Free Webinar on

7 QC Tools

Systematic approach to Problem Solving

STAT MODELLER
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Delivered by

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Stat Modeller, Vadodara

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HISTORY

Stat Modeller is formed in 2019 providing services related to training and consultancy for Operational Excellence, Application of Statistical Tools and Data Science Tools to solve the problems of various segments.

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TRAINING AND CONSULTANCY

Data Science

- Machine Learning
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- Minitab
- Power BI
- Tableau
- Excel & Advanced Excel

Operational Excellence

Blended Approach

- Six Sigma
- Lean
- 5-S
- TPM
- Kaizen
- Kanban
- QMS
- SPC and SQC

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- Research Projects
- Survey Analysis
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PROGRAMS WE CONDUCTED

Agro Economics

Workshop on **Basics of SPSS** at
BVM College of Engineering, Vallabh Vidyanagar

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PROGRAMS WE CONDUCTED

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Workshop on **Role of SPSS in Research** at DDU, Nadiad

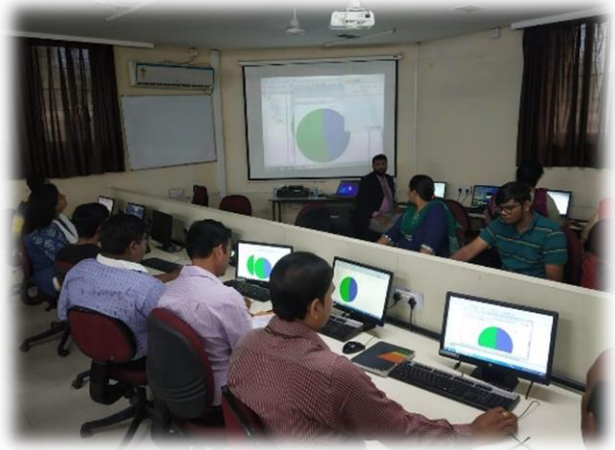
Training on R at
Mumbai University

Training on R at
AERC, Vallabh Vidyanagar

Training on R at
FDP, SPU

Training on R at
HRDC, Gujarat University

Training on R at
Charusat University, Changa



Training on SPSS at
Charusat University, Changa

01

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CEO & CO-FOUNDER

Expert in Data Science, Business Transformation and Research Project Analysis

02

MEHUL GANDHI

BUSINESS ASSOCIATE

Expert in Business Transformation and Advanced Excel

03

SAURABH CHAUDHARI

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Content

- What is quality?
- Why Quality Improvement is much needed?
- Approach of Quality Improvement
- Various tools & techniques for Quality control & improvement.
- 7 QC Tools & its application
- Q&A Session.

Question

What is Quality?

What is Quality

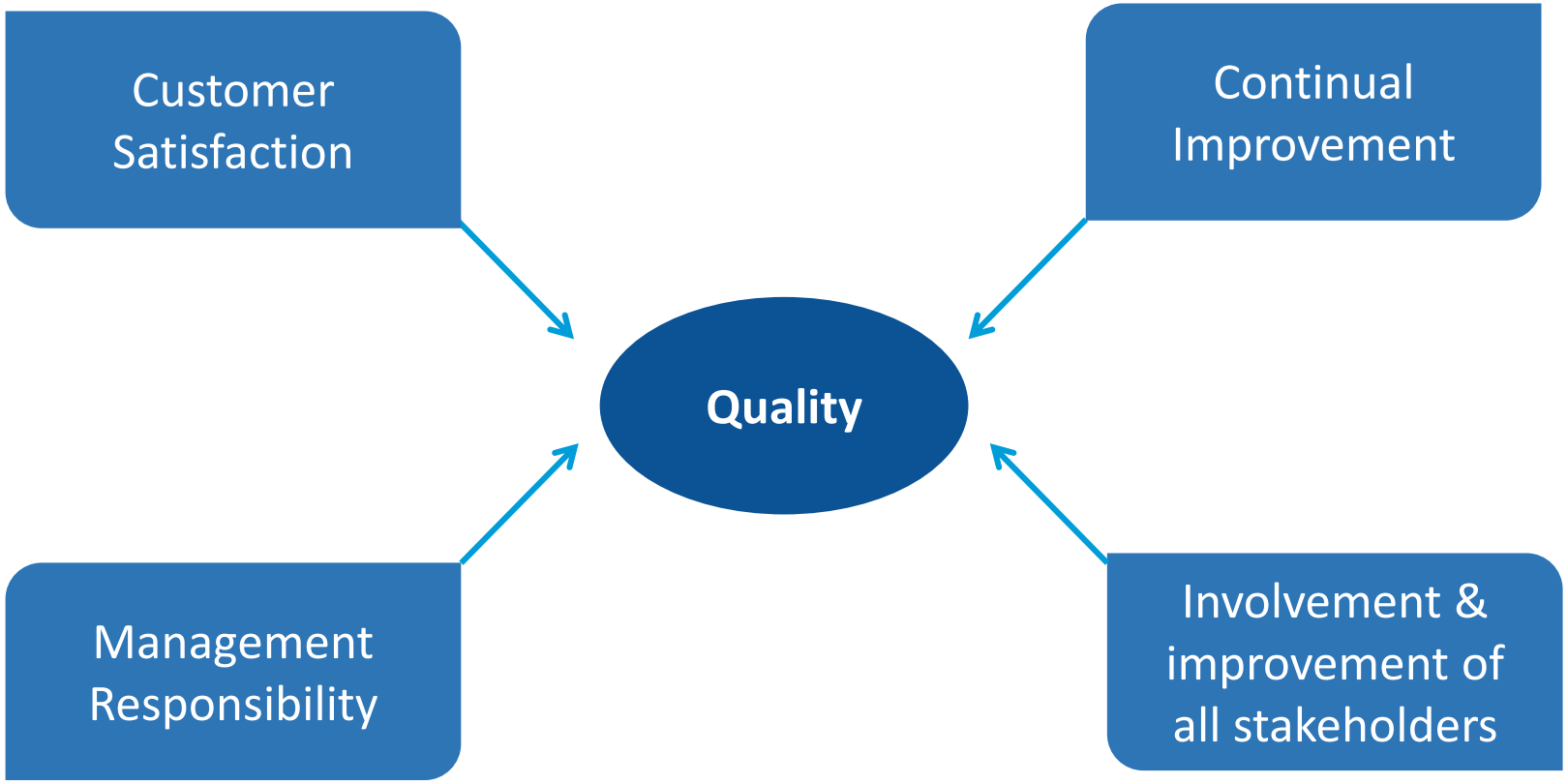
Conformance to stated requirements

Fit for Use

Customer Experience

New Customer

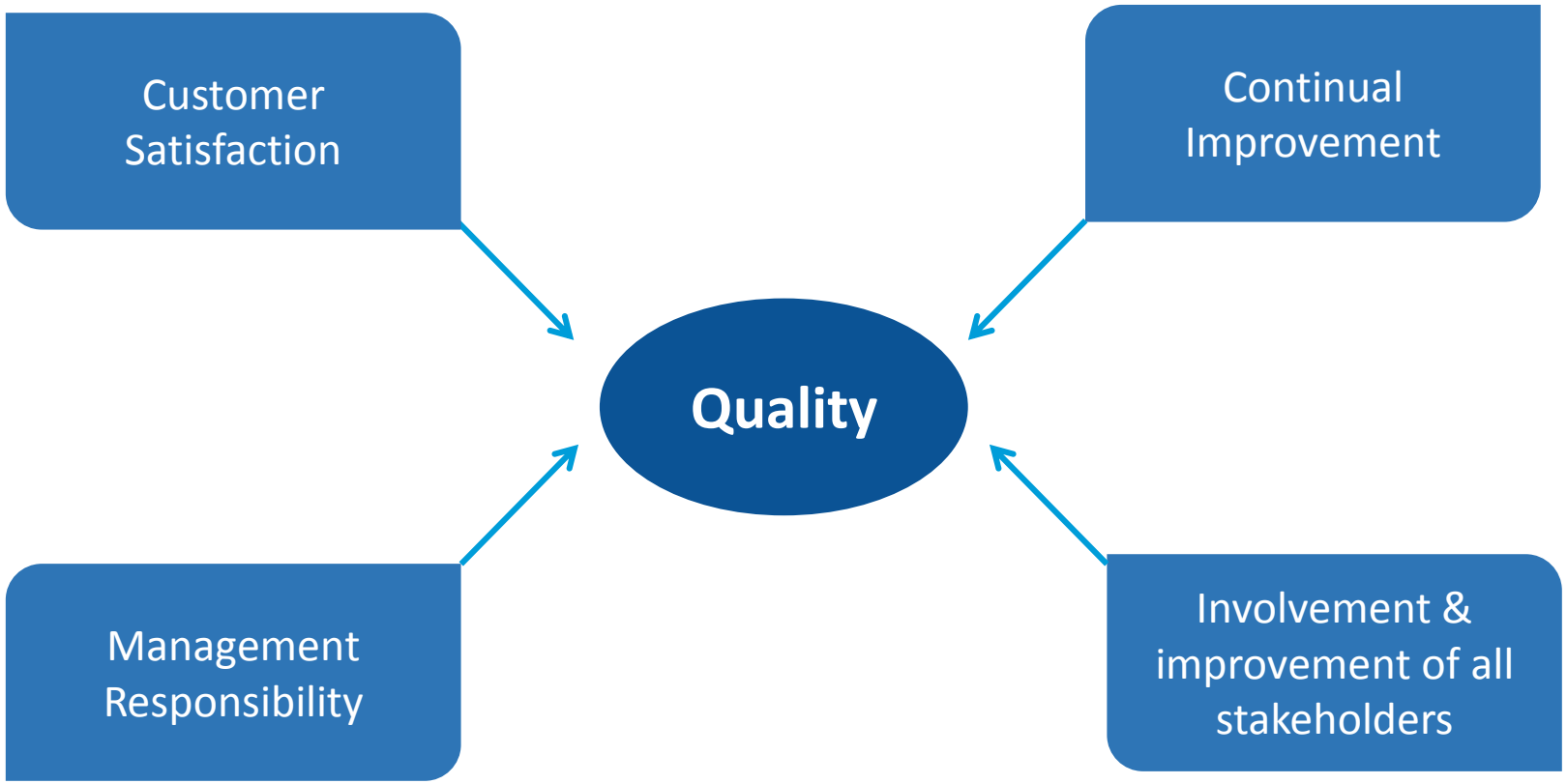
Existing Customer



What is Quality

Resources, Time, People Moral

Supplier, Employee, all stake holder



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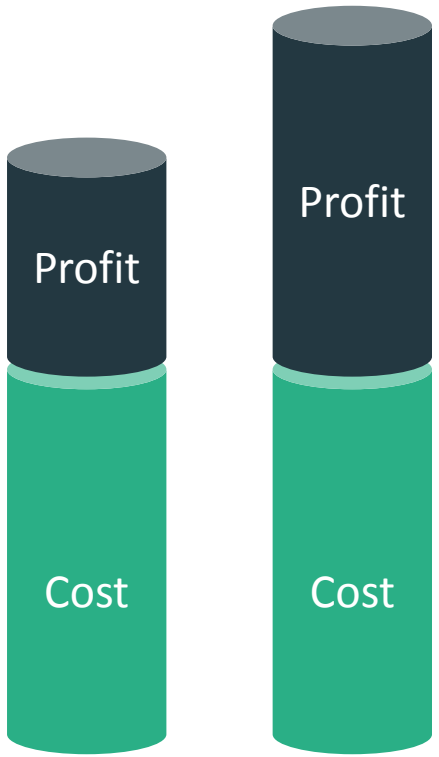
Question

What is the ultimate goal of any business or organization?

