



# Introduction to Total Quality Management



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1. Introduction to TQM
2. Need and Applicability of TQM
3. Key Elements of TQM
4. TQM and Six Sigma



## Other Definitions for Quality

- The concept and vocabulary of quality are elusive. Different people interpret quality differently. Few can define quality in measurable terms that can be proved operationalize.
- The American National Standards Institute (ANSI) and the American Society for Quality (ASQ) define quality as:  
*“The totality of features and characteristics of a product or service that bears on its ability to satisfy given needs.”*
- *Quality is Fitness for Use.*  
Evaluates performance for intended use
- *Quality is customer satisfaction and loyalty.*



# Introduction

- **What is a customer?**

Anyone who is impacted by the product or process delivered by an organization.

**External customer:** The end user as well as intermediate processors. Other external customers may not be purchasers but may have some connection with the product.

**Internal customer:** Other divisions of the company that receive the processed product.

- **What is a product?**

The output of the process carried out by the organization. It may be goods (e.g. automobiles, missile), software (e.g. a computer code, a report) or service (e.g. banking, insurance)



# Introduction

- How is customer satisfaction achieved?

Two dimensions: Product features and Freedom from deficiencies.

- **Product features** – Refers to *quality of design*.

Examples in manufacturing industry: Performance, Reliability, Durability, Ease of use, Esthetics etc.

Examples in service industry: Accuracy, Timeliness, Friendliness and courtesy, Knowledge of server etc.

- **Freedom from deficiencies** – Refers to *quality of conformance*.

Higher conformance means fewer complaints and increased customer satisfaction.



# History of quality management

*...To know the future, know the past!*

- Before Industrial Revolution, skilled craftsmen served both as manufacturers and inspectors, building quality into their products through their considerable *pride in their workmanship*.
- Industrial Revolution changed this basic concept to *interchangeable parts*. Likes of Thomas Jefferson and F. W. Taylor (“scientific management” fame) emphasized on production efficiency and decomposed jobs into smaller work tasks. Holistic nature of manufacturing rejected!



# History of quality management

- Statistical approaches to quality control started at **Western Electric** with the separation of inspection division. Pioneers like Walter Shewhart, **George Edwards**, W. Edwards **Deming** and Joseph M. **Juran** were all employees of Western Electric.
- After World War II, under General MacArthur's Japan rebuilding plan, Deming and Juran went to Japan.
- Deming and Juran introduced statistical quality control theory to Japanese industry.
- The difference between approaches to quality in USA and Japan: Deming and Juran were able to convince the top managers the importance of quality.



# History of quality management

- Next 20 odd years, when top managers in USA focused on marketing, production quantity and financial performance, Japanese managers improved quality at an unprecedented rate.
- Market started preferring Japanese products and American companies suffered immensely.
- America woke up to the quality revolution in early 1980s. Ford Motor Company consulted Dr. Deming to help transform its operations.

(By then, 80-year-old Deming was virtually unknown in USA. Whereas Japanese government had instituted The Deming Prize for Quality in 1950.)





# History of quality management

- Managers started to realize that “quality of management” is more important than “management of quality.” Birth of the term *Total Quality Management (TQM)*.
- *TQM – Integration of quality principles into organization’s management systems.*
- Early 1990s: Quality management principles started finding their way in *service industry*. FedEx, The Ritz-Carton Hotel Company were the quality leaders.
- *TQM recognized worldwide*: Countries like Korea, India, Spain and Brazil are mounting efforts to increase quality awareness.



# Commonality of Themes of Quality Gurus

- Inspection is never the answer to quality improvement, nor is “policing”.
- Involvement of leadership and top management is essential to the necessary culture of commitment to quality.
- A program for quality requires organization-wide efforts and long term commitment, accompanied by the necessary investment in training.



# TQM vs. Other Quality Tools



ISO for example has different standards for different purposes, for security management, for product quality etc. Implementing ISO involves going through certain guided principles to ensure that correct approach is taken while rendering services with lesser effort to focus on the final product.



ITIL (Information Technology Infrastructure Library) is a set of standards for quality. However, they are applicable to IT related products and services only.



COPC (Customer Operations Performance Centre) CSP (Customer Service Provider) and VMO (Vendor Management Organization) are quality standards specifically designed for the processes that are outsourced to a call centre and for the call centre itself.



Six Sigma is used when either there is a defect in existing process or we want process to perform at a higher performance level. So, the approach, is limited to the departments/persons/processes involved in the process and at end. It has a definite problem statement and a defined solution.



# TQM vs. Other Quality Tools



**TQM is an effective System of Quality Development, Quality Maintenance and Quality improvement efforts involving all the departments and groups in an organization to allow economy in production of goods or rendering of services along with complete customer satisfaction.**



# Ingredients of TQM



**TQM is an effective System of Quality Development, Quality Maintenance and Quality improvement efforts involving all the departments and groups in an organization to allow economy in production of goods or rendering of services along with complete customer satisfaction.**

**So, the basic ingredients of TQM are:**

Quality of Products or Processes is responsibility of all involved in the creation and customer (internal and external).

Aimed at Economy in the cost level

Aimed at Satisfaction at the customer level



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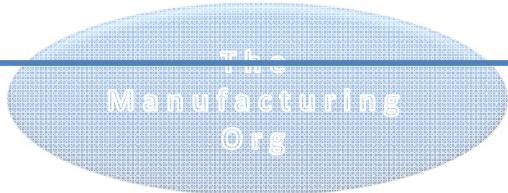
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# Applicability of TQM

Need and Applicability of TQM



**Total Quality Management covers all aspects from Top Down and Maintenance**  
**Helps optimize cost, revenue and ensures Customer satisfaction**





# Need of TQM

Need and Applicability of TQM

**The need of TQM lies in the fact that it is Quality tool that can be:**

1. Implemented over a larger area
2. Always the end result aimed at Customer or End User satisfaction
3. All Process from Conceiving Idea to Earning Revenue is taken care of
4. Aims are Long Term Success
5. Caters to Manufacturing Process that is more dynamic
6. Creates Accountability in each entity



# Relationship between TQM, JIT & TPM

**Total Quality Management has a close relationship between the below two Quality Parameters**

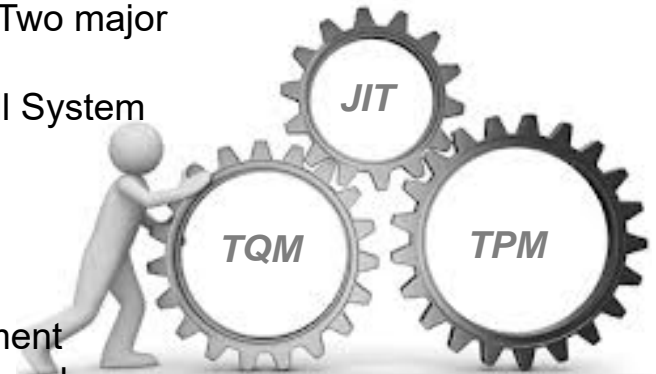
Need and Applicability of TQM

## **JIT – Just in Time**

JIT is a manufacturing Program to identify and eliminate all kinds of waste through Just in Time production and involvement of workforce. Two major wastes are WIP inventory and unnecessary delay in flow time. Implementation methodology are Set up time reduction and Pull System production.

## **TPM – Total Productive Maintenance**

TPM is a manufacturing Program designed to maximise equipment effectiveness, throughout its entire life through the participation and motivation of entire workforce.



## **TQM – Total Quality Management includes the below in light of JIT and TPM**

TQM basic techniques include cross-functional product design, process management, supplier quality management, and customer involvement.

JIT basic techniques include set-up time reduction, pull systems production, JIT delivery by suppliers, equipment layout, and daily schedule adherence.

TPM basic practices are autonomous and planned maintenance, technology emphasis and proprietary equipment development.



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# Key Elements of TQM – TQM Structure in the Org.

Key Elements of TQM



# TQM Structure in the Org.

Key Elements of TQM



Management plans the activities for TQM facilitation

Different applicable Quality Standards are integrated into the Process and Operation

The Quality Standards ensure Supply Chain Management to be correct and smooth

The Quality Standards also ensure the final product to be as per customer requirement or better

Correct inflow and outflow of services and products keep customers satisfied

**So, overall Operation runs on its Optimum Capacity always, so that Cost, Revenue and Customer Satisfaction are always on minimum defect level**



# Cost - Money - Price

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- Money – The language of management



# Concept

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The "**cost of quality**" is **not the price** of creating a quality product or service.

It's the **cost of NOT** creating a quality product or service.





