Lecture Six: Seven Quality Tools

The Seven Quality Tools are technical methods that help in analysis and synthesis in different areas of work related to quality. They usually include charts, diagrams, and visual representations.

The emergence of this concept of quality control is mainly due to three factors:

1. The high cost of modern production technologies, where production errors lead to significant financial losses.

2. Strong competition between service and product organizations, making it difficult to gain customer trust and meet their needs.

3. The adoption of international standards such as ISO by organizations to ensure product quality, compliance with local and global standards, and to attract more customers.

Companies use quality tools to improve products and services. The most important ones are the seven tools such as the Ishikawa diagram (for cause and effect analysis), Pareto chart (for prioritization), and histogram (for data monitoring).

These tools help to:

- Improve process efficiency
- Reduce costs
- Ensure customer satisfaction

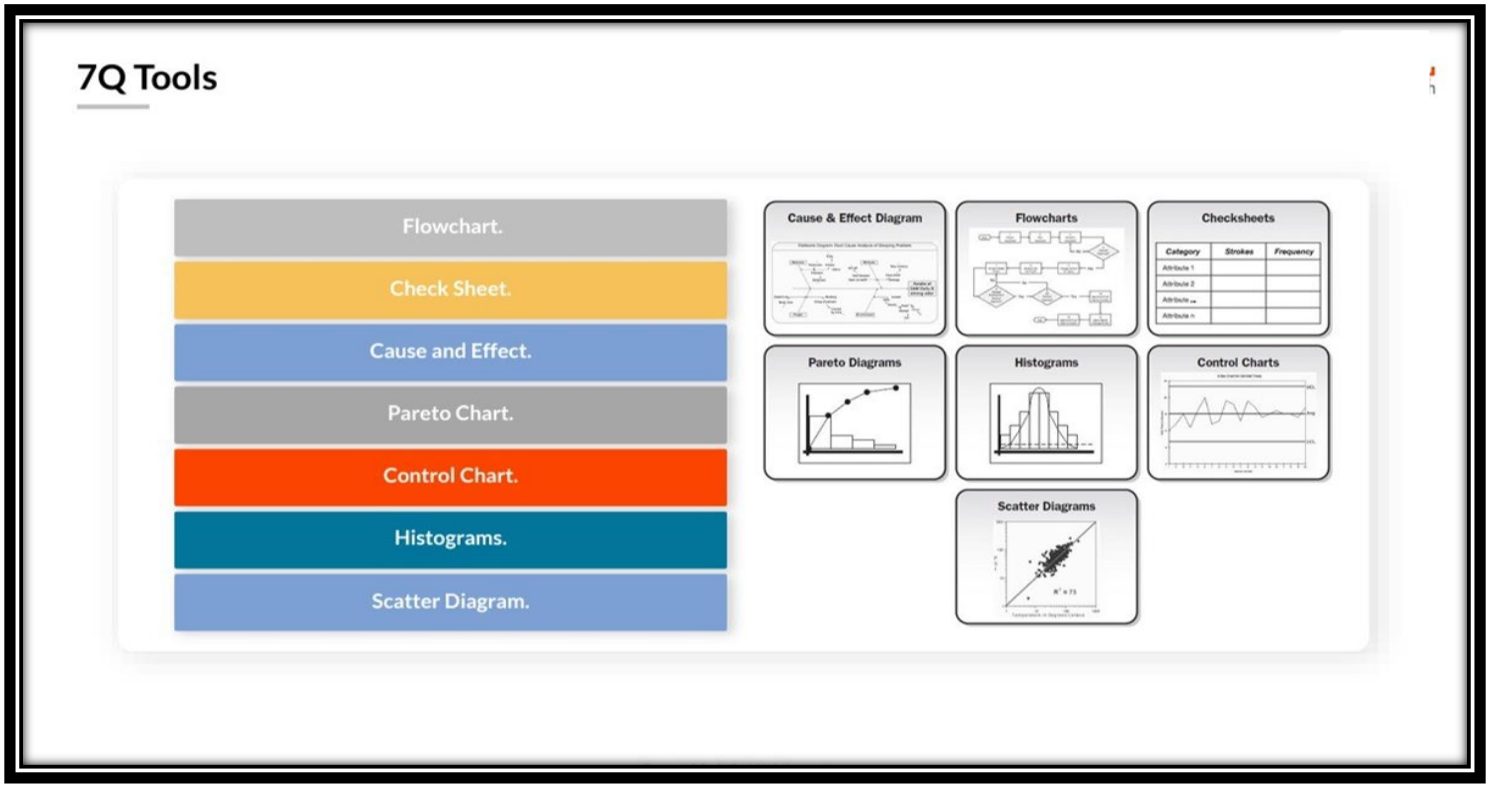
Therefore, they are essential for achieving organizational excellence.