Goal

Traditional approach

Cost + Profit = Price



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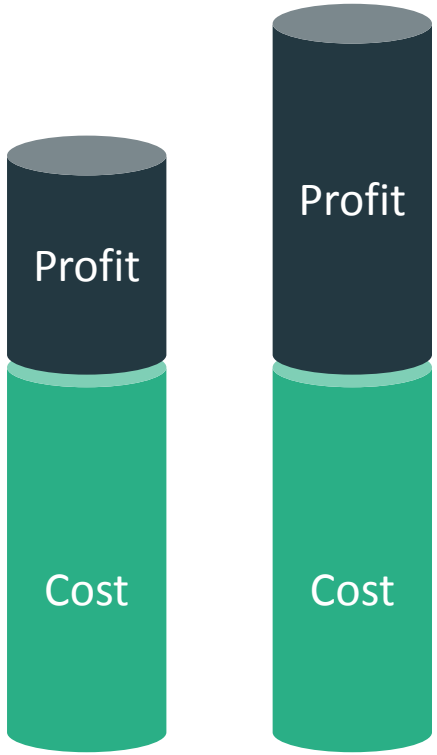
Goal

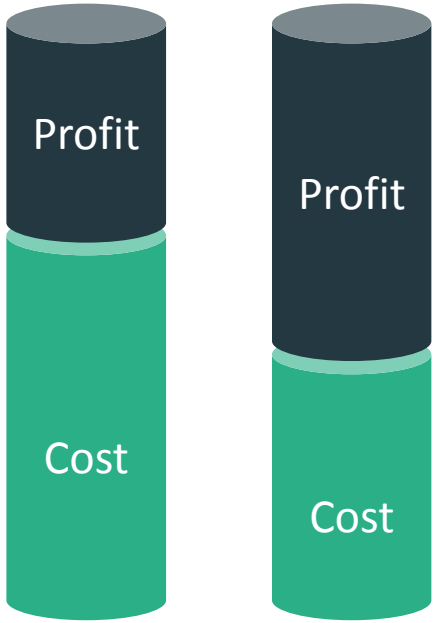
Traditional approach

Cost + Profit = Price



Modern approach

Price - Cost = Profit



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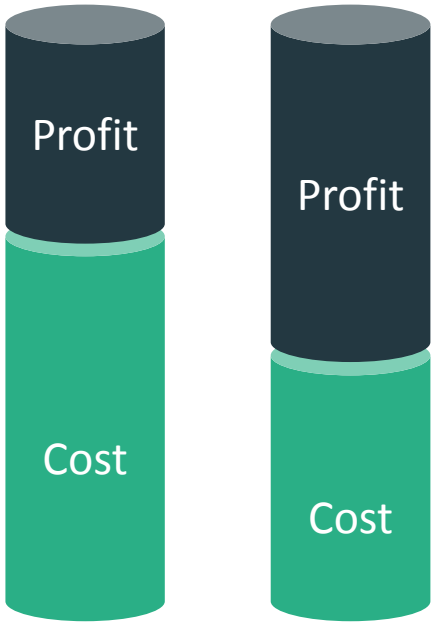
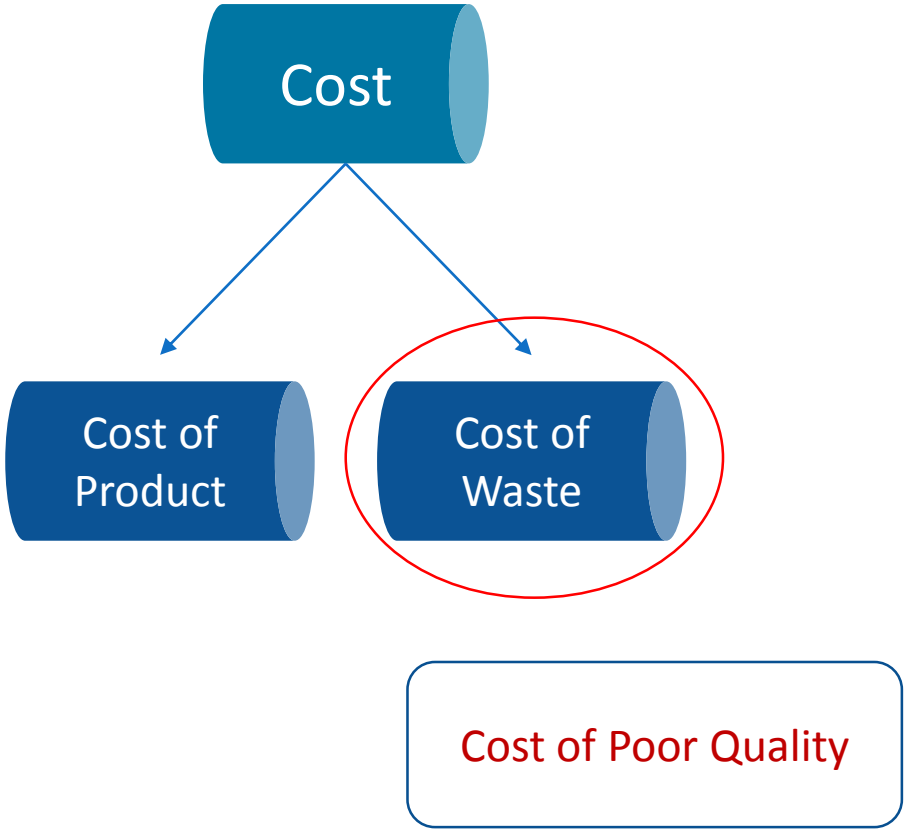
Goal

Modern approach

Price - Cost = Profit





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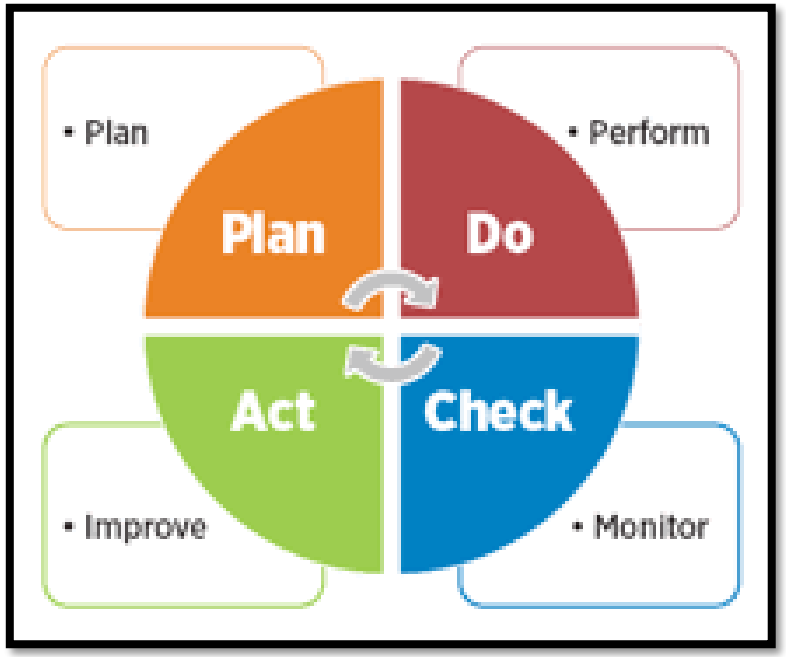
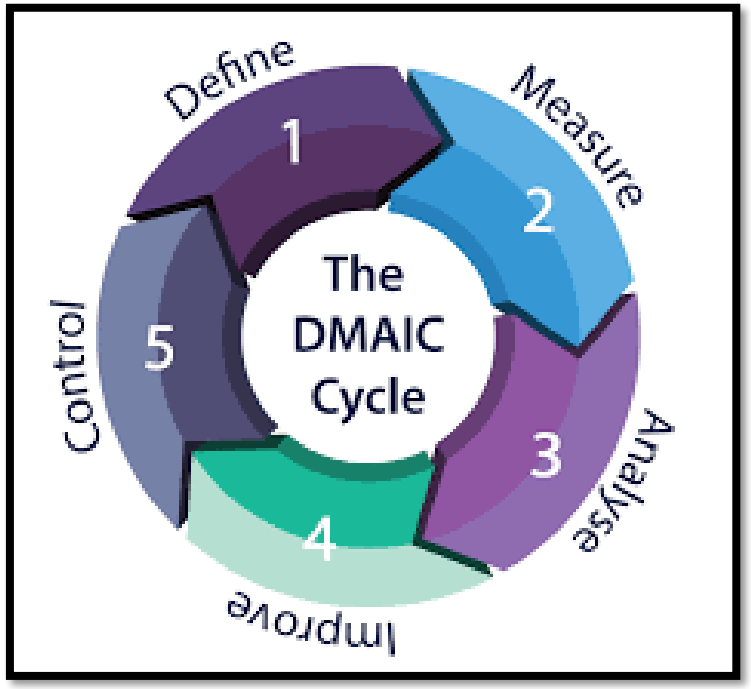
Approach





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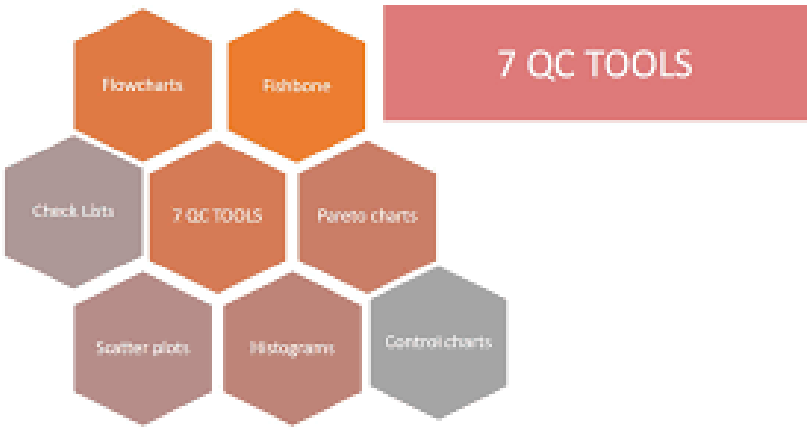
Tools & Techniques

ISO 9001:2015



DMAIC

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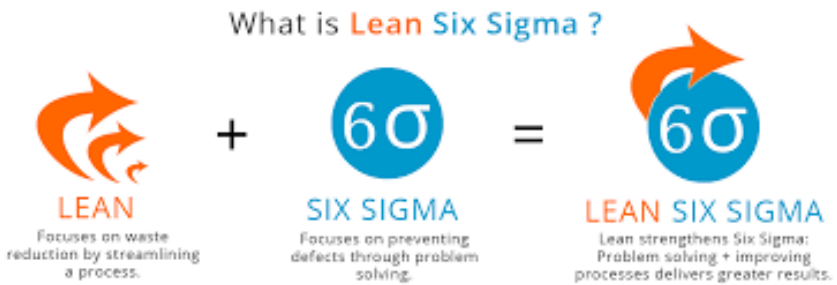

ZED™
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kai 改 change
zen 善 good

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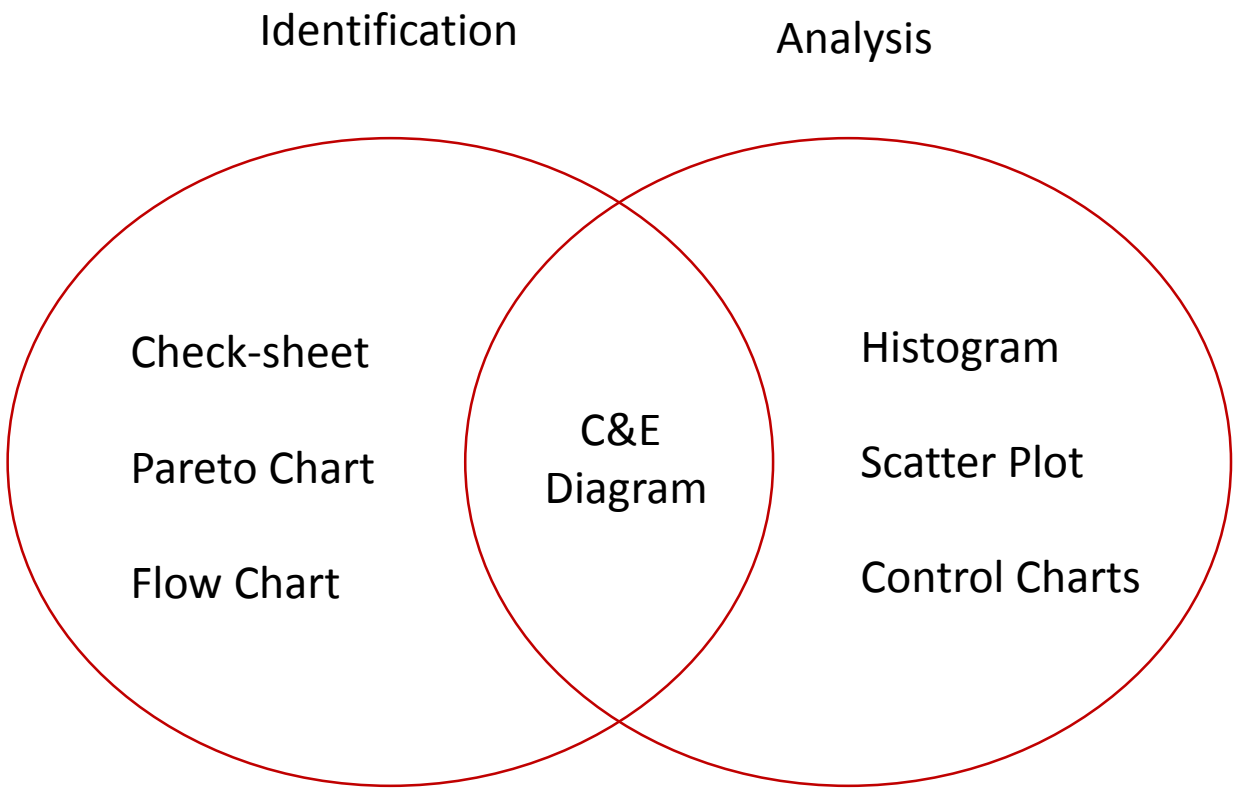
Introduction to 7 QC Tools

- Problem Solving & Process Improvement tools
- 1st proposed by Dr. Kaoru Ishikawa – 1968
- Basic Quality Tools
- Collecting, organizing, manipulating & presenting data graphically.
- 95% problems can be solved



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Why 7 QC Tools?