# COQ - Definition

- **Cost of Quality** is a means to quantify the total cost of:
  - Quality-related efforts  
and
  - Deficiencies



**Quality costs are the costs associated with**

- **Preventing**.....Investing in the prevention of nonconformance to requirements
- **Finding**..... Appraising a product or service for conformance to requirements
- **Failing to meet requirements**.....Correcting defective work



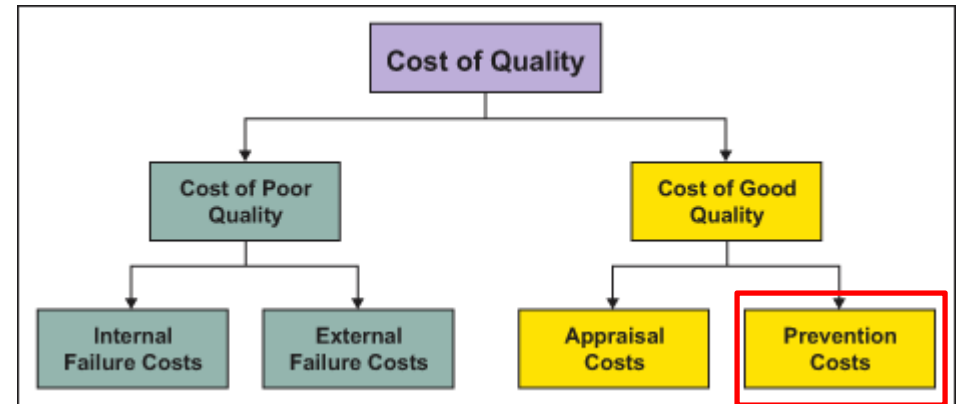
# COQ Components

## ➤ Preventive Cost

The costs of all activities specifically designed to **prevent** poor quality in products or services.

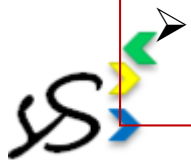
Examples are the costs of:

- New product review
- Quality planning
- Supplier capability surveys
- Quality improvement team meetings
- Quality improvement projects
- Quality education and training



*These are all planned, proactive activities*

- In the ideal situation, Prevention costs will be the largest portion of the Total Cost of Quality
- Typically, prevention is less than 10% of Total COQ where it should be about **70%**



# COQ Components

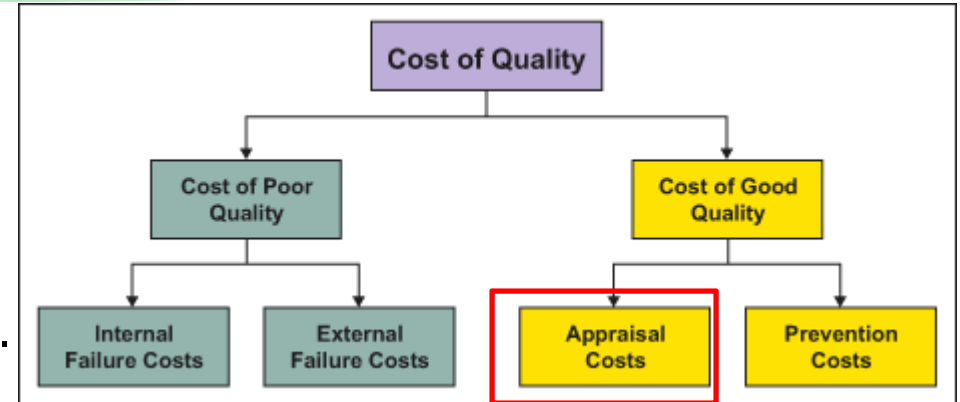
## ➤ Appraisal Cost

The costs associated with **measuring, evaluating or auditing** products or services to assure conformance to standards & performance requirements.

These include the costs of:

- Inspection/test of purchased material
- In-process and final inspection/test
- Product, process or service audits
- Calibration of measuring and test equipment

These are all planned activities



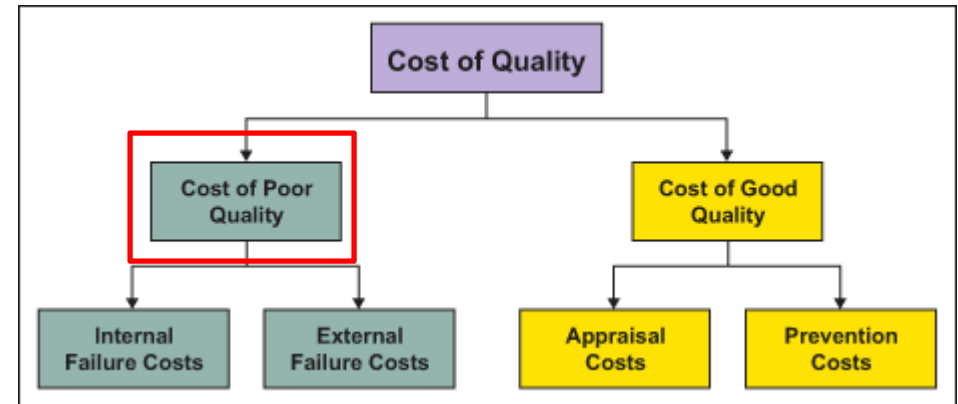
➤ Appraisal Costs should be the second largest category, but should not exceed prevention costs



# COQ Components

## ➤ Failure Costs

The costs resulting from products or services **not conforming to requirements** or customer/user needs. Failure costs are divided into internal and external failure categories.



## Internal Failure Costs

Failure costs occurring prior to delivery or shipment of the product, or the furnishing of a service, to the customer.

Examples are the costs of:

✓ Scrap

✓ Rework

✓ Re-inspection

✓ Re-testing



# COQ Components

## ➤ Failure Costs (Contd.)

### • External Failure Costs

Failure costs occurring after delivery or shipment of the product — and during or after furnishing of a service — to the customer.

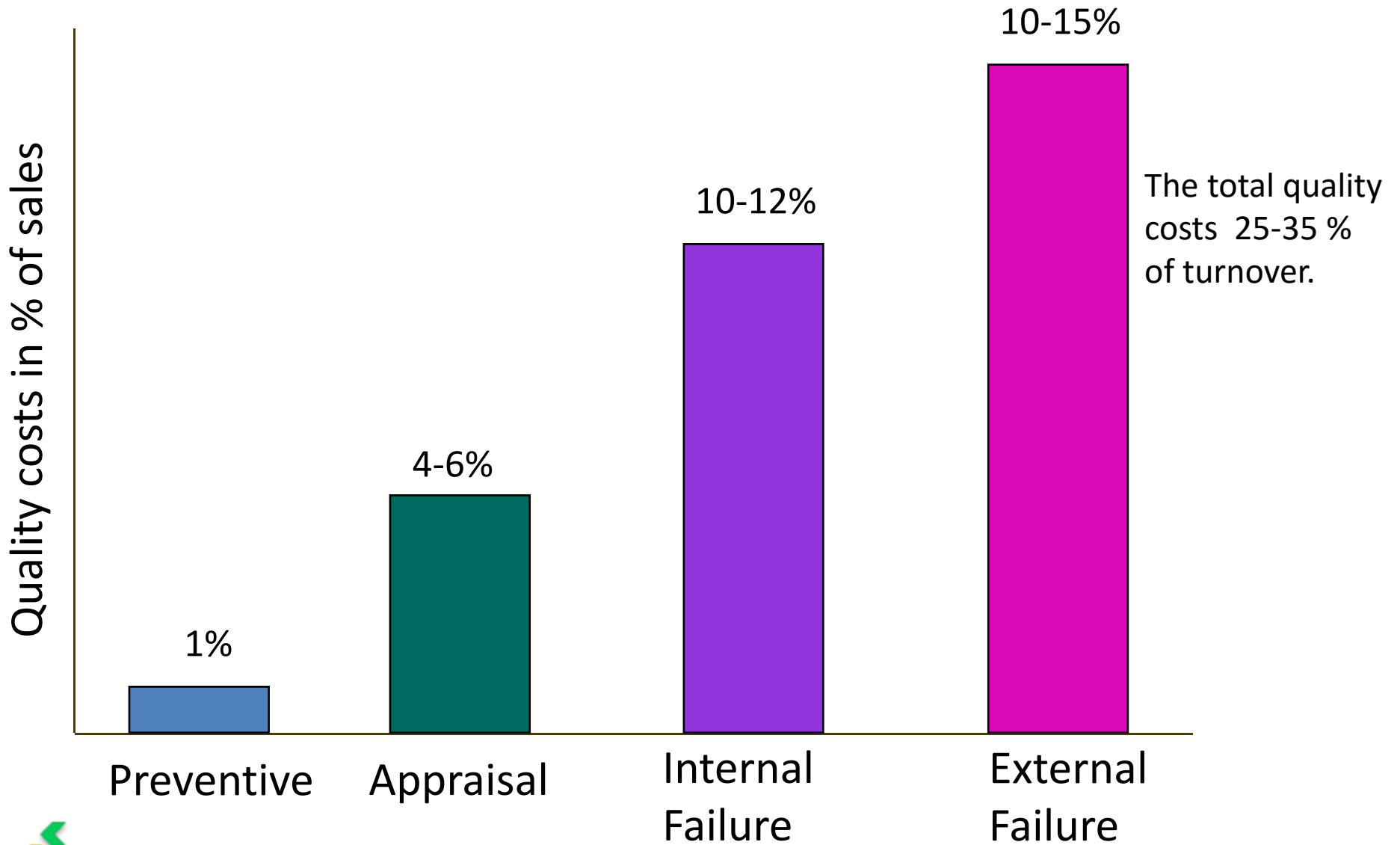
Examples are the costs of:

- ✓ Processing customer complaints
- ✓ Customer returns
- ✓ Warranty claims
- ✓ Product recalls

**These are non-value added and reactive**



# Size of various quality cost elements



## Impact of TQM on costs.

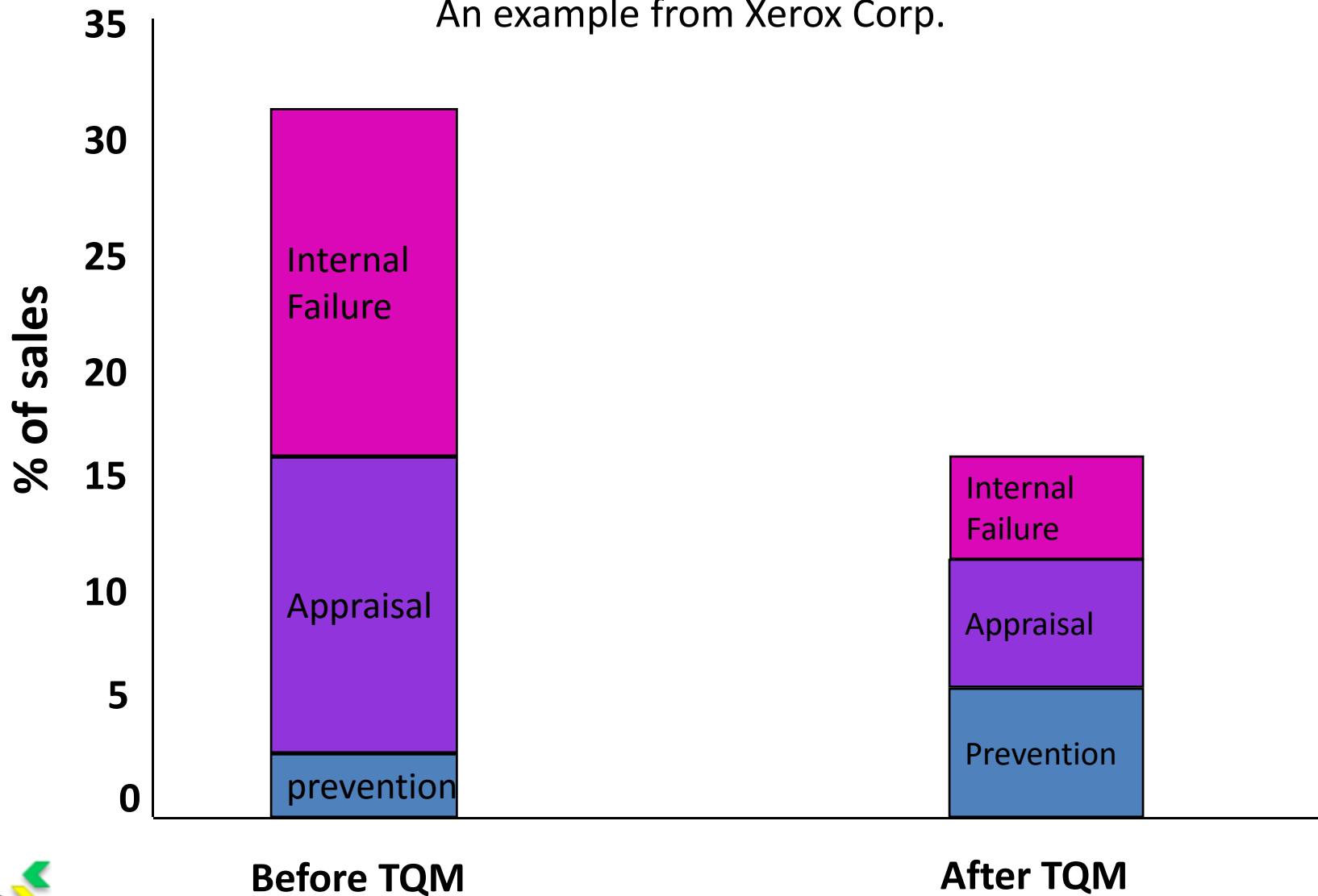


- ã TQM is primarily aimed to improve the quality of the product , higher customer satisfaction and better working environment for the employees. The most dramatic impact of TQM is on reduction of quality costs which directly effect the profitability .
- ã This is demonstrated by the results of TQM program in Xerox Corp . The change in various elements of quality cost before and after launching TQM by Xerox Corp is shown on the next slide.



# Impact of TQM on costs.

An example from Xerox Corp.





# Why measure COQ?

## Measure COQ - Why?

- COQ can be used to identify quality improvement candidates
- COQ provides one measure of comparing the success of projects
- COQ can provide cost data for motivational purpose
- **Money is the language of management, you need to show them the numbers - Crosby**



# Steps in implementing TQM

- 1 Obtain CEO Commitment
- 2 Educate Upper-Level Management
- 3 Create Steering Committee
- 4 Outline the Vision Statement, Mission Statement, & Guiding Principles
- 5 Prepare a Flow Diagram of Company Processes
- 6 Focus on the Owner/Customer (External) & Surveys
- 7 Consider the Employee as an Internal Owner/customer
- 8 Provide a Quality Training Program
- 9 Establish Quality Improvement Teams
- 10 Implement Process Improvements
- 11 Use the Tools of TQM
- 12 Know the Benefits of TQM

**Continuous Improvement**



# TQM

## The implementation of TQM its impact on manufacturing performance

They derived 16 Principles which are essential elements of TQM

1. Cross-Functional Product Design
2. Process Management
3. Supplier Quality Management
4. Customer Involvement
5. Information and Feedback
6. Committed Leadership
7. Strategic Planning
8. Cross-Functional Training
9. Employee Involvement
10. Set-up time reduction
11. Pull System Production
12. Delivery by Supplies
13. Equipment Layout
14. Daily Schedule Adherence
15. Autonomous & Planned Maintenance
16. Technology Emphasis



## **The implementation of TQM its impact on manufacturing performance.**

They derived 16 Principles which are essential elements of TQM.

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16. Technology Emphasis



# TQM for Top Management

## 1-Strategic Quality Management (SQM).

Vision/Mission statement

Quality policies.

Quality goals

Measurement feedback

Review of progress

Training



# – Strategic Planning

Strategy or Policies are made at the uppermost levels of Leadership. TQM wants that there should be a Strategic Plan for the organization which is clear and motivated. Generally an organizations strategy revolves around its Vision and Mission.

With a clear strategy, it is easy for the Management, Manufacturing Plant and other departments to develop their own pointers to drive towards the common goal.

This requires a methodical approach, that is TQM or any other Quality initiative.

Key Elements of TQM

## The advantages are:

1. Goal is defined
2. Misinterpretation of Key deliverables are avoided
3. Larger goal of the organization makes the smaller missions well defined and time bound
4. Leadership's ease of maneuvering the teams and management is increased towards the Vision



# TQM for Middle Management

## 1-Process Management

Planning and administrating the activities necessary to *achieve high quality in business processes*; and also identifying *opportunities for improving quality* and operational performance – ultimately, *customer satisfaction*.

- Processes are of two types – value-added processes and support processes.
- Value-added processes – those essential for running the business and achieving and maintaining competitive advantage. (Design process, Production/Delivery process).
- Support processes – Those that are important to an organization's value-creation processes, employees and daily operations.
- Value creation processes are driven by external customer needs while support processes are driven by internal needs.



# Process Management (TQM)

Process management is the application of knowledge, skills, tools, techniques and systems. Its primary motive is to define, visualize, measure, control, report and improve processes. The goal of PM is to meet customer requirements profitably. It is also called BPM (Business Process Management)

Key Elements of TQM

## The advantages are:

1. Processes are defined as per Quality Parameters and has defined SOPs
2. It is an ongoing Process, and helps to keep pace with the market change and demand
3. Defects are minimized, Cost and Revenue Optimized and Customer Satisfaction Maximized.





## 2-Statistical Process Control (SPC).

Statistics and probability

Confidence interval.

Control chart

Mil standard

Quality tools



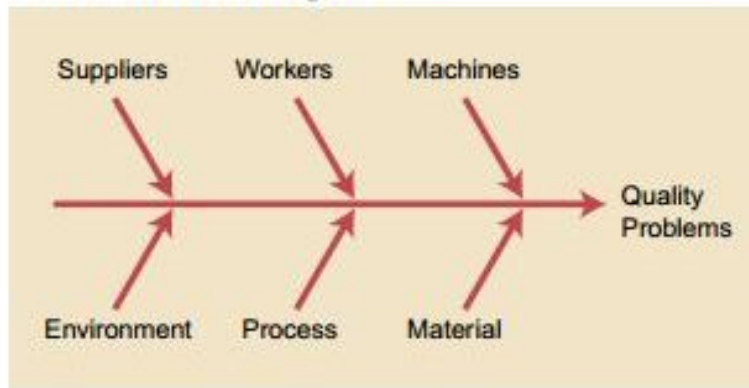
# Use the Tools of TQM

Seven *classical* tools of quality and process improvement, plus one, are presented below.