Organizations do not rely on these tools only to improve product or service quality, but also to achieve customer satisfaction by meeting their needs, reducing waste, and saving costs. In this lecture, we will focus on the most important and common quality tools, especially the seven basic tools.

The Seven Basic Tools of Quality are essential tools used to identify and solve quality problems quickly and efficiently. By using these tools, you can easily

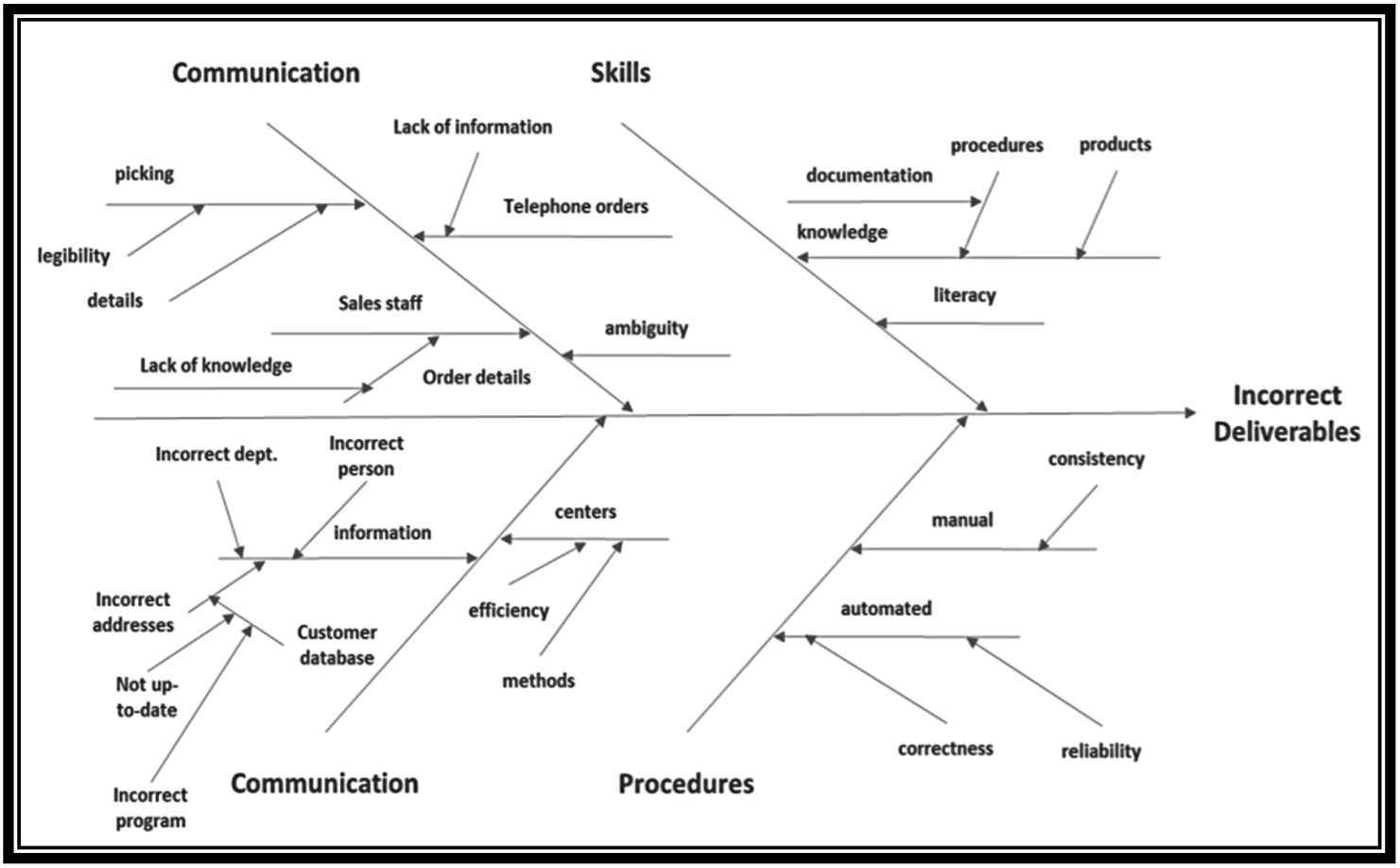
manage the quality of a product or process. These tools are applicable in all industries.