- A fixed set of graphical tools to solve problems
- The basic fundamental tools to achieve quality improvement
- These tools help organization to tackle every day problems
- These tools are easy to understand and implement
- Do not required any complex analytical or statistical competency
- Rely on data

Problem Solving Framework

Defining the problem

Identifying the root causes

Prioritizing the root causes

Implementing best possible actions

Evaluating best possible actions

Measuring effectiveness of action taken

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Problem Statement

Sales of ABC company has decrease by 15% in the year of 2019-2020 comparing to sales of year 2018-2019.

The sales in year 2018-2019 was 10,00,000 INR.

Company targeted to achieve sales or Rs. 15,00,000 by the year ending 2021.

Root Causes?

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Data Collection

Criteria	Rank
Extremely Unhappy	1
Unhappy	2
Cannot Say	3
Happy	4
Extremely Happy	5

- Conducted sample survey of 2000 existing customers
- Samples were collected using statistical sampling method
- Survey was conducted to analyze customer's satisfaction.

Data Collection

Customer ID	Customer Name	City of Customer	Contact No.	Overall Rating by Customer
CSS - 001	-	Vadodara	-	2
CSS - 002	-	Surat	-	1
CSS - 003	-	Ahmedabad	-	3
CSS - 004	-	Ahmedabad	-	5
CSS - 005	-	Vadodara	-	4
CSS - 006	-	Vadodara	-	1
CSS - 007	-	Anand	-	3
CSS - 008	-	Vadodara	-	5
CSS - 009	-	Ahmedabad	-	5
CSS - 010	-	Surat	-	4

Data Collection

Customer ID	Customer Name	City of Customer	Contact No.	Overall Rating by Customer
CSS - 001	-	Vadodara	-	2
CSS - 002	-	Surat	-	1
CSS - 003	-	Ahmedabad	-	3
CSS - 004	-	Ahmedabad	-	5
CSS - 005	-	Vadodara	-	4
CSS - 006	-	Vadodara	-	1
CSS - 007	-	Anand	-	3
CSS - 008	-	Vadodara	-	5
CSS - 009	-	Ahmedabad	-	5
CSS - 010	-	Surat	-	4

Category	Tally Sheet	Frequency
Extremely Unhappy	𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸	668
Unhappy	𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸	560
Can not Say	𝍸 𝍸 𝍸	127
Happy	𝍸 𝍸 𝍸 𝍸 𝍸	422
Extremely Happy	𝍸 𝍸 𝍸 𝍸	223
	TOTAL	2000

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Check Sheet

- Check sheet is a systematic method to collect, record & present the relevant data.
- Check sheet can be used for various purposes.
- Both Qualitative data & Quantitative data can be collected using check sheet.
- Check sheet is useful to collect attribute data
- Data collected using check sheet can be used as input data for other quality tools.

Category	Tally Sheet	Frequency
Extremely Unhappy	𝍸 𝍸 𝍸 𝍸 𝍸	668
Unhappy	𝍸 𝍸 𝍸 𝍸	560
Can not Say	𝍸	127
Happy	𝍸 𝍸	422
Extremely Happy	𝍸	223
	TOTAL	2000

Check Sheet / Tally Sheet

When to use ?

- ❑ When data can be observed and collected repeatedly.
- ❑ When collecting data on frequency or problems, defects, defect locations, defects causes or any issues.
- ❑ When collecting data from a production process.

Benefits

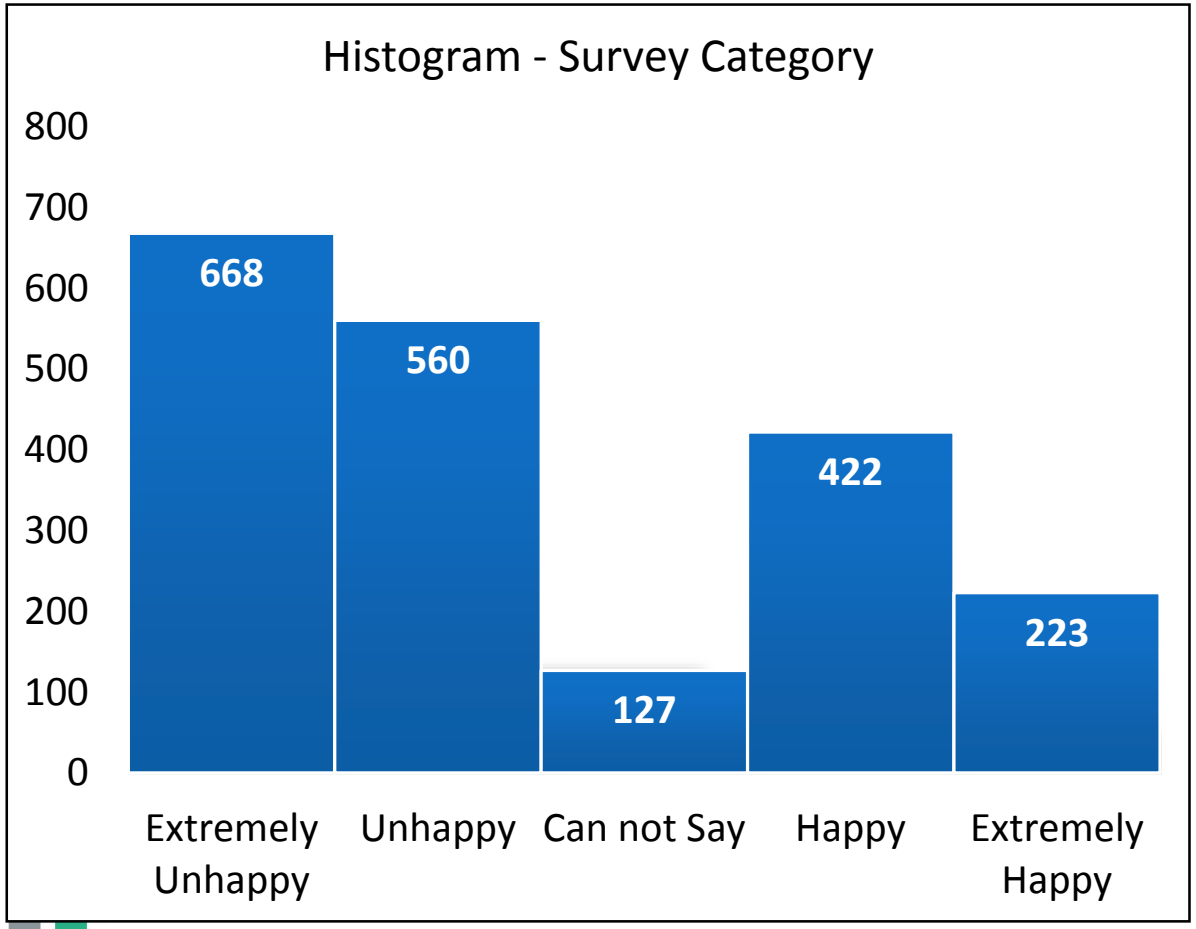
- ❑ Simple to understand
- ❑ Strong visual communication
- ❑ Can be store & compare with other data
- ❑ Real time data

Check Sheet / Tally Sheet

Type of Check sheet in Quality Control – Kaoru Ishikawa

1. To check the shape of the probability distribution
2. Defect Type
3. Defect Location
4. Defect Cause
5. Multi-step process tracking

Histogram



- Graphical representation of survey category
- Almost 60% customers are not satisfied.

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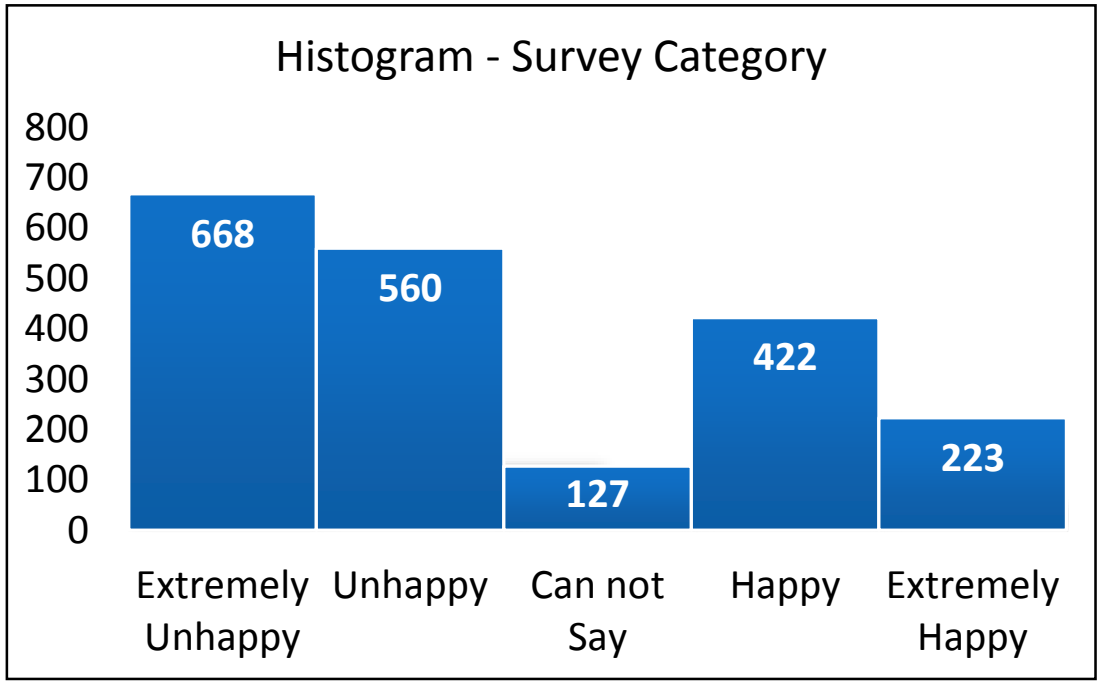
Histogram

- Histogram is a graph which represent frequency of observation or range of observation.
- Graphical summary of large data
- Karl Perason - 1891.
- Classification of data.



