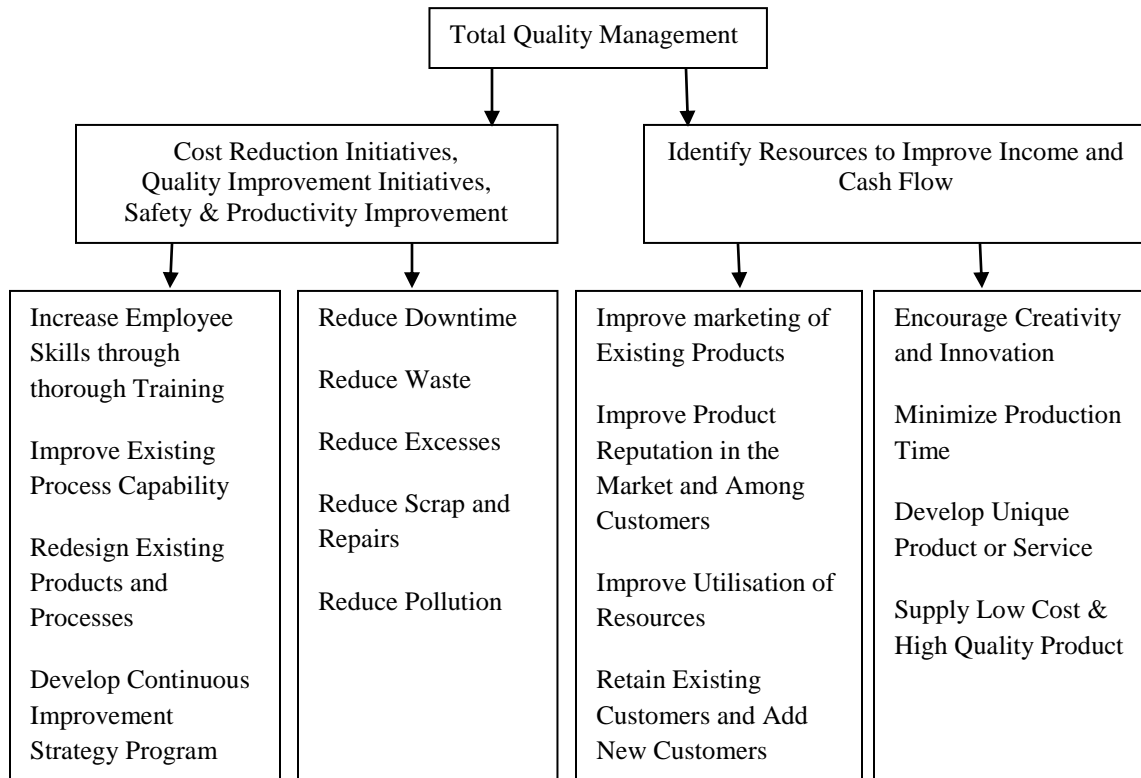


A Smart Impact of Total Quality Management on Continuous Improvements of Ventures & the Century

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Abstract- Total Quality Management is defined as a continuous effort by the management as well as employees of a particular organization to ensure long term customer loyalty and customer satisfaction. Remember, one happy and satisfied customer brings ten new customers along with him whereas one disappointed individual will spread bad word of mouth and spoil several of your existing as well as potential customers. Quality can be measured in terms of durability, reliability, usage and so on. Total quality management is a structured effort by employees to continuously improve the quality of their products and services through proper feedbacks and research. Every individual who receives his/her paycheck from the organization has to contribute equally to design processes and systems which would eventually ensure superior quality of products and services. Total Quality management is indeed a joint effort of management, staff members, workforce, suppliers in order to meet and exceed customer satisfaction level. William Edwards Deming, Joseph M. Juran, and Armand V. Feigenbaum jointly developed the concept of total quality management. Total Quality Management originated in the manufacturing sector, but can be applied to almost all organizations. The following chart shows the tree diagram for effects of TQM:



I. TOTAL QUALITY MANAGEMENT

1. Quality refers to a parameter which decides the superiority or inferiority of a product or service. Quality can be defined as an attribute which differentiates a product or service from its competitors. Quality plays an essential role in every business.

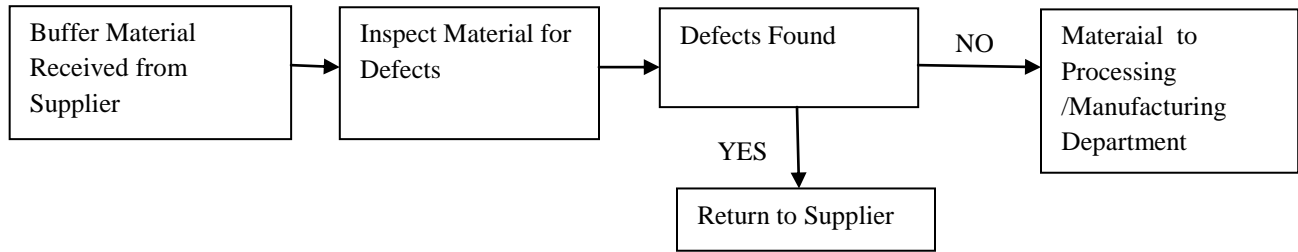
2. Total quality management ensures that every single employee is working towards the improvement of work culture, processes, services, systems and so on to ensure long term success.
3. It is a measure of goodness to understand how a product meets its specifications.
4. Usually, when the expression “quality” is used, we think in the terms of an excellent product or service that meets or even exceeds our expectations.
5. These expectations are based on the price and the intended use of the goods or services. In simple words, when a product or service exceeds our expectations we consider it to be of good quality.