It is important to note that the first person who introduced these seven tools was Kaoru Ishikawa, a professor of engineering at the University of Tokyo, known as the father of "Quality Circles".



Traditional Quality Control Tools

1. Ishikawa Diagram (Cause and Effect)
2. Pareto Chart
3. Histogram
4. Control Charts
5. Scatter Diagram
6. Flow Chart / Stratification
7. Check Sheet



First: Ishikawa Diagram (Cause and Effect)

It is also known as the Fishbone Diagram because it looks like the structure of a fish skeleton. It was developed by the Japanese scientist Kaoru Ishikawa in 1943. As for its name "Cause and Effect," this is because the diagram focuses on the causal factors and the results that follow from them.

This diagram focuses on identifying the causes of the problem and the resulting outcomes, where:

• The bones represent the causes

• The head of the fish represents the result (the problem)

It helps in analyzing problems in an organized way.

Main benefits:

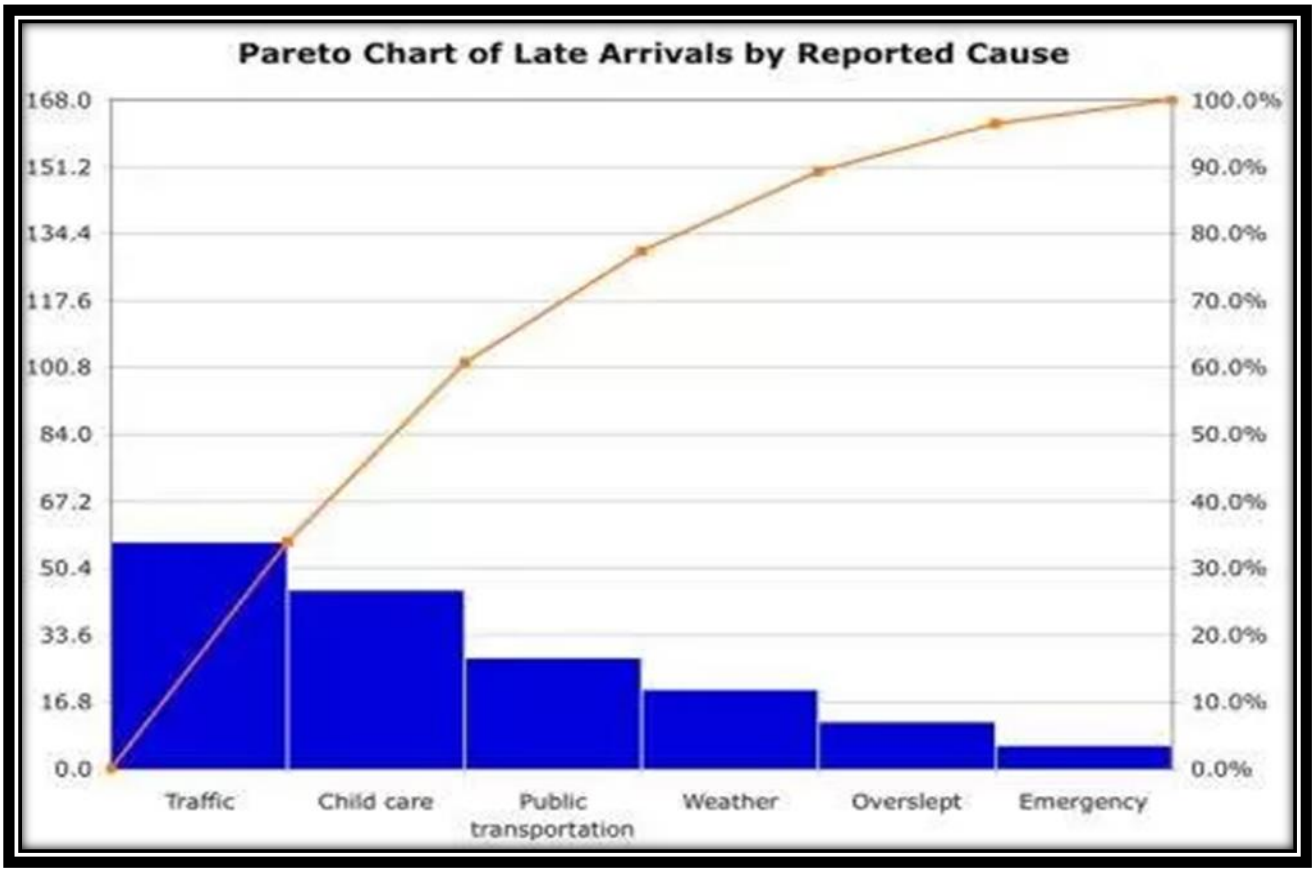
• Identifying problems that affect product quality and how to solve them by presenting effective solutions