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Histogram

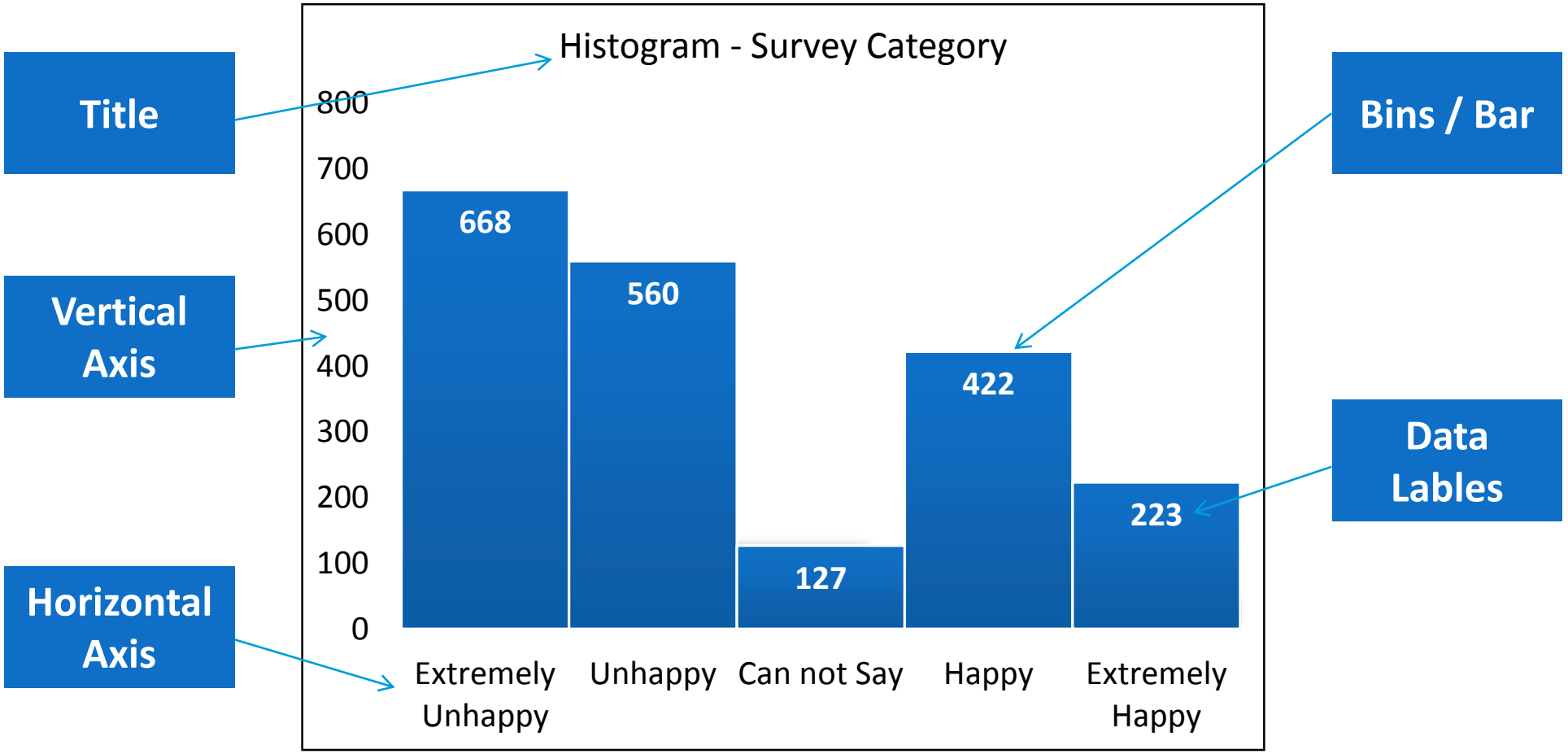
When to use ?

- ❑ Numerical Data
- ❑ Distribution of data
- ❑ To compare data of different time period
- ❑ To represent & communicate data easily and effectively to others

Benefits

- ❑ Easy to construct.
- ❑ Easy to understand different data, it's frequency of occurrence and categories which are difficult to interpret in tabular form.
- ❑ Helps to visualize distribution of data.
- ❑ Helps to understand skewness of the data.

Elements of Histogram



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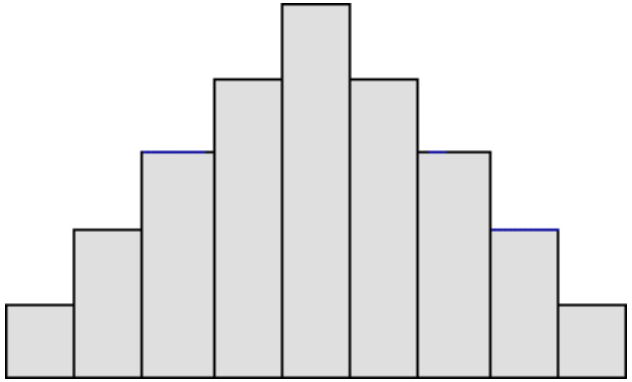
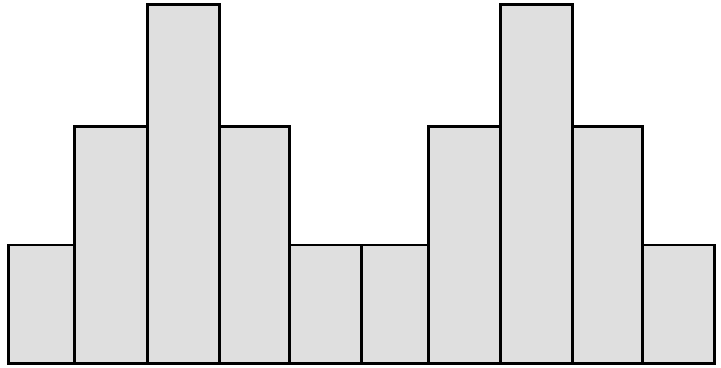
Histogram

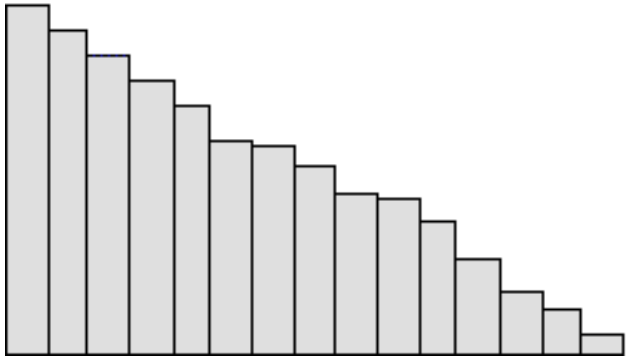
Most common shapes of Histogram



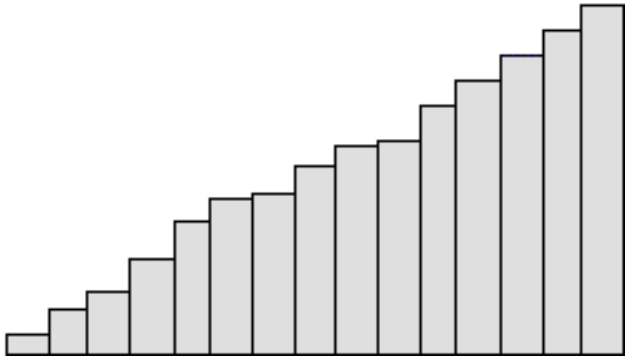
Bell Shape



Bimodal



Right Skew



Left Skew

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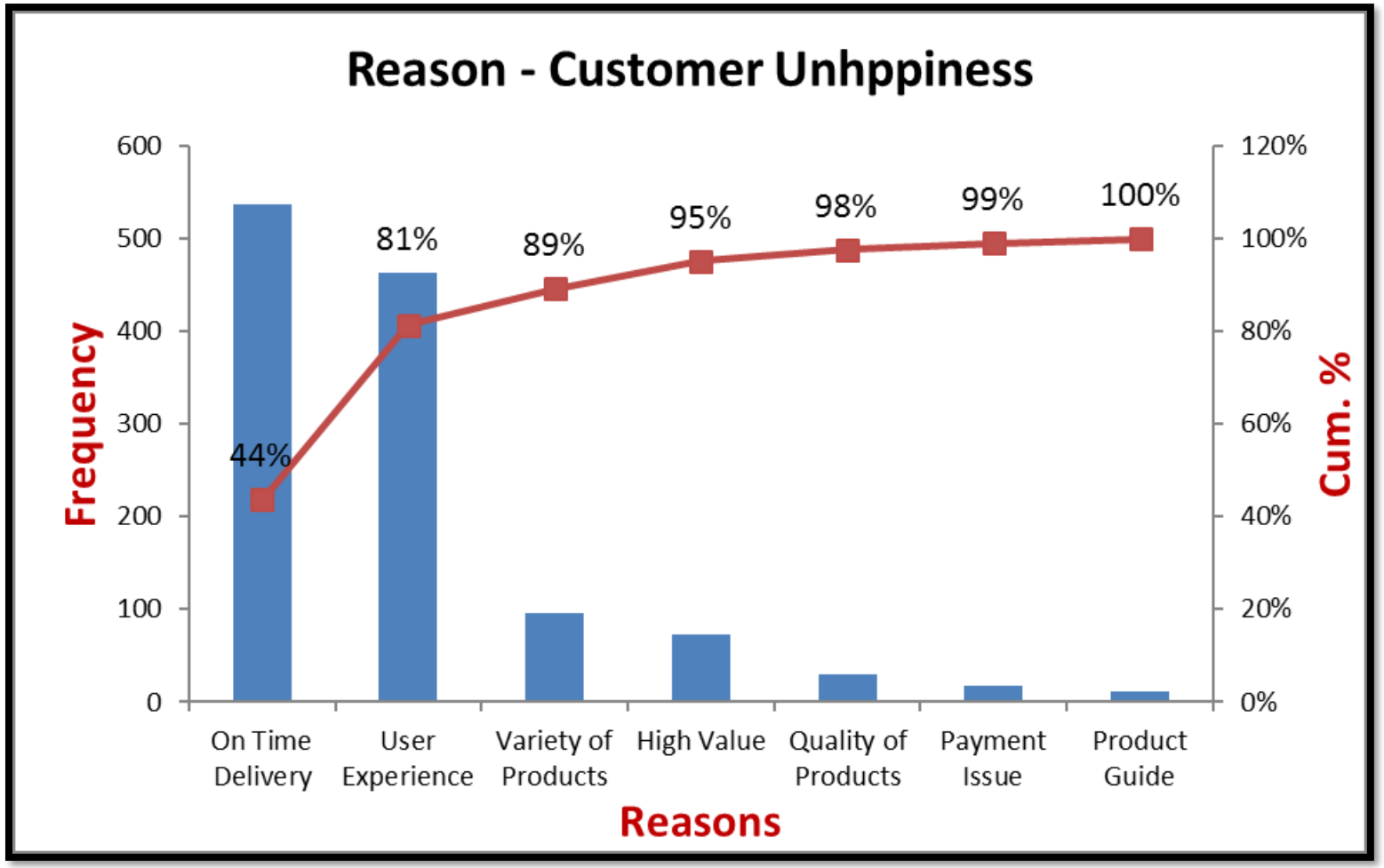
Re-survey – Not satisfied customer

1. On Time Delivery
2. User Experience
3. Variety of Product
4. High value
5. Quality of Product
6. Payment Issue
7. Product Guide

- How much time required to address all reasons?
- Which reason to be address?
- Which are the most potential reasons?

Pareto Chart / Pareto Analysis

Reasons - Customer Unhappiness			
Sr. No.	**Complaint Reason**	**No. of Complaint**	**Cum. %**
1	On Time Delivery	537	44%
2	User Experience	463	81%
3	Variety of Products	96	89%
4	High Value	73	95%
5	Quality of Products	30	98%
6	Payment Issue	18	99%
7	Product Guide	11	100%
	TOTAL	1228	



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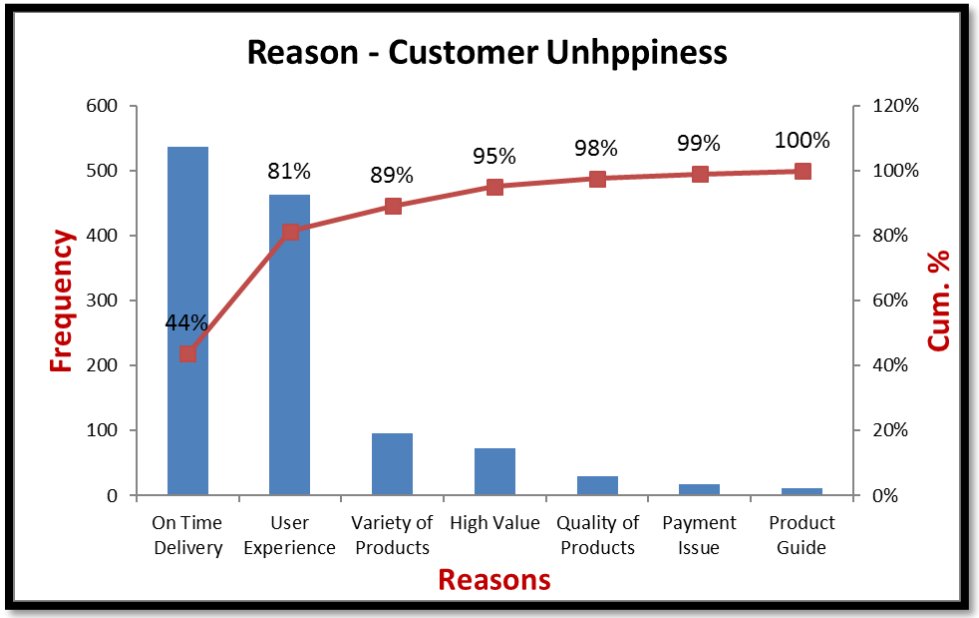
Pareto Chart / Pareto Analysis

- It is a combination of Bar Graph & Line Graph.
- Represents frequency of occurrence in numbers & cumulative impact in %
- Data is arranged in Descending Order.
- Based on 80/20 Principle.
- Developed Vilfredo Pareto



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Pareto Chart / Pareto Analysis

When to use ?