1.1. Definition Of Tqm

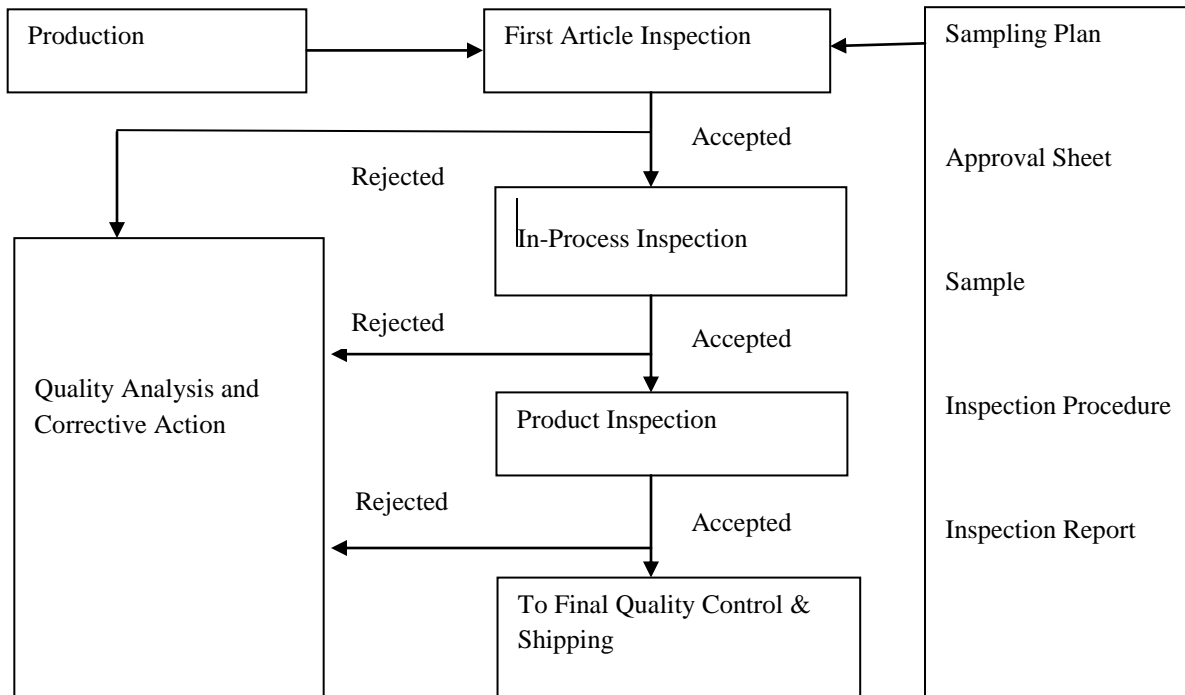
1. Total Quality Management is defined as a customer-oriented process and aims for continuous improvement of business operations. It ensures that all allied works (particularly work of employees) are toward the common goals of improving product quality or service quality, as well as enhancing the production process or process of rendering of services.
2. The concept of TQM states that every employee works towards the improvement of work culture, services, systems, processes and so on to ensure a continuing success of the organization.
3. TQM is a management approach for an organization, depending upon the participation of all its members (including its employees) and aiming for a long-term success through customer satisfaction.
4. TQM approach is beneficial to all members of the organization and to the society as well.
5. Total Quality Management is an extensive and structured organization management approach that focuses on continuous quality improvement of products and services by using continuous feedback.
6. Total quality management originated in the industrial sector of Japan (1945), Korea, China, Phillipines, Singapore, Saudi Arabia, Indonesia, UAE, USA, UK, Canada, Russia, Portugal, Germany, France, Spain, Greece, Mexico, El Salvador, Cuba, Peru, Venezuela, Bolivia, Argentina, Chile, Columbia, Australia, New Zealand, Egypt, Ghana, Tanzania, Nigeria, Ethiopia, Kenya, South Africa etc., Since that time the concept has been developed and can be used for almost all types of organizations such as schools, automobiles, hospitals, hotel management and churches.
7. Nowadays, Total Quality Management is also used within the e-business sector, and the objective of total quality management is doing things right the first time over and over again.
8. Total Quality Management can be set up separately for an organization as well as for a set of standards that must be followed- for instance the International Organization for Standardization (ISO) in the ISO 9000 series.
9. Total Quality Management uses strategy, data and communication channels to integrate the required quality principles into the organization’s activities and culture.
10. Total Quality Management is a management framework based on the belief that an organization can build long-term success by having all its members, from low-level workers to its highest ranking executives, f focus on quality improvement and, thus, delivering customer satisfaction.
11. More specifically, TQM puts a spotlight on the processes that organizations use to produce their products, and it calls for organizations to define those processes, continuously monitor and measure their performance, and use that performance data to drive improvements.
12. Furthermore, it calls for all employees, as well as all organizational departments, to be part of this process.
13. TQM's objectives are to eliminate waste and increase efficiencies by ensuring that the production of the organization's product (or service) is done right the first time applied in automobile industry.