• Knowing the objectives that need to be achieved

• Making it easier to collect all required data

• Enhancing the ability to generate ideas

• Its elements are organized and easy to read.



Second: Pareto Analysis

It is named after the Italian economist Vilfredo Pareto, and it is based on the 80/20 rule, meaning:

80% of the results come from 20% of the causes.

It is used to identify the most important problems that should be focused on.

It depends on collecting data about:

• The frequency of problems

• The size of losses resulting from them

• Ranking problems from most to least impact

It is represented using a bar chart:

1- Each bar represents a problem

2- The height of the bar represents frequency or impact

3- The bars are arranged in descending order

The goal:

To identify the most influential problems in order to address them first instead of wasting time on less important problems.

Steps to prepare a Pareto chart:

1. Classify data according to the problem

2. Collect data for an appropriate time period

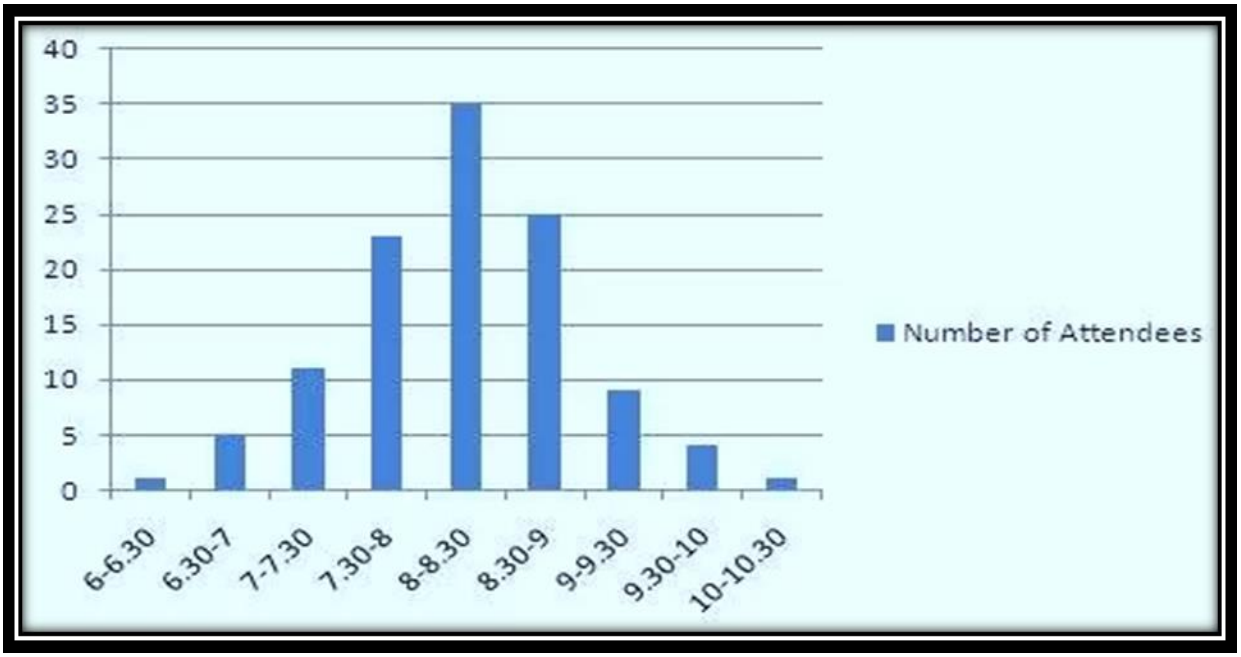
3. Summarize data and arrange categories in descending order from largest to smallest

4. Calculate the cumulative percentage then design the chart and identify the vital few

5. Draw the X and Y axes, then scale the Y axis

6. Draw chart bars along the X axis as rectangles arranged in descending order, and the height of each bar represents defect frequency or defective percentage (Y)

7. Write the Pareto chart title, completion time, data collection date, data collector name, and the purpose of the analysis



Third: Histogram

A histogram is a graphical representation used to show data distribution and frequency.