- ❑ To analyze cumulative impact of reasons or causes of problem.
- ❑ To prioritize reasons or causes.
- ❑ Decision making based on fact base data.

Benefits

- ❑ Easy to construct.
- ❑ Easy to identify vital few causes from trivial many.
- ❑ Simple but effective tool for decision making.
- ❑ Helps to identify root causes

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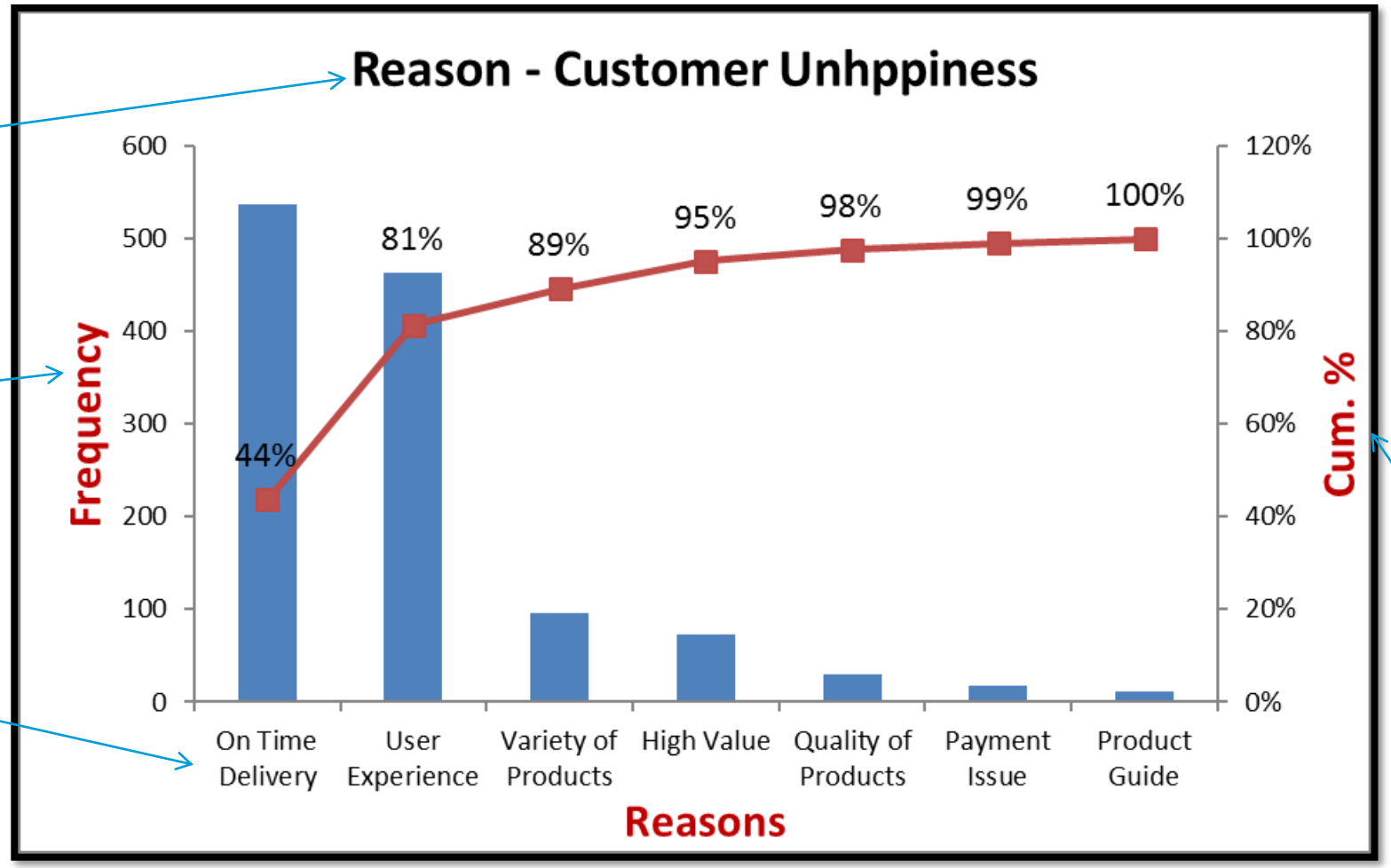
Elements of Pareto Chart



Title

Primary Vertical Axis

Horizontal Axis

Secondary Vertical Axis

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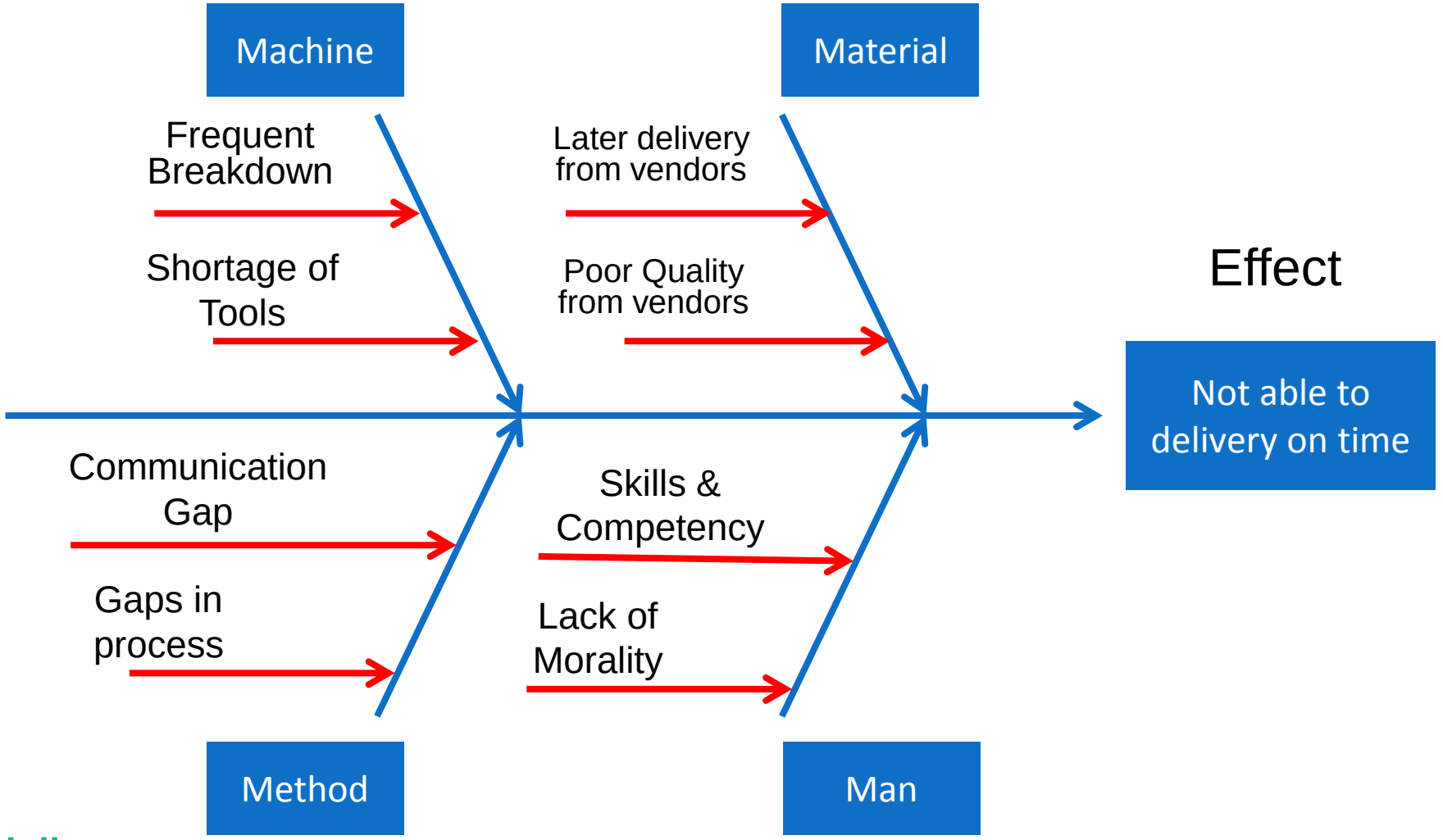
Cause & Effect Diagram / Fishbone Diagram

$Y = f(x)$



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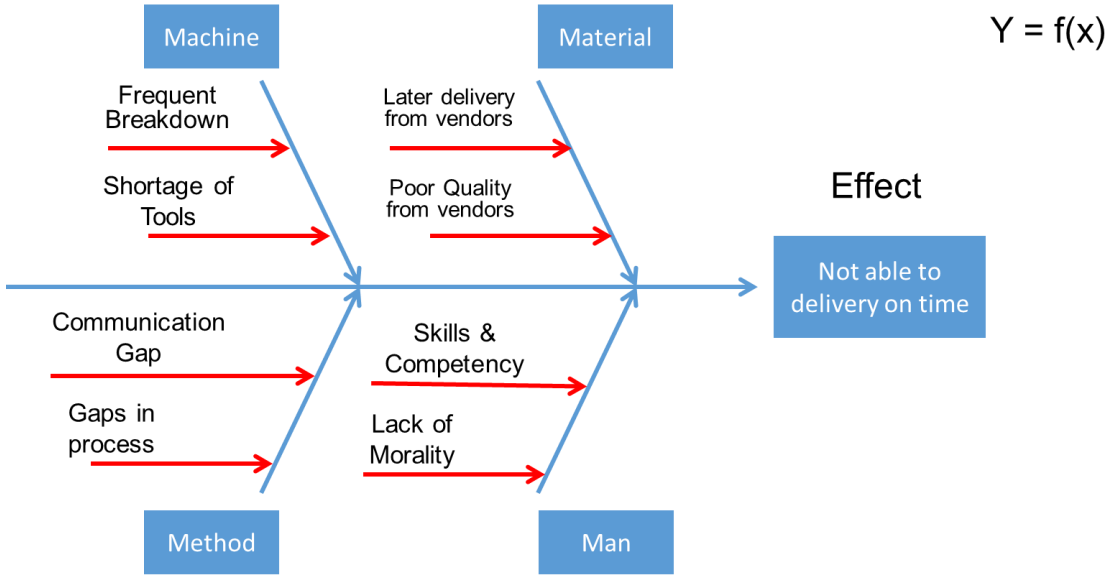
Cause & Effect Diagram / Fishbone Diagram

- It helps to identify root causes of any problem in category.
- It is the result of Brainstorming
- 6Ms, 4S, 7Ps method used to create C&E Diagram.
- Evaluation of effect is based on mathematical function Y = f(x)
- Developed Prof. Ishikawa



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Cause & Effect Diagram / Fishbone Diagram

When to use ?

- ❑ When the problem is clearly defined.
- ❑ To identify root causes
- ❑ Organized possible causes in category
- ❑ Decision making based on fact base data.