1.2 TQM Process Flow Chart to find Quality Problems on Incoming Raw Materials



1.3 TQM Process Flow Chart to find Quality Problems on Finished Products/Components



II. THE KEY PRINCIPLES OF TOTAL QUALITY MANAGEMENT

Commitment from the Management:

1. Plan (drive, direct)
2. Do (deploy, support, and participate)
3. Check (review)
4. Act (recognize, communicate, revise)

This also referred to as the PDCA cycle.

Planning Phase: This phase is the most crucial phase of total quality management. Under this phase, employees have to come up with their respective queries and problems which need to be addressed. The employees apprise the management of different challenges which they are facing in their day to day operations and also analyze the root cause of the problem. They need to do the required research and collect significant data which would help them find solutions to all the problems.

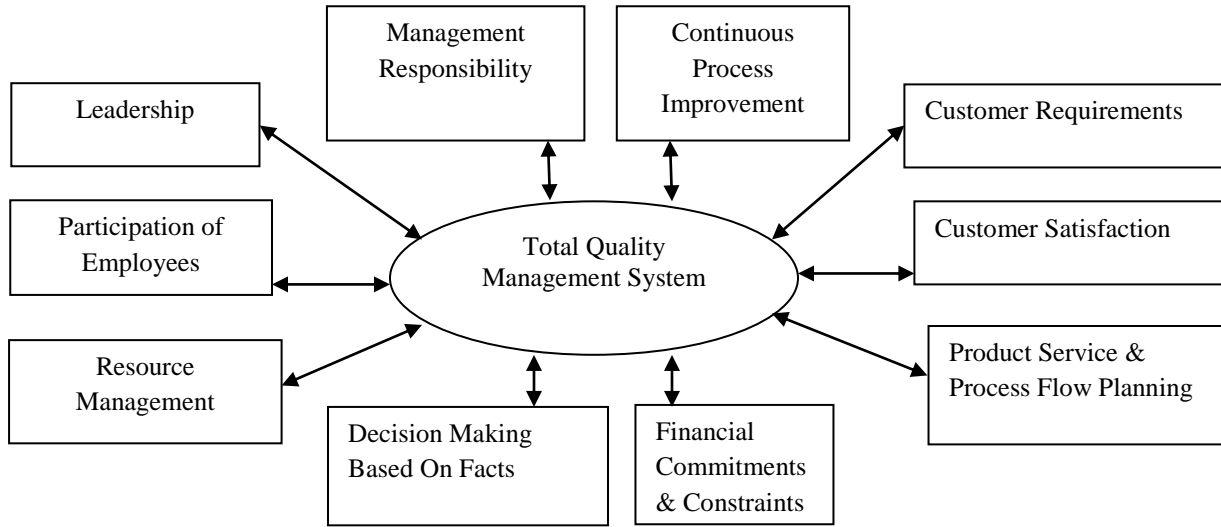
Doing Phase: In this phase, a solution for the identified problems in the planning phase is developed by the employees. Strategies are devised and implemented to crack down the challenges faced by employees. The efficiency and effectiveness of solutions and strategies are also evaluated in this stage.

Checking Phase: Under this phase, a comparison analysis of before and after is done in order to assess the effectiveness of the processes and measure the results.

Acting Phase: This is the last phase of the cycle, in this phase employees document their results and prepare themselves to address other problems.

Employee Empowerment	Continuous Improvement	Customer Focus
Training	Systematic measurement	Partnership with Suppliers
Excellence team	Excellence teams	Service relationship with internal customers
Measurement and recognition	Cross-functional process	Customer-driven standards
Suggestion scheme	management	Never compromise quality
	Attain, maintain, improve standards	

III. TOTAL QUALITY MANAGEMENT SYSTEM DIAGRAM



Importance of customer: When using total quality management it is of crucial importance to remember that only customers determine the level of quality. Whatever efforts are made with respect to training employees or improving processes, only customers determine, for example through evaluation or satisfaction measurement, whether your efforts have contributed to the continuous improvement of product quality and services.

Employee Involvement: Employees are an organization's internal customers. Employee involvement in the development of products or services of an organization largely determines the quality of these products or services. Ensure that you have created a culture in which employees feel they are involved with the organization and its products and services.

Select the Right Process: Process thinking and process handling are a fundamental part of total quality management. Processes are the guiding principle and people support these processes based on basis objectives that are linked to the mission, vision and strategy.

Integrated Unique System: It is important to have an integrated organization system that can be modelled for example ISO 9000 or a company quality system for the understanding and handling of the quality of the products or services of an organization.

Strategic and Systematic Approach: A strategic plan must embrace the integration and quality development and the development or services of an organization.

Decision-Making based on Facts: Decision-making within the organization must only be based on facts and not on opinions (emotions and personal interests). Data should support this decision-making process.