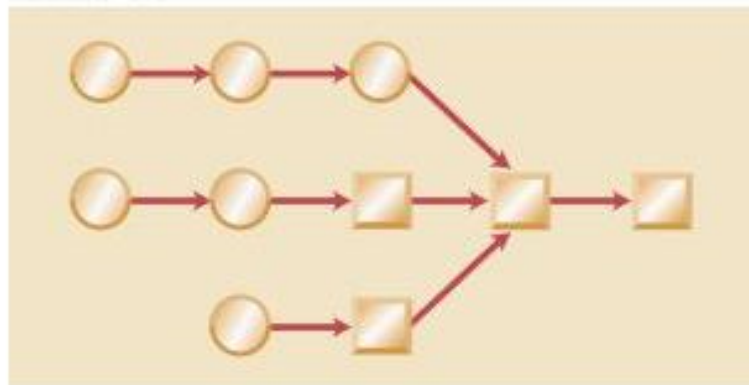
Tool	Use
Flowchart	Portrays all the steps in a process. Helps understand the process.
Cause and Effect Diagram	Portrays possible causes of a process problem. Helps determine root cause.
Control Chart	Shows if a process has too much variation.
Histogram	Portrays the frequency of occurrence.
Check Sheet	Tabulates frequency of occurrence.
Pareto Diagram	Visually portrays problems and causes in order of severity or frequency. Helps determine which problem or cause to tackle first.
Scatter Diagram	Helps determine if two variables are related.
Run Chart	Shows variation and trends with time. Provides baseline data, and helps to determine if a process is improving or not.



### 1. Cause-and-Effect Diagram



### 2. Flowchart



### 3. Checklist

Defect Type	No. of Defects	Total
Broken zipper	///	3
Ripped material	////////	7
Missing buttons	///	3
Faded color	//	2