Benefits

- ❑ Single screen view of all possible causes
- ❑ Helps to concentration on causes by category.
- ❑ Effective decision making tool.
- ❑ Involvement of People

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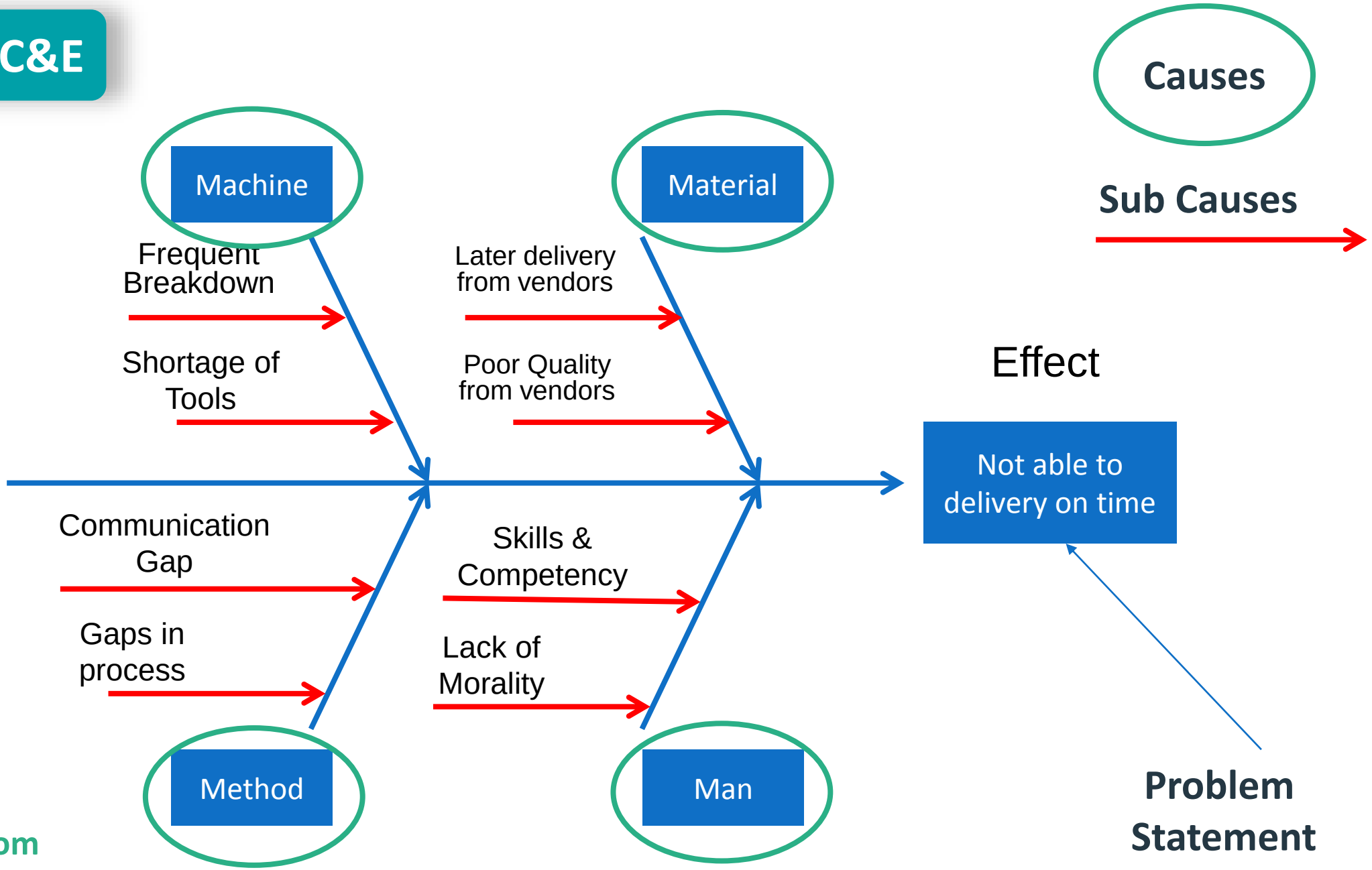
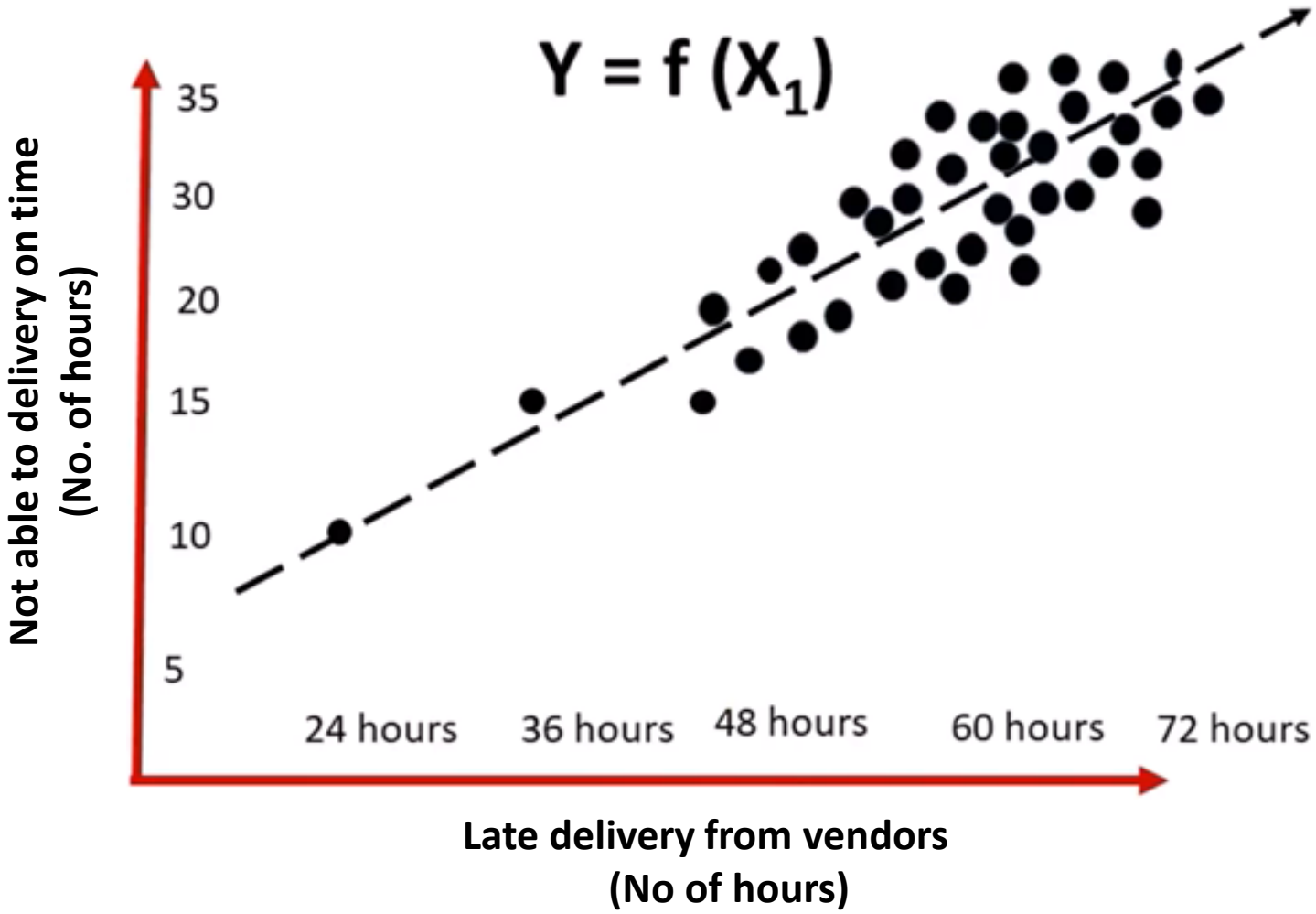
Element of C&E



Scatter Plot

Late delivery from Vendors	Late delivery to customer
1 Day	5 Hours
1.5 Days	10 Hours
2 Days	15 Hours
2.5 Days	20 Hours
3 Days	25 Hours



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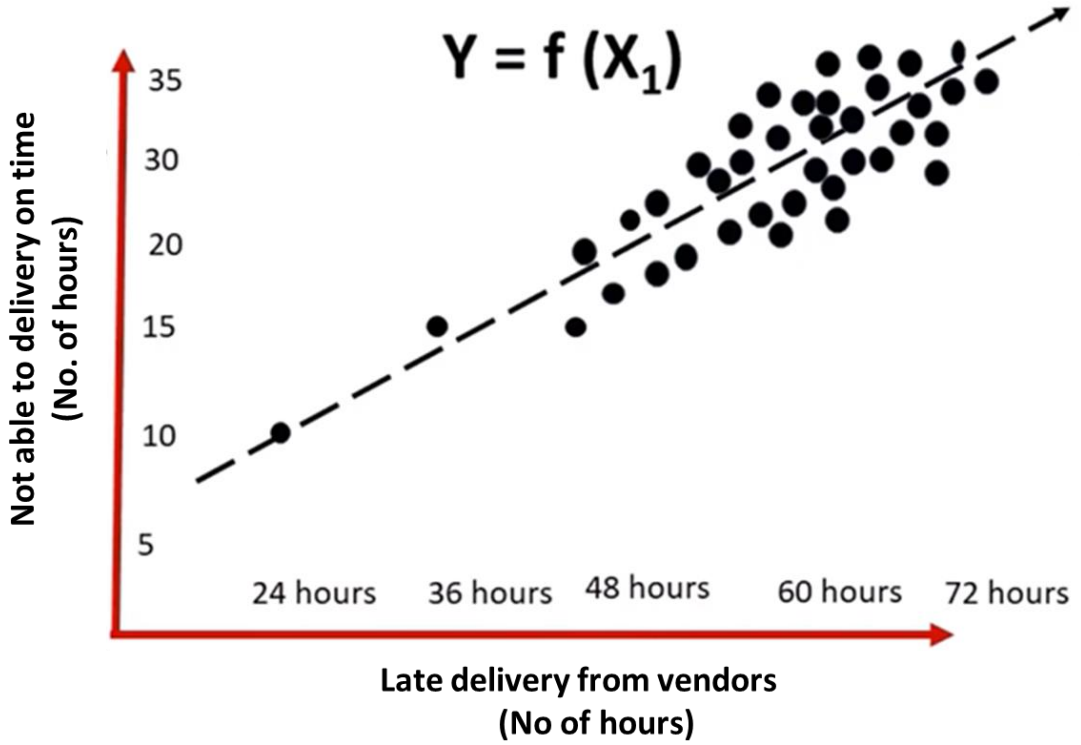
Scatter Plot

- It helps to identify relation between two variable
- Plot one independent variable at a time to have better identification of effect on dependent variable.



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Scatter Plot

When to use ?

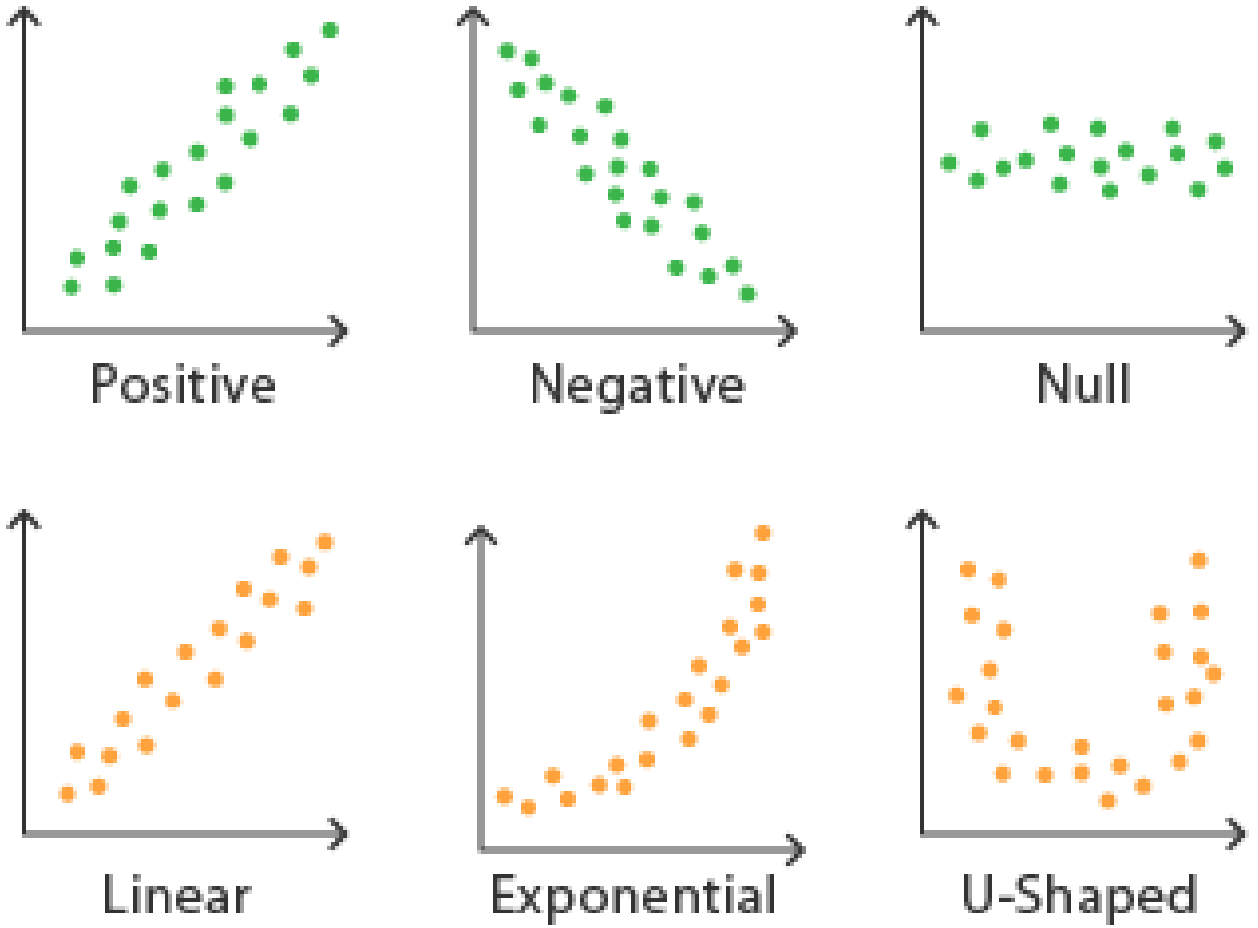
- Two numerical paired data.
- Dependent variable may have multiple value for each value of independent variable
- To determine whether the two variables are related or not.
- To identify potential root causes of problem.