It helps in:

• Knowing the extent to which quality matches standards

• Detecting quality problems

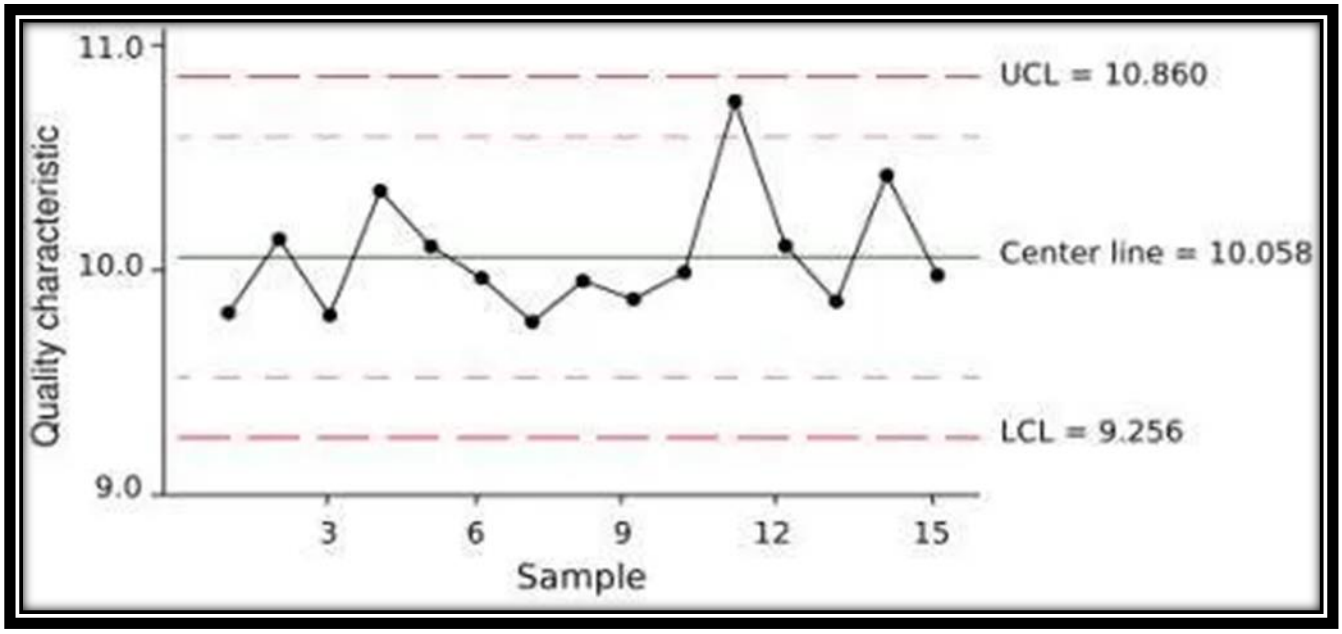
It is done by comparing actual data with required specifications.

It also shows:

• Arithmetic mean

• Data distribution

• Number of repetitions (frequency)



Fourth: Control Charts

Control charts are used to monitor process performance using statistical methods. These charts help identify processes that are managed through statistical control. They consist of graphical representations that show variations in product or service quality, through which variations related to specific factors and those related to process factors are identified.