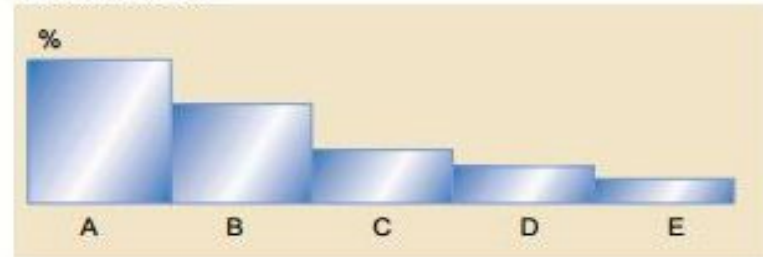
### 4. Control Chart



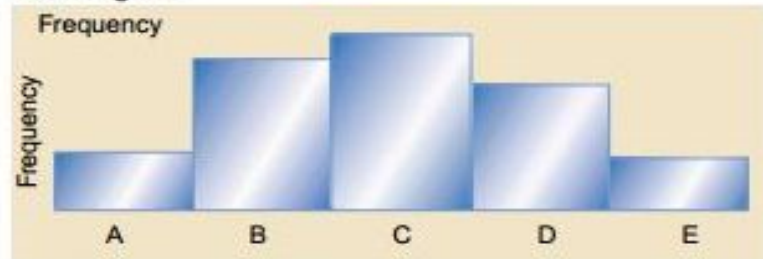
### 5. Scatter Diagram



### 6. Pareto Chart

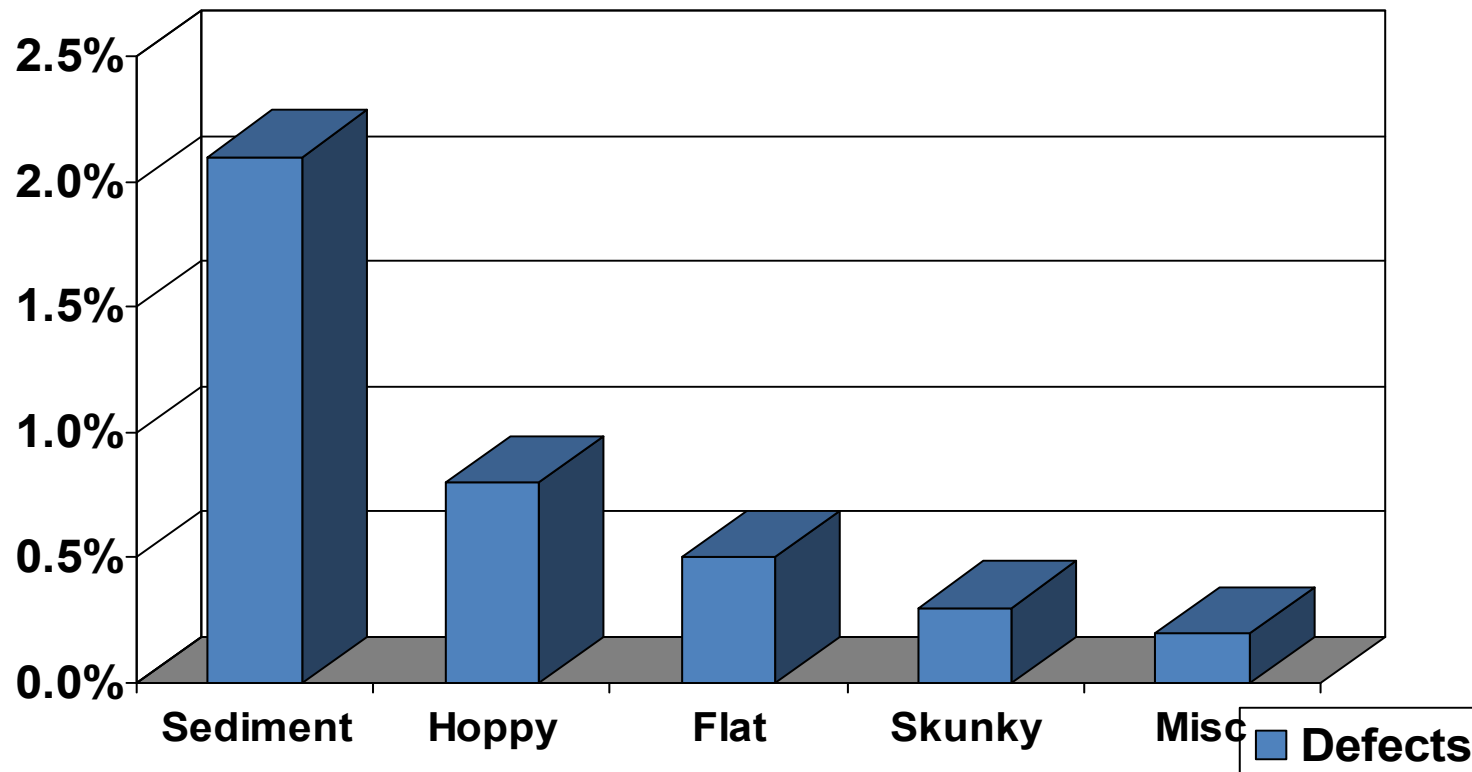


### 7. Histogram



# Pareto Chart - ranked histogram

- Invented by Joseph Juran
- Beer defects



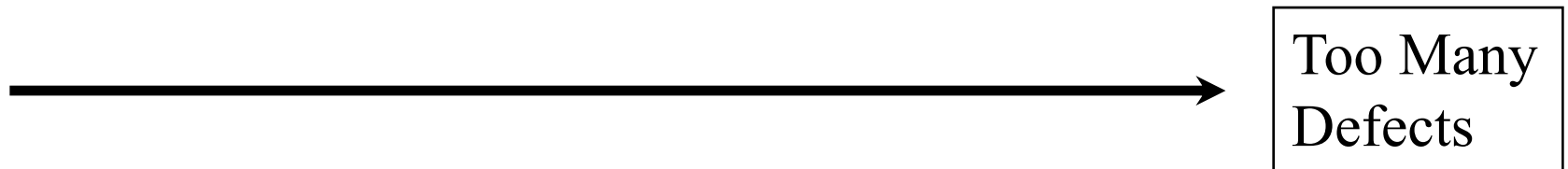
## Wilfredo Pareto 1848-1923



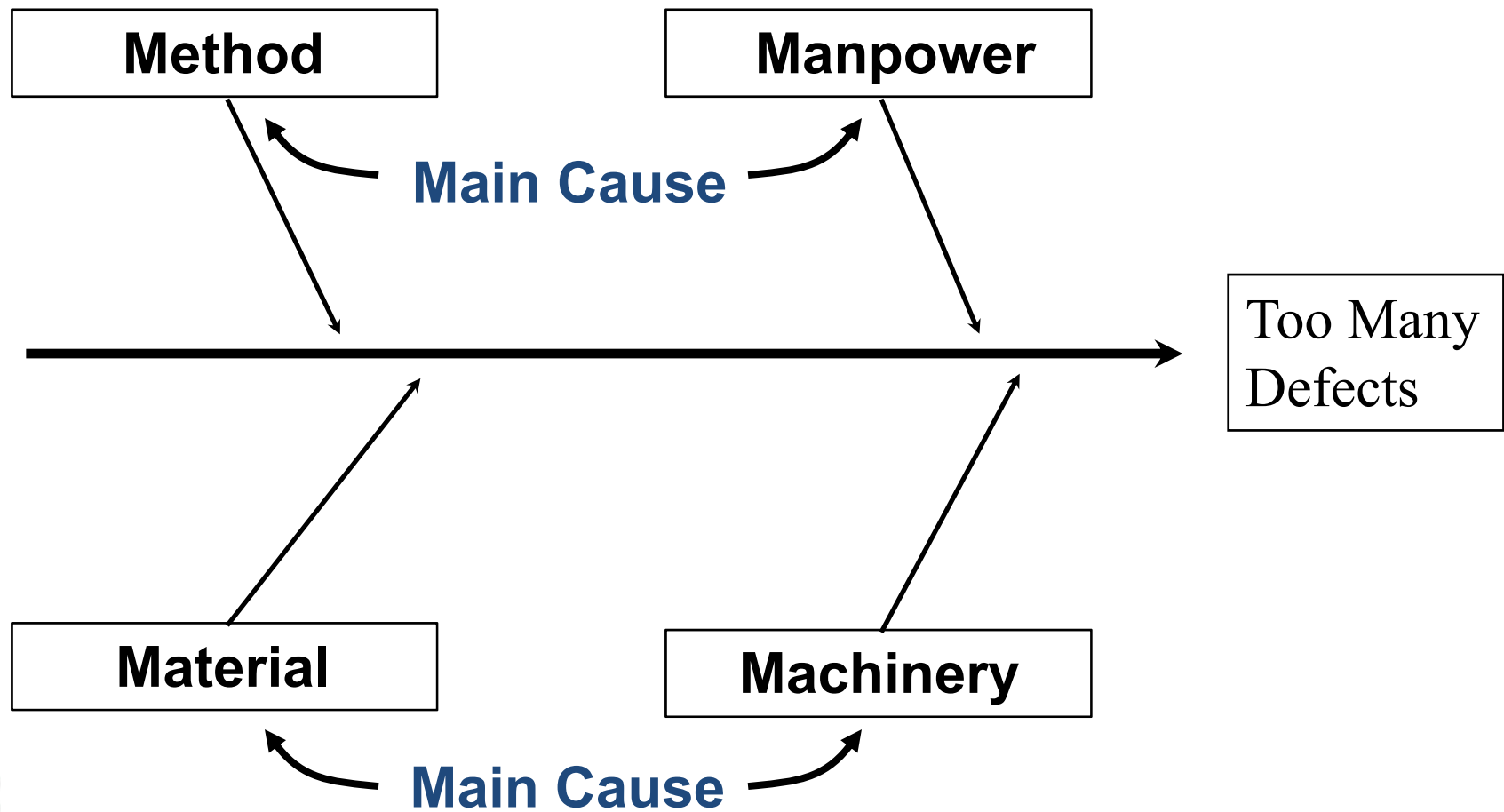
- Italian Economist
- “80/20” rule: 80% of the wealth is controlled by 20% of the people  
*Cours d'économie politique* (1896-7)
- 80/20 rule believed to apply much more widely
- 1906- “Pareto Optimality” – not possible to make anyone better off (in his own estimation) without making someone else worse off