Systematic Communication: A communication strategy must be formulated in such a way that it is in line with the mission, vision and objectives of the organization. This strategy comprises the stakeholders, the level within the organization, the communications channels, the measurability of effectiveness, timeliness, etc.

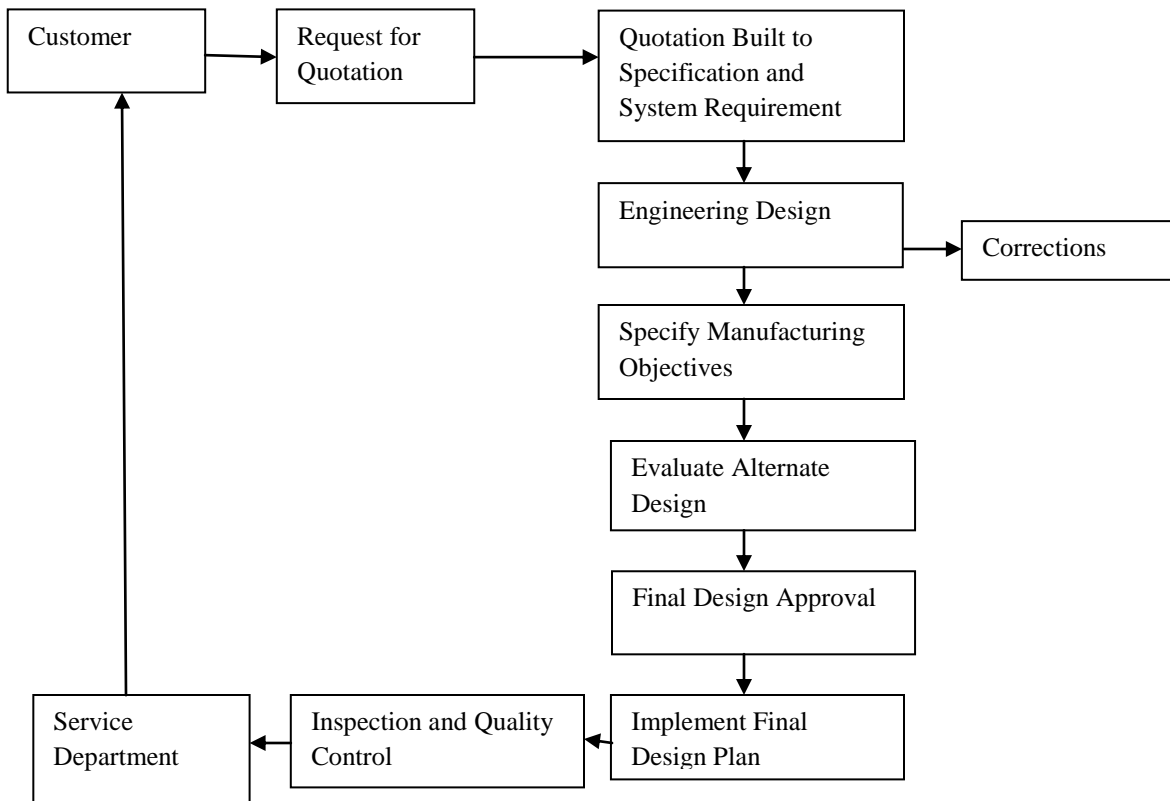
Strive for Continuous improvement: By using the right measuring tools and innovative and creative thinking, continuous improvement proposals will be initiated and implemented so that the organization can develop into a higher level of quality.

Practical approach to Total Quality Management: When you implement total quality management, you implement a concept. It is not a system that can be implemented but a line of reasoning that must be incorporated into the organization and its culture.

Practice has proved that there are a number of basic assumptions that contribute to a successful roll-out of total quality management within an organization. These basic assumptions are:

1. Train senior management on total quality management principles and ask for their commitment with respect to its roll-out.
2. Assess the current culture, customer satisfaction and the quality system.;
3. Senior management determines the desired core values and principles and communicates this within the organization.
4. Develop a basic total quality management plan using the basic starting principles mentioned above.
5. Identify and prioritize customer needs and the market and determine the organization's products and services to meet those needs.
6. Determine the critical processes that can make a substantial contribution to the products and services.
7. Create teams that can work on process improvement for example quality circles.
8. Managers support these teams using planning, resources, and by providing timely training.
9. Management integrates the desired changes for improvement in daily processes. After the implementation of improved processes, standardization takes place.;
10. Evaluate progress continuously and adjust the planning or other issues if necessary.
11. Stimulate employee involvement. Awareness and feedback lead to an overall improvement of the entire process. Support this for example by means of a reward model, i.e. Management by Objectives, and recognition.