Benefits

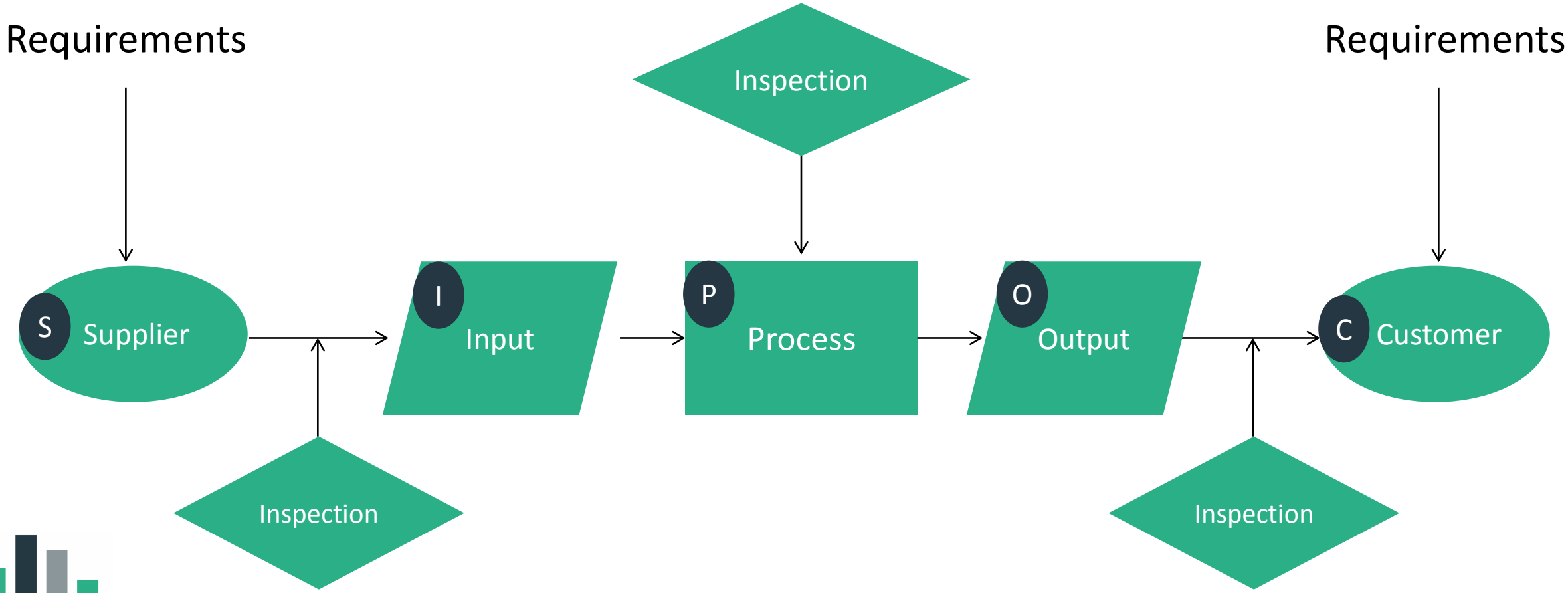
- It helps to identify relationship between two variables.
- It helps to determine range of data. i.e. maximum and minimum value can be determine.
- Easy to construct & interpret.

Scatter Plot

Shapes of Scatter Plot



Flow Chart / Process Map



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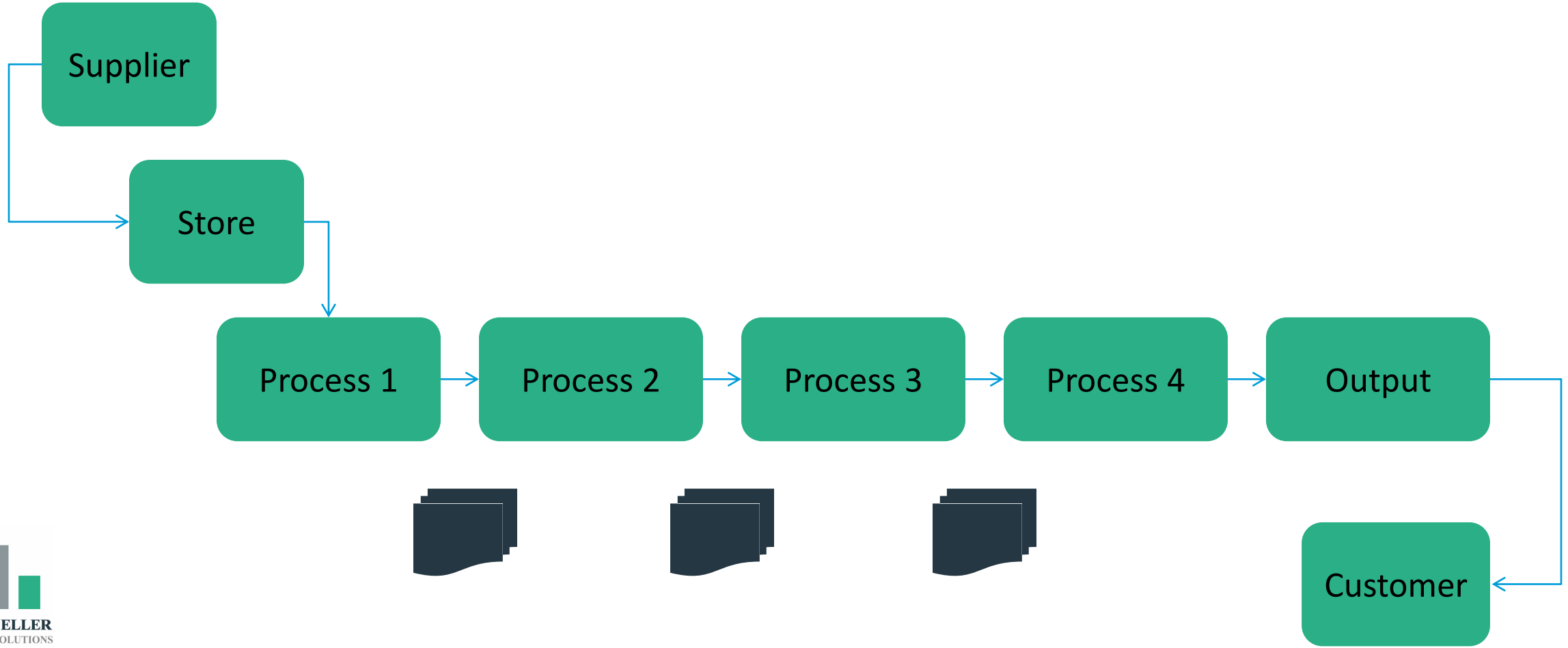
Flow Chart / Process Map



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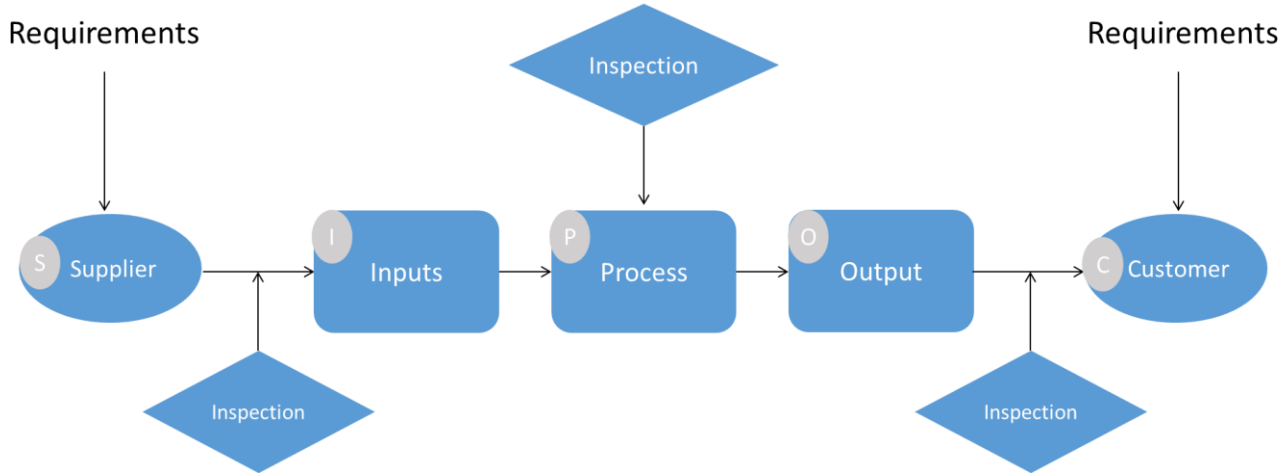
Flow Chart / Process Map

- It is a simple representation of process steps in sequence.
- It has a various shapes of boxes which is symbol of action.
- It is widely use in Manufacturing, computer programming & complex processes.



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Flow Chart / Process Map

When to use ?

- ❑ To explain process in sequence
- ❑ To identify and communicate check-points.
- ❑ It helps in process time study on early stage.
- ❑ To communicate start & end point of process.

Benefits

- ❑ It helps to clarify complex processes.
- ❑ It helps to identify delay, unwanted storage & transportations.
- ❑ It helps to minimize communication gap & provide better clarity to work.