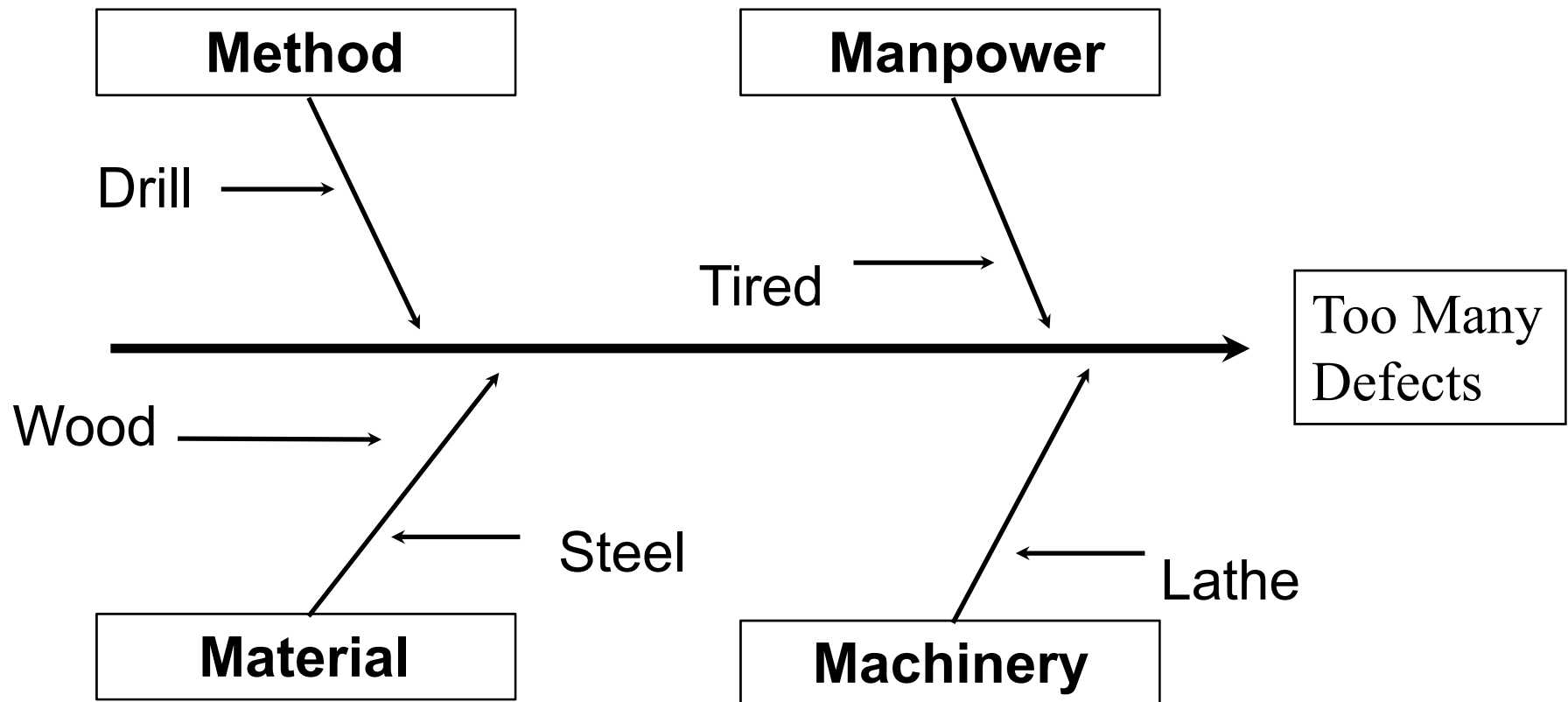
# Cause & Effect Diagram Example



# Cause & Effect Diagram Example

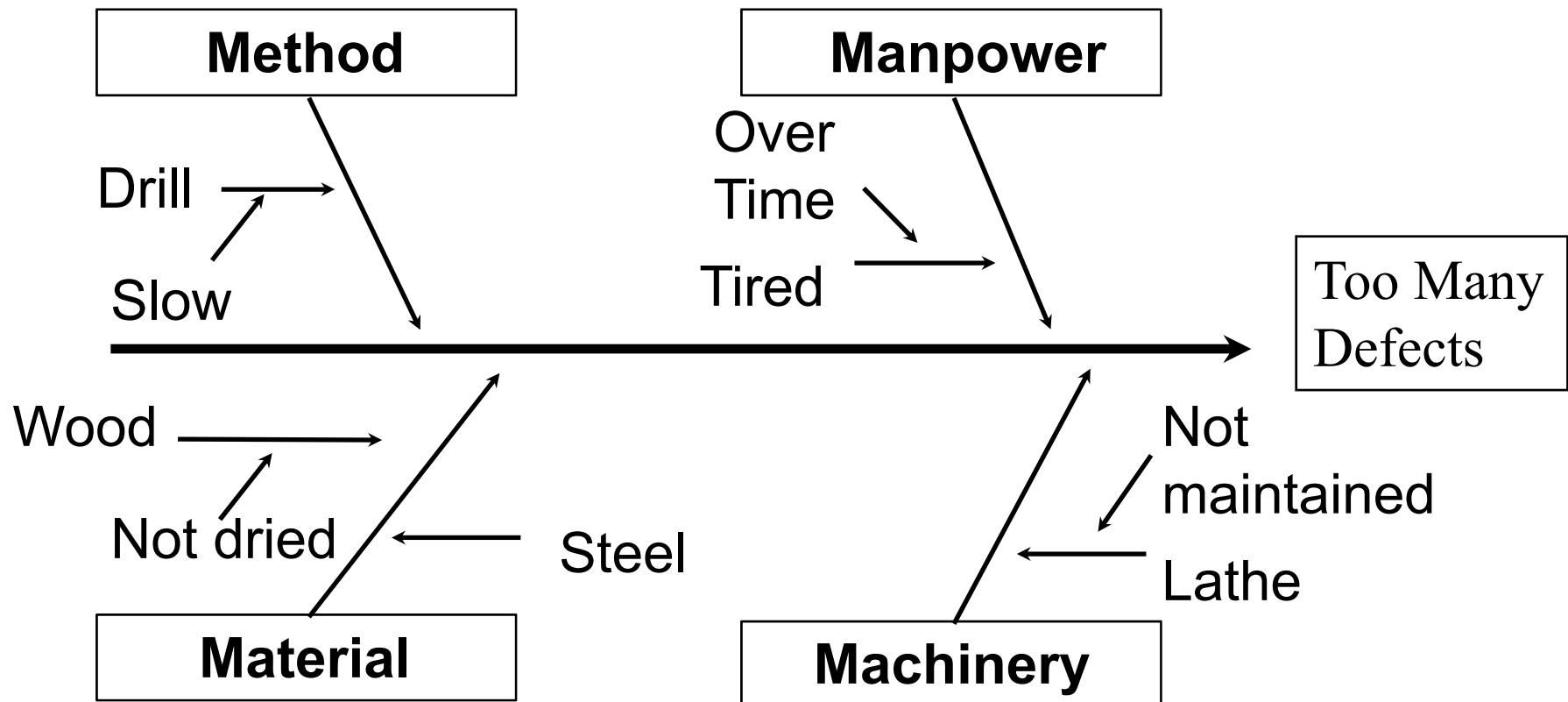


# Cause & Effect Diagram Example

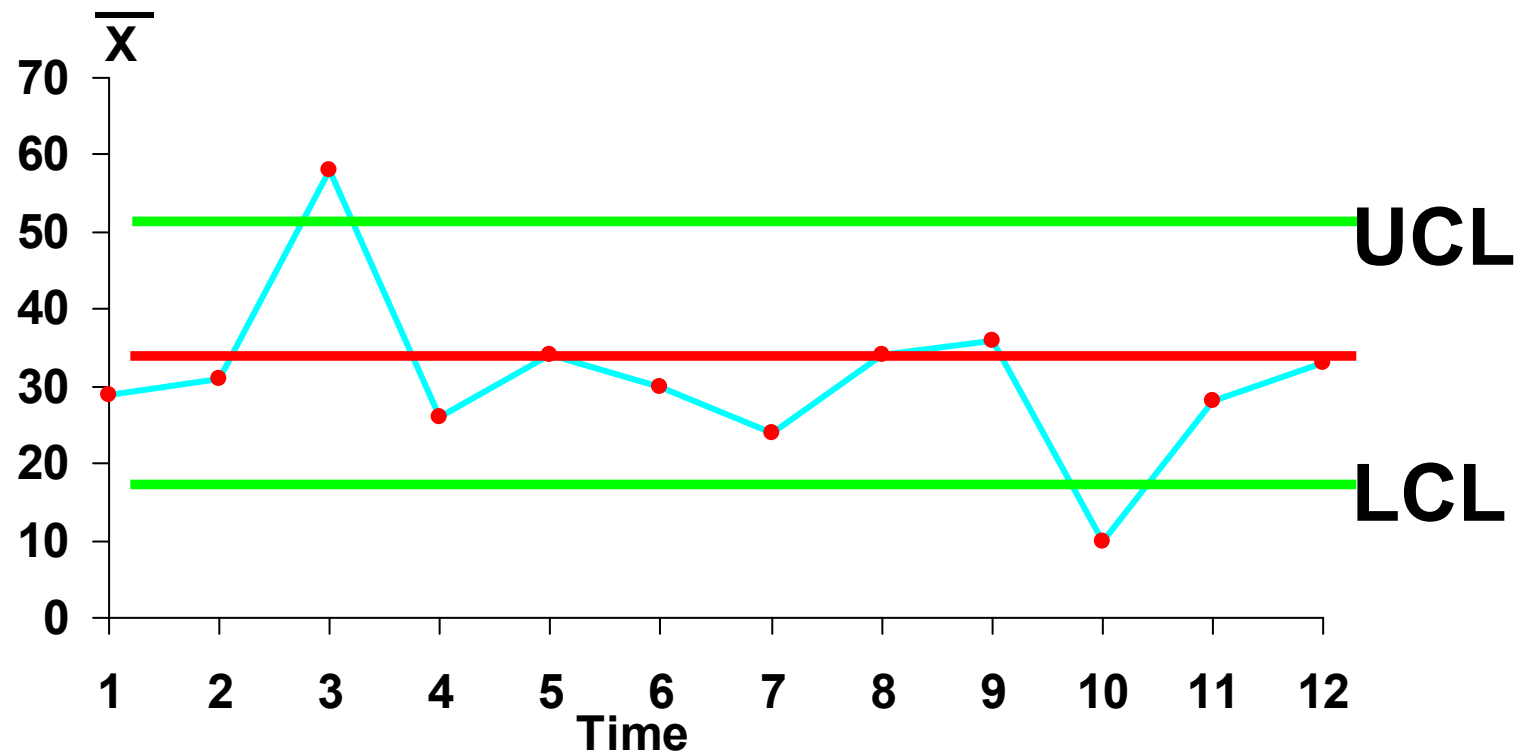




# Cause & Effect Diagram Example



# Control Chart Example



# Checklist

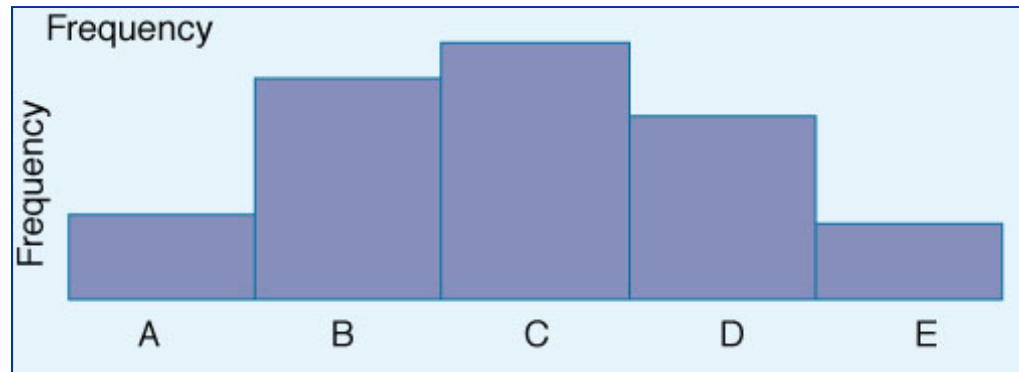
- Simple data check-off sheet designed to identify type of quality problems at each work station; per shift, per machine, per operator

Defect Type	No. of Defects	Total
Broken zipper	✓✓✓	3
Ripped material	✓✓✓✓✓✓✓	7
Missing buttons	✓✓✓	3
Faded color	✓✓	2



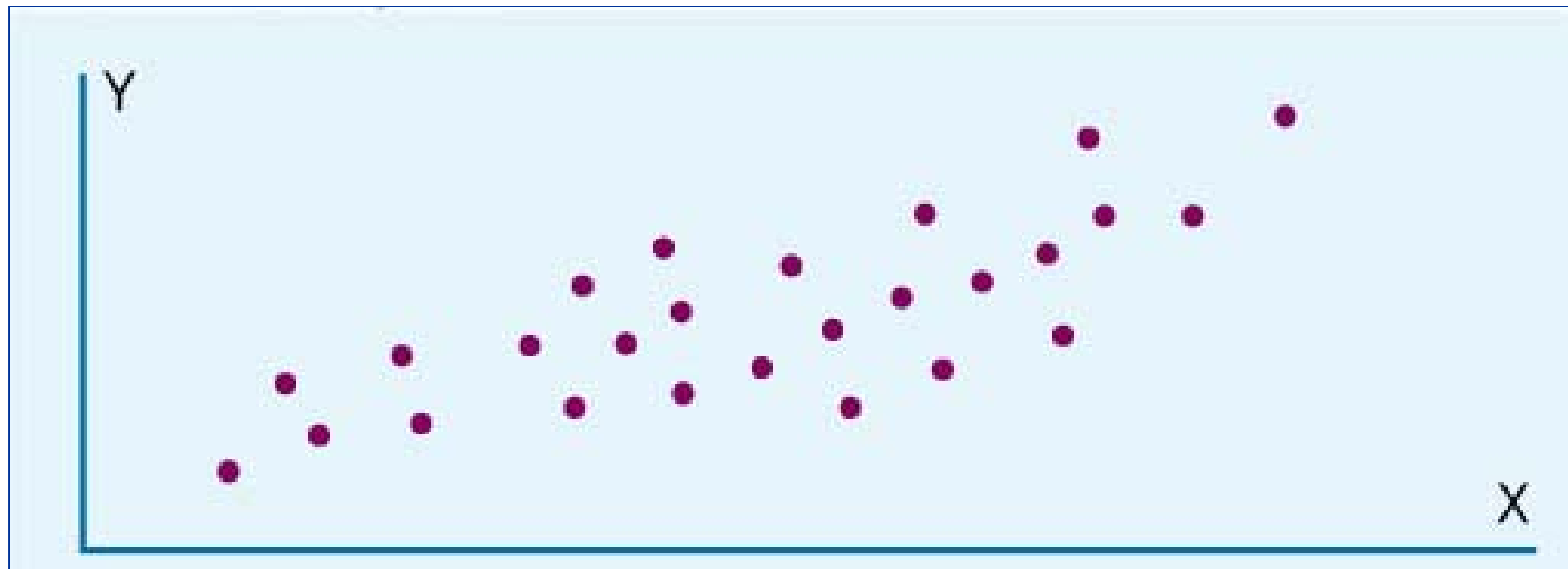
# Histograms

- A chart that shows the frequency distribution of observed values of a variable like **service time** at a bank drive-up window
- Displays whether the distribution is symmetrical (normal) or skewed