IV. TQM PROCESS CHART

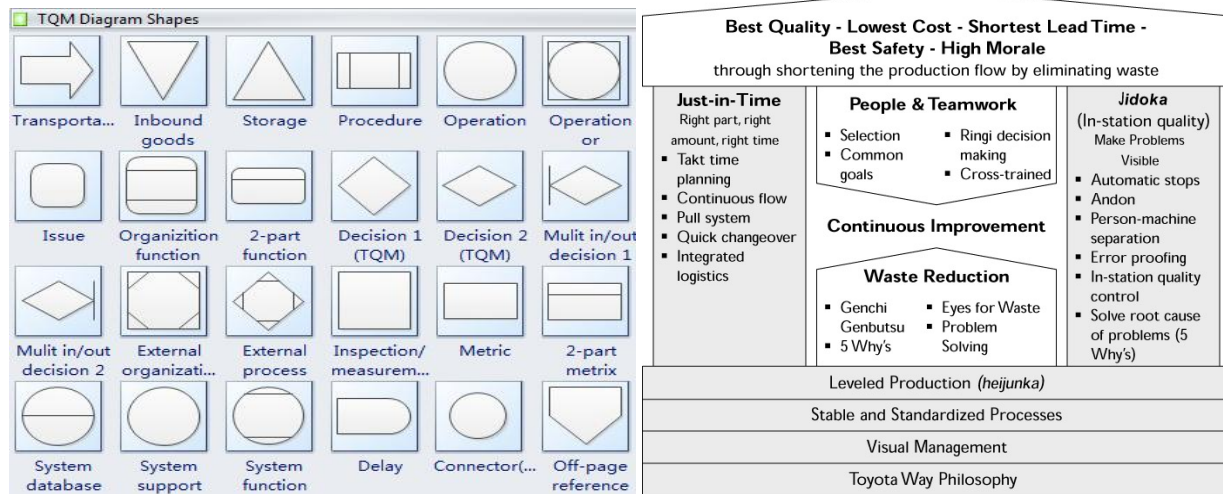


V. ESSENTIAL REQUIREMENTS FOR SUCCESSFUL IMPLEMENTATION OF TQM PARTICULARLY IN AUTOMOBILE MANUFACTURING

1. Commitment: Quality improvement (in all aspect) must be everyone's job in the organization. Training and support for this should be extended.
2. Culture: There should be proper training to effect the changes in attitude and culture.
3. Continuous Improvement: Recognize improvement as a continuous process, and not merely a one-off program.
4. Customer Focus: Perfection in service with zero defectives and full satisfaction to end-user.
5. Control: Ensure monitoring and control checks for any deviation from the intended course of implementation.



VI. THE FOLLOWING CHART SHOWS DIAGRAMS OF TQM SHAPES & TQM CONCEPT



VII. BELIEFS ABOUT TOTAL QUALITY MANAGEMENT

Following are the universal Total Quality Management beliefs:
 Satisfaction of the customer/owner is the measure of quality.

- Everyone is an owner.
- Continuous Quality improvement must be there.
- Analysis of the processes is the key to quality improvement.
- Constant TQM is not possible without consistent, active and enabling leadership by managers at all levels.
- Six Sigma is a disciplined approach for reducing defects and producing measurable quality/financial results. It consists of Continuous Improvement & Reengineering through defining, measuring, analyzing, improving and controlling manufacturing quality problems
- Benchmarking is a technique in which a company measures its performance against that of best in class companies, determines how those companies achieved their performance levels and uses the information to improve its own performance. It is important to incessantly improve quality of the products and services which we are supposed to provide to our customers/owners, like in automobile industry



VIII. DEMING'S 14 POINTS FOR TQM

1. Create constancy of purpose for improving products and services
2. Adopt the new philosophy
3. Cease dependence on inspection to achieve quality
4. Donot award business on price alone, instead, minimize total cost by working with a single supplier

5. Improve constantly and forever every process for planning
 - a. Institute training on the job
 - b. Adopt and institute leadership
 - c. Drive out fear
 - d. Break down barriers between staff areas
 - e. Eliminate slogans, exhortations and targets for the work force
 - f. Eliminate numerical quotas for the workforce and numerical goals for management
 - g. Remove barriers that prevent people from workmanship, and eliminate the annual rating or merit system
 - h. Institute a vigorous program of education and self-improvement for everyone
 - i. Put everybody in the company to work accomplishing the transformation

IX. THE SEVEN TOOLS OF TQM

- | | |
|-----------------------------|--|
| 1. Check Sheet | 5. Flow Chart |
| 2. Scatter Diagram | 6. Histogram |
| 3. Cause and Effect Diagram | 7. Statistical Process Control Chart (SPC Chart) |
| 4. Pareto Chart | |