They are also known as:

• Process charts

• Behavior charts

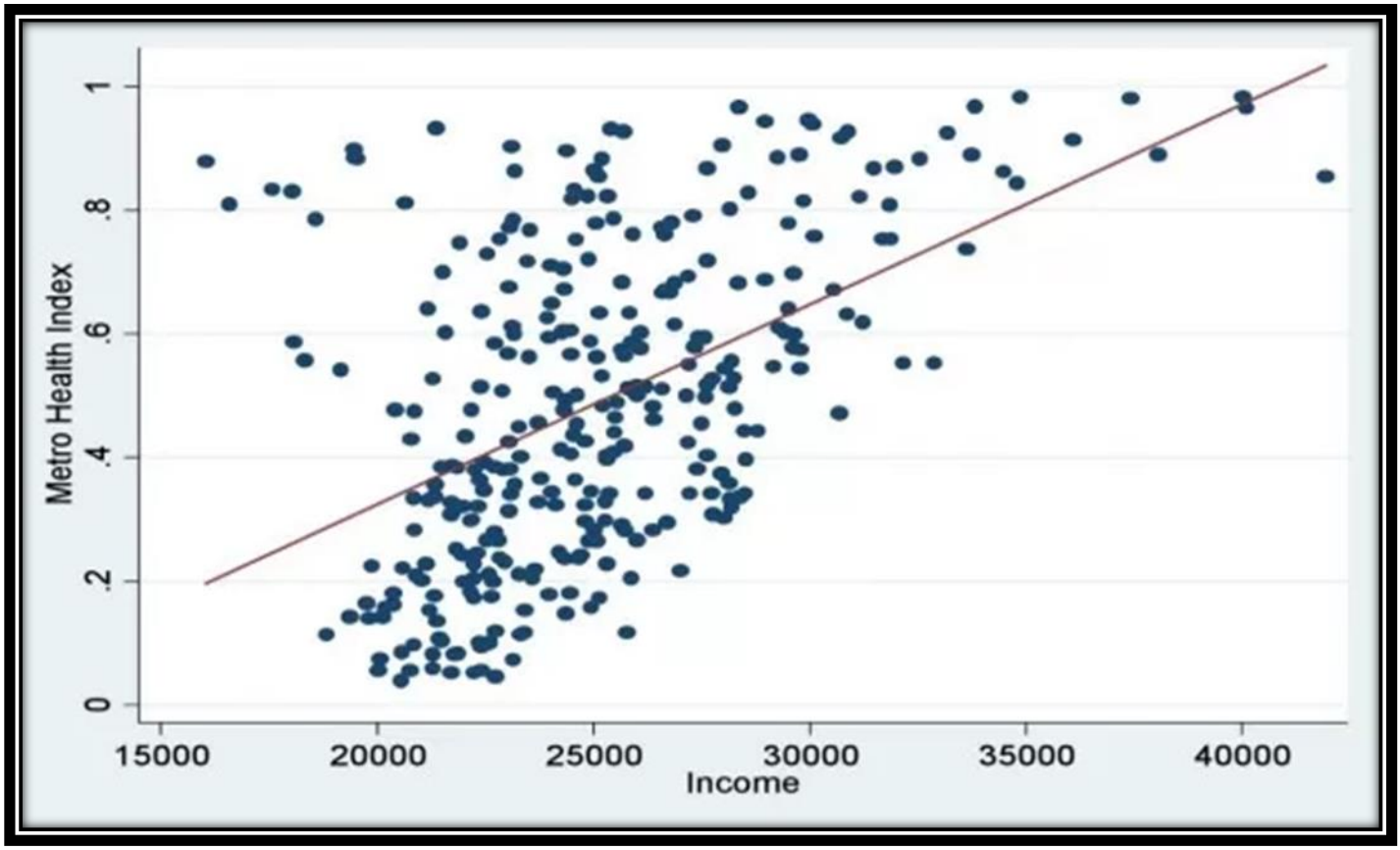
They are associated with the scientist Walter Shewhart, one of the pioneers of quality.

They help in:

• Monitoring processes

• Detecting deviations

• Distinguishing causes of variation



Fifth: Scatter Diagram (Dispersion)

The scatter diagram is a graphical chart mainly used in searching for cause and effect in bivariate variables, and it is used to study the relationship between two variables using points on a graph.

Through it we can know:

• The strength of the relationship between variables

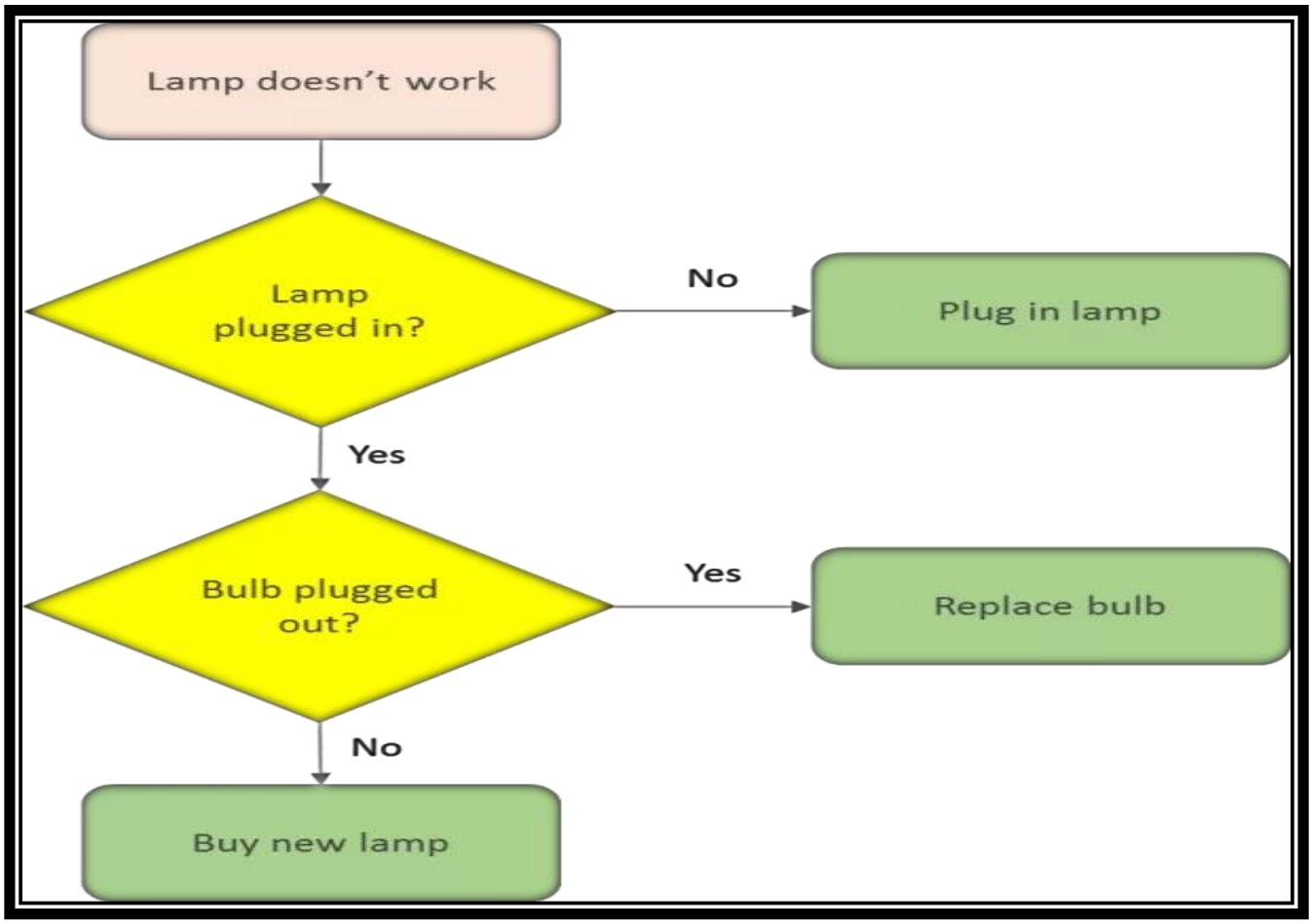
• The type of relationship (positive or negative)

It helps in:

• Analyzing quality problems

• Understanding the impact of different factors

• Studying customer feedback



Sixth: Flow Charts (Process)

They are visual diagrams used to display all stages of a process from start to end.

They help in:

• Understanding process sequence

• Identifying weak points

• Improving performance efficiency

Special symbols are used for each step, and when connected, they show the full process sequence.

Motor Assembly Check Sheet								
Name of Data Recorder:								
Location:								
Data Collection Date:								
Defects Types	Days							Total
	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	
Supplied parts rusted								20
Misaligned XXXX								5
Improper test procedure								0
Wrong part issued								3
Film on parts								0
XXXX								6
Incorrect dimension								2
Adhesive failure								0
XXXX								1
Spray failure								5
Total		10	13	10	5	4		

Seventh: Check Sheets

They are used to collect and organize data with the aim of improving processes.

They help in:

• Organizing data

• Analyzing problems

• Evaluating the quality of procedures

Types include:

• Multiple choice tests

• Performance tests

• Open-ended questions