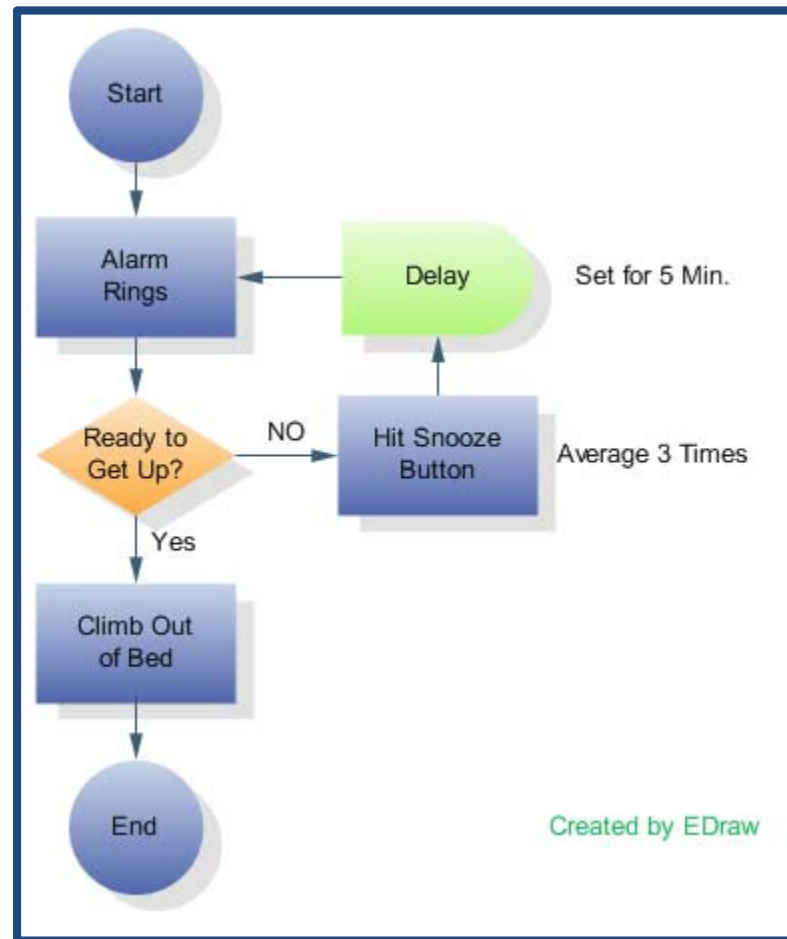


# Scatter diagrams

- Graphical components of the regression analysis.
- Often used to point out *relationship between variables*. Statistical correlation analysis used to interpret scatter diagrams.



# Flow chart



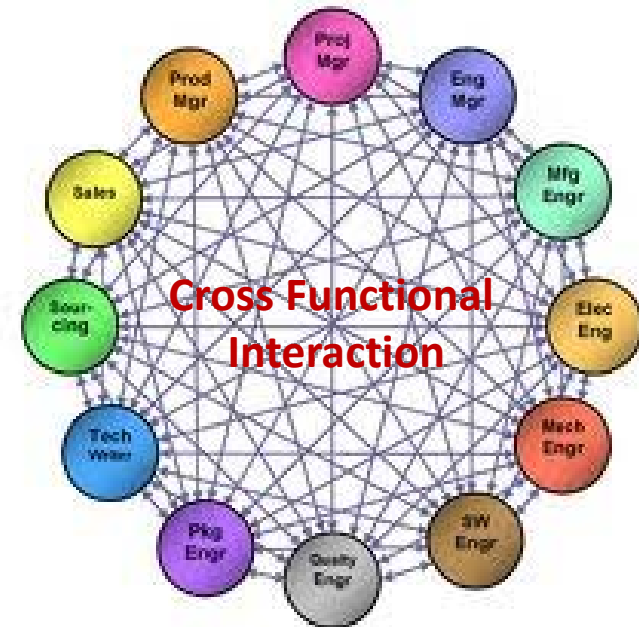
# 3 – Cross-Functional Product Design (TQM)

Cross-functional product design is a widely used method for involving different functional areas in new product/process development.

It is used when either an existing product has to under go change or a new product is planned or conceived to be launched.

## The advantages are:

1. Previous Experience are used
2. Buy in of all departments ensures minimum resistance and ease in change management
3. All factors, including Finance, Engineering, Maintenance, Marketing, Operations etc. are taken care of
4. Sustainability of the Product increases
5. Any setback in future is handled with planned procedures



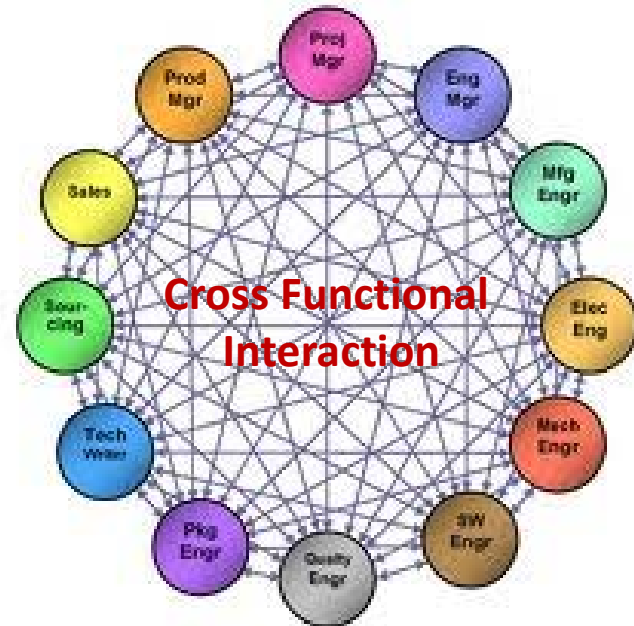
# 3 – Cross-Functional Product Design (TQM)

The Cross-Functional Product Design should be measured to eliminate chances of a Product design or re-design to miss out on inputs of any Function and to ensure, it is adhered to, at first place.

Key Elements of TQM

## The advantages are :

1. Direct labour employees are involved to a great extent (on teams or consulted) before introducing new products or making product changes.
2. Manufacturing are involved to a great extent before the introduction of new products.
3. Design is conceived in teams, with members from a variety of areas (marketing, manufacturing, etc.) to introduce new products.
4. The time to introduce new products is reduced by designing product and process together.





# 3 – Supplier Quality Management (TQM)

Supplier Quality Management ensures that the supplier of raw materials is certified for Quality, example ISO certified. Or the Organization has its own Quality check mechanism that has certified the Supplier. Management Guru's have created a separate chain called SCM (Supply Chain Management) that studies the efforts in improving the standards and maintaining the high standards of Supplier so that the basic input to the Process Management is flawless and optimized.

Key Elements of TQM

## The advantages are:

1. Quality of raw materials are ensured.
2. Timely delivery is ensured.
3. Cost effective inventory management can be done.
4. Supplier back up ensure least disruption in production
5. Competitive price can be negotiated



# TQM for the Workforce

## -Kaizen teams

-An intense and rapid improvement process in which a team or a department throws all its resources into an improvement project over a short period of time.

## -Blitz teams

usually comprise of employees from all areas involved in the process who *understand* it and can *implement the changes on the spot*.

## -Quality Circles

*Teams of workers and supervisors* that meet regularly to address work-related problems involving quality and productivity.

Typically small day-to-day problems are given to quality circles. Since workers are most familiar with the routine tasks, they are asked to identify, analyze and solve quality problems in the routine processes.



# Employee Involvement

As per the name, it simply means that the employees are involved in problem solving and getting around issues that may or are cause of production to go down or stop. Employee Involvement ensures that the solution derived has the accent of employees and any issue faced by the employees in the production are addressed automatically.