1. Check sheet: A check sheet is a structured, prepared form for collecting and analyzing data. This is a generic data collection and analysis tool that can be adapted for a wide variety of purposes and is considered one of the seven basic quality tools. Check Sheet is also called: defect concentration diagram
 1. When data can be observed and collected repeatedly by the same person or at the same location.
 2. causes, or similar issues.
 3. When collecting data from a production process.
 4. Decide what event or problem will be observed. Develop operational definitions.
 5. Decide when data will be collected and for how long.
 6. Design the form. Set it up so that data can be recorded simply by making check marks or X's or similar symbols and so that data do not have to be recopied for analysis.
 7. Label all spaces on the form.
 8. Test the check sheet for a short trial period to be sure it collects the appropriate data and is easy to use.
 9. Each time the targeted event or problem occurs, record data on the check sheet.
 10. The figure below shows a check sheet used to collect data on telephone interruptions. The tick marks were added as data was collected over several weeks. Check sheet sample
2. Scatter diagram: Graphs pairs of numerical data, one variable on each axis, to look for a relationship. Also called: scatter plot, X–Y graph. The scatter diagram graphs pairs of numerical data, with one variable on each axis, to look for a relationship between them. If the variables are correlated, the points will fall along a line or curve. The better the correlation, the tighter the points will hug the line. Use of scatter diagram is as follows:
 - When you have paired numerical data.
 - When your dependent variable may have multiple values for each value of your independent variable.
 - When trying to determine whether the two variables are related, such as:
 - When trying to identify potential root causes of problems.
 - After brainstorming causes and effects using a fishbone diagram, to determine objectively whether a particular cause and effect are related.
 - When determining whether two effects that appear to be related both occur with the same cause.
 - When testing for autocorrelation before constructing a control chart.
- 2.1 Scatter Diagram usage Procedure:
 1. Collect pairs of data where a relationship is suspected.
 2. Draw a graph with the independent variable on the horizontal axis and the dependent variable on the vertical axis. For each pair of data, put a dot or a symbol where the x-axis value intersects the y-axis value. (If two dots fall together, put them side by side, touching, so that you can see both.)
 3. Look at the pattern of points to see if a relationship is obvious. If the data clearly form a line or a curve, you may stop because variables are correlated. You may wish to use regression or correlation analysis now. Otherwise, complete steps 4 through 7.
 4. Divide points on the graph into four quadrants. If there are X points on the graph,
 - Count X/2 points from top to bottom and draw a horizontal line.

- Count $X/2$ points from left to right and draw a vertical line.
 - If number of points is odd, draw the line through the middle point.
5. Count the points in each quadrant. Do not count points on a line.
 6. Add the diagonally opposite quadrants. Find the smaller sum and the total of points in all quadrants. A = points in upper left + points in lower right, B = points in upper right + points in lower left, Q = the smaller of A and B , $N = A + B$
 7. Look up the limit for N on the trend test table.
 - If Q is less than the limit, the two variables are related.
 - If Q is greater than or equal to the limit, the pattern could have occurred from random chance.

3. Cause-and-Effect Diagram: (also called Ishikawa or fishbone chart):

Identifies many possible causes for an effect or problem and sorts ideas into useful categories. It can be used to structure a brainstorming session. It immediately sorts ideas into useful categories. A fishbone diagram is used when

- When identifying possible causes for a problem.
- When a team's thinking tends to fall into ruts.

Materials needed: flipchart or whiteboard, marking pens.

1. Agree on a problem statement (effect). Write it at the center right of the flipchart or whiteboard. Draw a box around it and draw a horizontal arrow running to it.
2. Brainstorm the major categories of causes of the problem. If this is difficult use generic headings: Methods
 - Machines (equipment)
 - People (manpower)
 - Materials
 - Measurement
 - Environment

1. Write the categories of causes as branches from the main arrow.
2. Brainstorm all the possible causes of the problem. Ask "Why does this happen?" As each idea is given, the facilitator writes it as a branch from the appropriate category. Causes can be written in several places if they relate to several categories.
3. Again ask "Why does this happen?" about each cause. Write sub-causes branching off the causes. Continue to ask "Why?" and generate deeper levels of causes. Layers of branches indicate causal relationships.
4. When the group runs out of ideas, focus attention to places on the chart where ideas are few.

4. Pareto chart:

Shows on a bar graph which factors are more significant. Also called Pareto diagram, Pareto analysis Variations: weighted Pareto chart, comparative Pareto charts

A Pareto chart is a bar graph. The lengths of the bars represent frequency or cost (time or money), and are arranged with longest bars on the left and the shortest to the right. In this way the chart visually depicts which situations are more significant. Pareto chart is used when

- When analyzing data about the frequency of problems or causes in a process.
- When there are many problems or causes and you want to focus on the most significant.
- When analyzing broad causes by looking at their specific components.
- When communicating with others about your data.

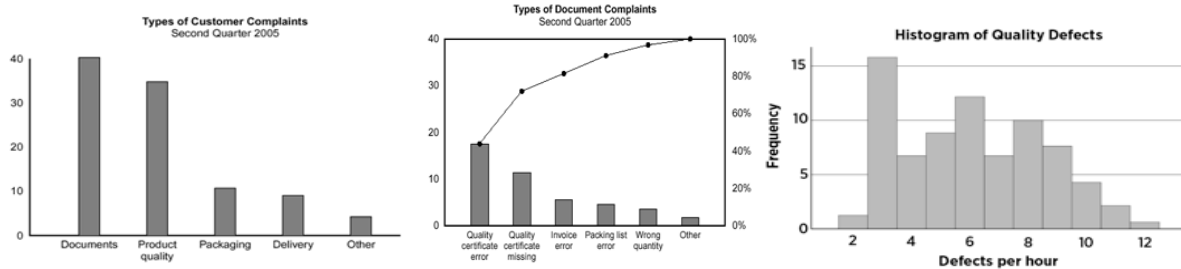
Pareto Chart Procedure

1. Decide what categories you will use to group items.
2. Decide what measurement is appropriate. Common measurements are frequency, quantity, cost and time.
3. Decide what period of time the Pareto chart will cover: One work cycle? One full day? A week?
4. Collect the data, recording the category each time, or assemble data that already exist.
5. Subtotal the measurements for each category.
6. Determine the appropriate scale for the measurements you have collected. The maximum value will be the largest subtotal from step 5
7. Construct and label bars for each category. Place the tallest at the far left, then the next tallest to its right and so on. If there are many categories with small measurements, they can be grouped as "other."
Note: Steps 8 and 9 are optional but are useful for analysis and communication.
8. Calculate the percentage for each category: the subtotal for that category divided by the total for all categories. Draw a right vertical axis and label it with percentages. Be sure the two scales match: For

example, the left measurement that corresponds to one-half should be exactly opposite 50% on the right scale.