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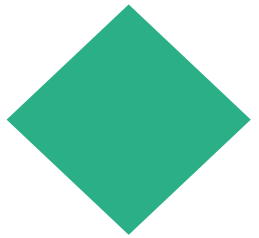
Flow Chart / Process Map

Symbols

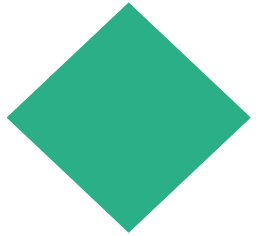
Start & End Point

Input / Output

Process



Decision / Inspection



Decision / Inspection

Document / Record

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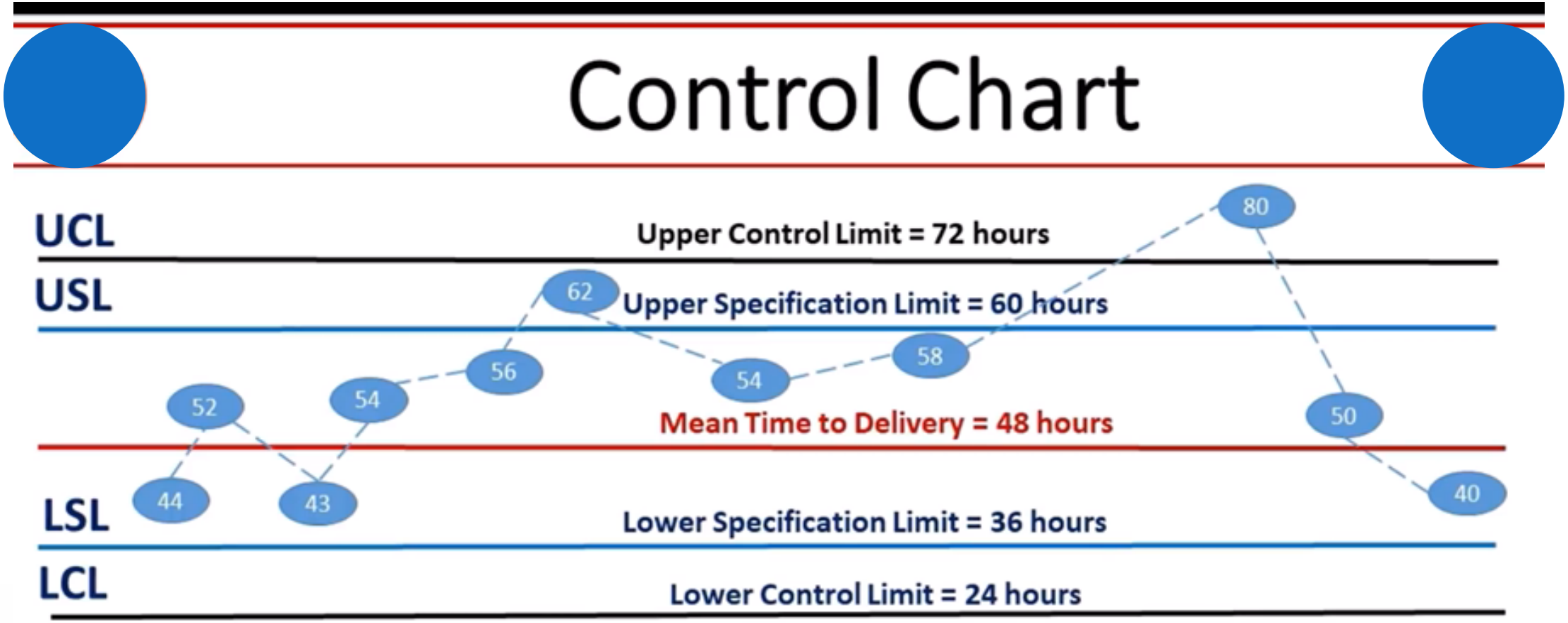
Control Chart



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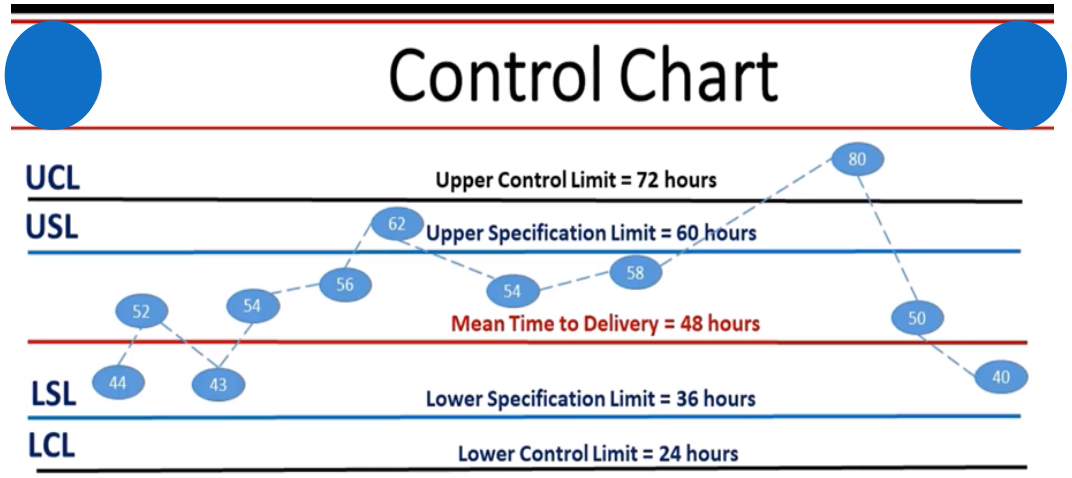
Control Chart

- Also known as Shewhart chart or process behavior chart.
- It is used to determine process is in control or not.
- It can be stated that control chart are graphical tool to represent process monitoring.
- Control chart can be used for variable and attribute data.



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Control Chart

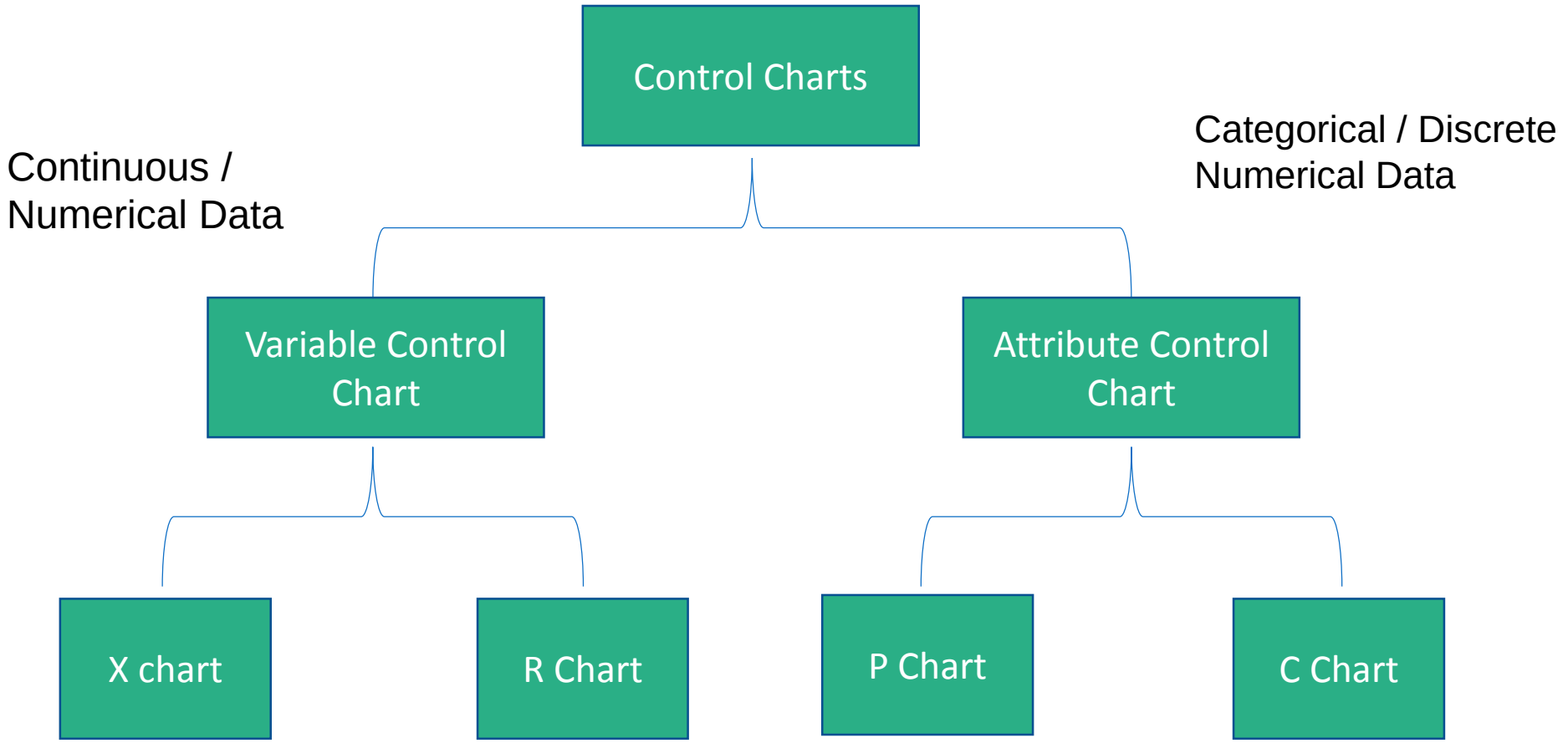
When to use ?

- ❑ To monitor & control ongoing process.
- ❑ To predict expected range of outcome from a process.
- ❑ To analyze variation in process.
- ❑ To determine process is in control or not.

Benefits

- ❑ Can easily identify special causes and common causes of variation.
- ❑ It helps to determine process capability.
- ❑ It gives early warning signals in case of process shifting to out of limit.

Types of Control Chart



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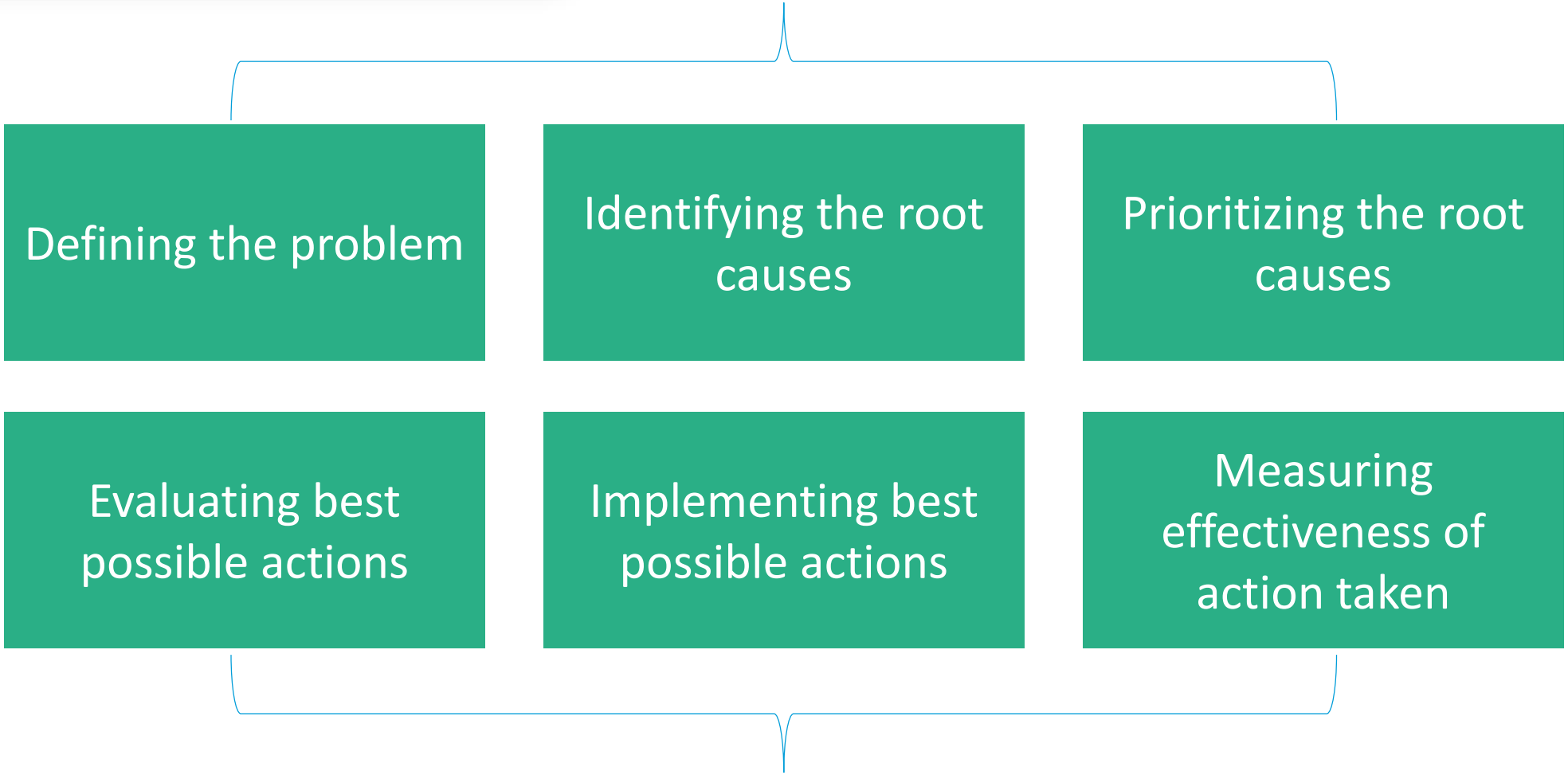
7 QC Tools for problem solving



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Action Plan Matrix

	High	Medium	Low
Possibly Control	Solutions	Solutions	Solutions
Out of Control	Solutions	Solutions	Solutions

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Action Plan

Root Cause	Action Plan	Responsibility	Time to Review	Expected completion date

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Q&A Session

Thank You...!!!

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