- Calculate and draw cumulative sums: Add the subtotals for the first and second categories, and place a dot above the second bar indicating that sum. To that sum add the subtotal for the third category, and place a dot above the third bar for that new sum. Continue the process for all the bars. Connect the dots, starting at the top of the first bar. The last dot should reach 100 percent on the right scale.

The following graphs 1 and 2 are examples of Pareto chart while graph 3 is an example of Histogram



5. Developing Your Flowchart

Quality control flowchart can help you to visualize the items being talked about. Familiarized symbols of the flowchart, are as follows

- Oval – starting and ending point of a process
- Box – an individual step in the process
- Diamond – decision point
- Circle – one step is connected with another
- Pentagon – one process is connected with another
- Flow Line – shows the order activities take place

6. Histogram:

A histogram is the most commonly used graph to show frequency distributions. It looks very much like a bar chart, but there are important differences between them. Use a histogram when:

- The data are numerical.
- You want to see the shape of the data's distribution, especially when determining whether the output of a process is distributed approximately normally.
- Analyzing whether a process can meet the customer's requirements.
- Analyzing what the output from a supplier's process looks like.
- Seeing whether a process change has occurred from one time period to another.
- Determining whether the outputs of two or more processes are different.
- You wish to communicate the distribution of data quickly and easily to others.

Procedure for creating a Histogram

- Collect at least 50 consecutive data points from a process.
- Use the histogram worksheet to set up the histogram.
- Draw x- and y-axes on graph paper. Mark and label the y-axis for counting data values. Mark and label the x-axis with the L values from the worksheet.
- For each data point, mark off one count above the appropriate bar with an X or by shading that portion of the bar.

7. Statistical Process Control (SPC):

SPC is method of measuring and controlling quality by monitoring the manufacturing process One of the most comprehensive and valuable resources of information regarding SPC is the manual published by the Automotive Industry Action Group (AIAG).

Why Use Statistical Process Control (SPC): By monitoring the performance of a process in real time the operator can detect trends or changes in the process before they result in non-conforming product and scrap.

How to Use Statistical Process Control (SPC): Before implementing SPC, manufacturing process should be evaluated to determine the areas of waste. Some examples of manufacturing waste include rework, scrap etc.,

Collecting and Recording Data: SPC data is collected in the form of measurements of a product dimension/The data is then recorded and tracked on various types of control charts, based on the type of data being collected.

Variable data

- Individual – Moving Range chart: to be used if your data is individual values
- Xbar – R chart: to be used if you are recording data in sub-groups of 8 or less
- Xbar – S chart: to be used if your sub-group size is greater than 8

Attribute data

- P chart – For recording the number of defective parts in a group of parts
- U chart – For recording the number of defects in each part

Control Charts: One of the most widely used control charts for variable data is the X-bar and R chart. X-bar represents the average or “mean” value of the variable x. The X-bar chart displays the variation in the sample means or averages. The Range chart shows the variation within the subgroup.

Benefits of Total Quality Management

The benefits arising from the implementation of a Total Quality Management in an organization are:

1. This will increase the awareness of quality culture within the organization.
2. A special emphasis on teamwork will be achieved, with cost reduction, improve quality and profit
3. TQM will lead to a commitment towards continuous improvement in productivity & safety

X. APPLICATIONS OF TOTAL QUALITY MANAGEMENT TO ORGANISATION, CONSTRUCTION, EDUCATION, AUTOMOBILES

10. 1. Organization:

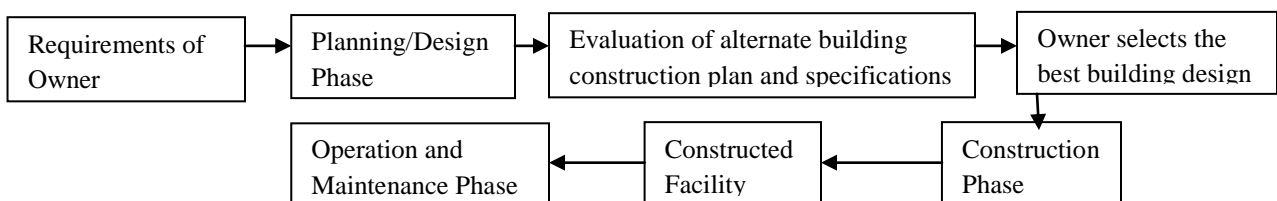
The following steps describe the application/review of TQM in Organisation

S.No	TQM/Components	Implementation Approach	Experience Approach	Who does the Work	The Experiences from Working
1	Customer co-operation and dialogue	A response to ISO 9000	Interest, Motivation, Lack of time	Persond responsible for customers	Increase knowledge
2	Follow-up of conducted training courses	A follow up of training to the customers	Time factor is very important	All training is evaluated	Increase Quality
3	Surveys regarding customer requirements	Identify a need during quality award process	Lack of precision in measurement	Compare surveys	Know what customers think about services
4	Employee Meetings	They discover a need for TQM approach	Easy to organize meetings	Involve everyone	Co-operation through meetings & discussions
5	Business plan development	Business plan is required since the start of business	Easy to implement	Finance & Administration	Flow of information
6	Staff Development Meetings	Training for the staff is identified to improve their performance	Need full-time manager	Manager gets all employees involved	The manager & employees are updated

10. 2. Construction:

Total quality management is applied to construction industry to improve the quality of construction, improve workers productivity, and reduce the cost of construction.

TQM Process Flow Chart in Construction Industry is as follows:

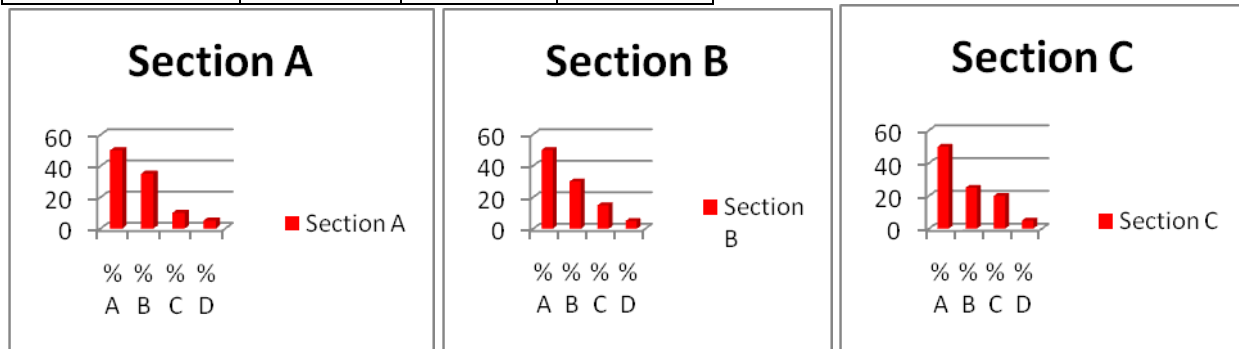


10. 3. Education:

The following steps describe the application of TQM in Education through Artificial Intelligence, Fuzzy Logic, Neural Networks & Statistical Methods

1. Predicting student academic success at our university/college, and steps taken to get good examination results
2. To predict, develop a statistical model, with student feed back data upon interviewing them by giving them a questionnaire, and student previous semester performance data in various subjects
3. With the data develop a statistical database model
4. Evaluate the data using the software - Statistica 5.0, Statistical Analysis Systems(SAS)
5. To predict, develop a neural network model, with student feed back data upon interviewing them by giving them a questionnaire, and student previous semester performance data in various subjects
6. To predict, with the data available, develop a Neural network database model
7. Evaluate the data using the software – Neuro Solutions 2.3
8. Compare the results obtained from Statistical model and Neural network model
9. Make necessary recommendations for this group of students for better performance in next semester
10. Improve the student enrollment and retention rate each semester/year, and get good examination results
11. Observations: The following table shows the % grades of students in each section namely A, B, C where total strength of students in each section = 60, and the graphs are plotted as follows:

% Grade/Section	Section A	Section B	Section C
% Grade A	50	50	50
% Grade B	35	30	25
% Grade C	10	15	20
% Grade D	5	5	5



Automobile Industry: TQM principles are applied in automobile industry to provide benefits for suppliers, owners, employees, customers, and society as a whole



XI. CONCLUSIONS & RECOMMENDATIONS

1. Employee training is fundamental for many TQM programs such as the adoption of new quality concepts, the set-up, and practices of customer satisfaction systems, the use of statistical quality control.
2. Moreover, employees require three basic areas of training: principles of TQM, the use of TQM tools and problem-solving techniques.
3. Literature revealed top management involvement, total employee involvement, empowerment, deployment of quality policies, education and training, adoption of process approach, customer orientation, employee job satisfaction, leadership, teamwork, use of quality tools, change of mind- set of employees
4. Continuous improvement, making organization learning organization, communication, manager -workers healthy relationship, elimination of dominating bossy attitude, involvement of suggestion system

5. TQM, Organizations need to create an atmosphere of transparency, mission and vision of the organizations should be communicated properly among all the employees and for total employee involvement quality training and education programme should be provided to achieve the goals of organisation.
6. In a total quality environment, employees need to understand the goal of customer satisfaction, to be given the training and responsibilities to achieve the goal and to feel that they do indeed make a difference.
7. Organization should focus on creation of talent pool centres and provide opportunity for the growth and development of talented employees.
8. Organization can retain their employees and promote team work among employees. The job rotation policy should also act as staircase for the growth and development of the employees and organisation
9. Top management have to involve and committed themselves in the companies vision and mission.
10. HRD can make the people working in the organizations clear about their goal and objectives and synchronism of the same with individual objectives and goals

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