## The advantages are:

1. Less Negative turnover
2. Skill bank enhancement
3. Increase in accountability of employees due to being engaged in problem solving and product design
4. Solutioning is fast due to prior knowledge of product engineering and quality enhancement



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# TQM and Six Sigma

TQM is a Framework of Principles and Systems Approach. All nine Elements we discussed for TQM, there are few which can use Six Sigma as a method of usage. Generally, a Six Sigma approach covers one or more areas of TQM Elements



## As per Philip Crosby:

Pre-determined requirements, design activities and manufacturing practices are the basis of quality product and quality definition will be 'conformance to requirement'. *This definition ensures zero defect product as 100% conformance to requirement is the only acceptable quality measure. So it is Management's responsibility to create correct requirements.*



## As per Joseph M. Juran:

Quality is the final product being in 'conformance to specifications' or 'conformance to standards'. *However, in terms of manufacturing, this definition is not accurate to T because at a Managerial Level, conformance to specification is only one of the many means to reach at end product that is 100% defect free.*



# What is six sigma..????

- Six sigma is a business statistical Strategy.
- Is to identifying defects and removing them from the process of products to improve quality.
- A defect is defined as any process output that does not meet customer specifications.
- Statistical measure to objectively evaluate processes.



# Six Sigma Definition

- Quality management program developed by Motorola in the 1980s.
- Management philosophy focused on business process improvements to:
  - ✓ Eliminate waste, rework, and mistakes
  - ✓ Increase customer satisfaction
  - ✓ Increase profitability and competitiveness



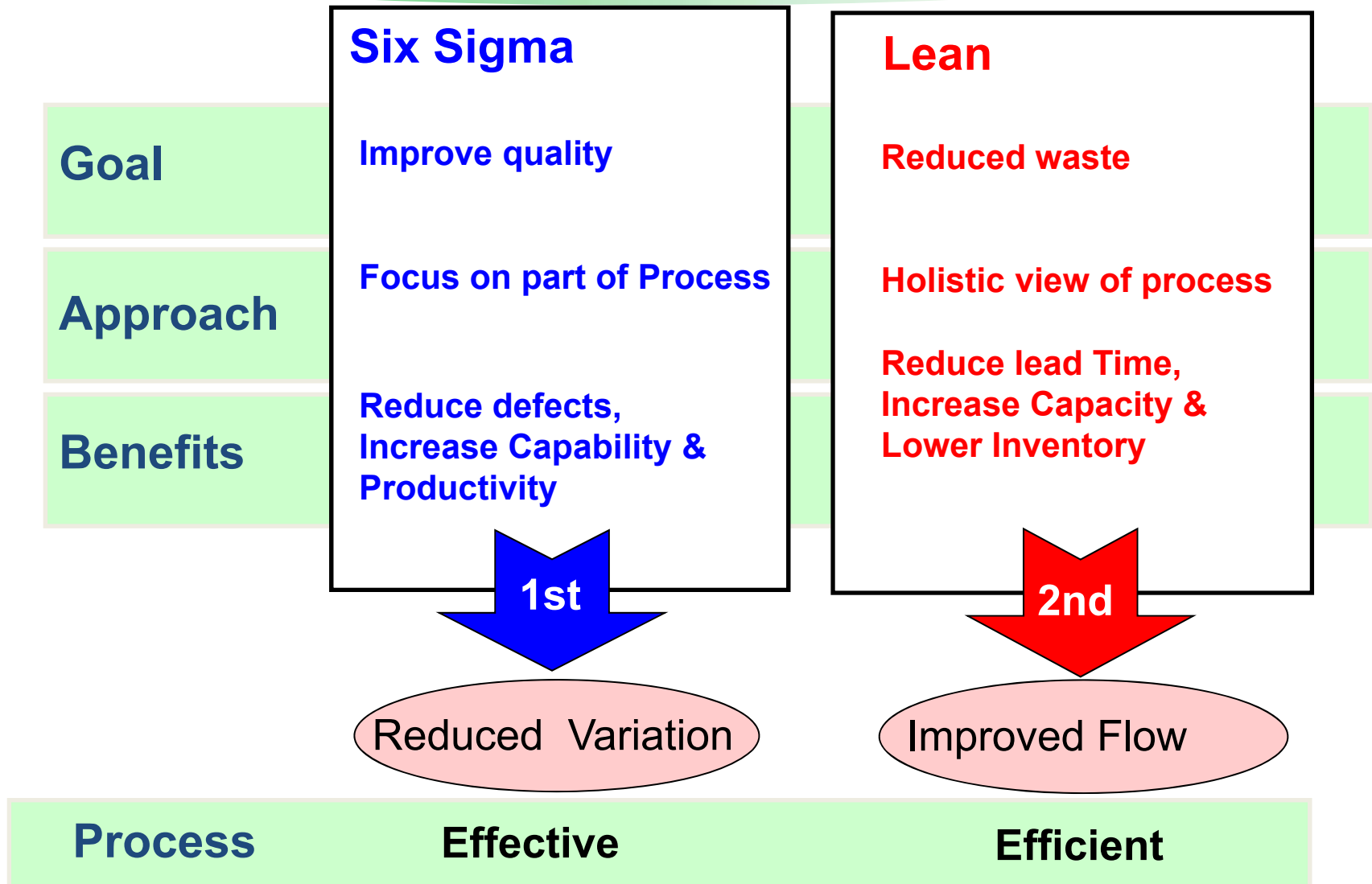


# History of six sigma

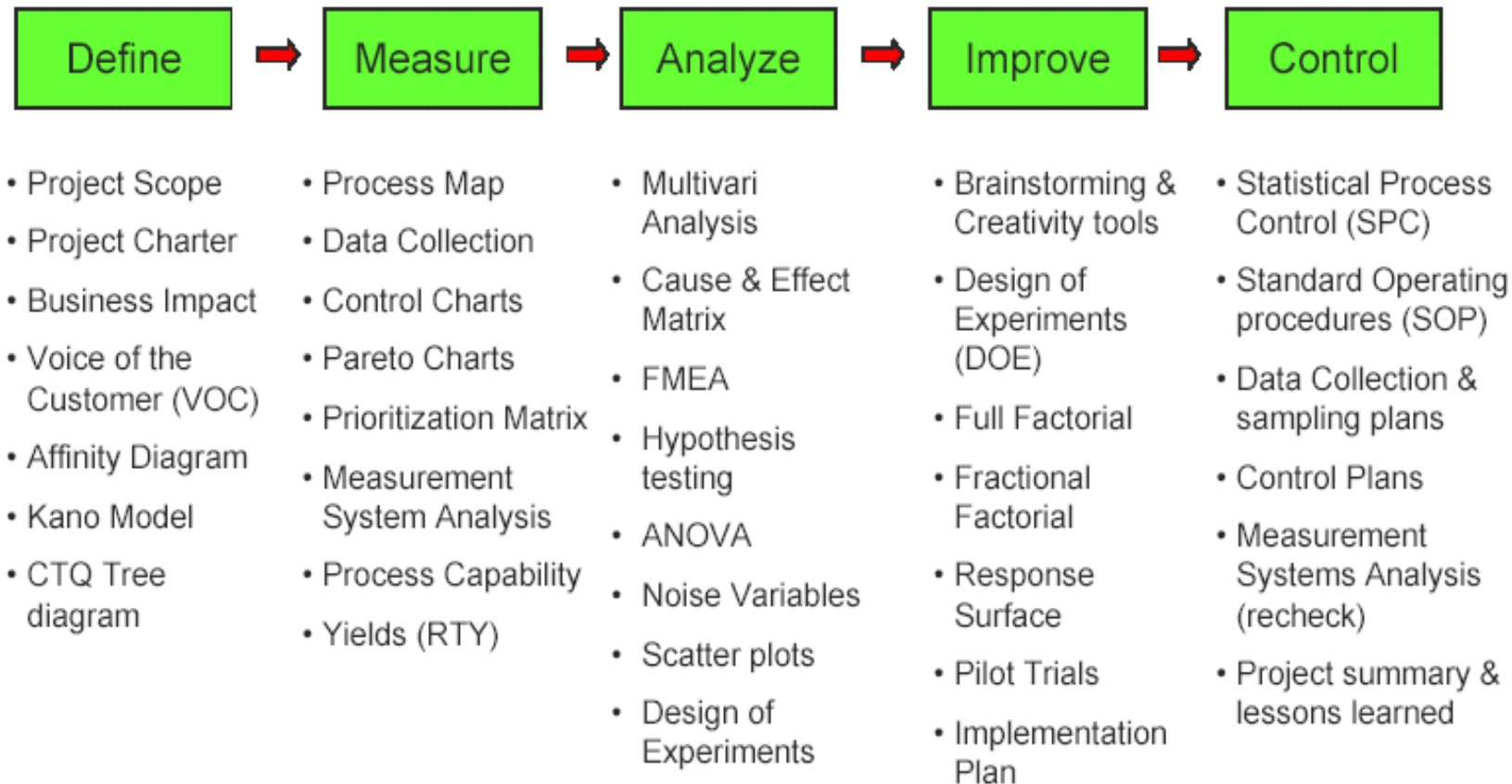
- The Six sigma was founded by Motorola in the 1970s.
- Out of senior executive Art Sundry's criticism of Motorola's bad quality.
- They founded a connection between increases in quality and decreases in costs of production.
- **Bill Smith**, “Father of six sigma” introduce this quality improvement Methodology to Motorola.



# Six Sigma + Lean Manufacturing

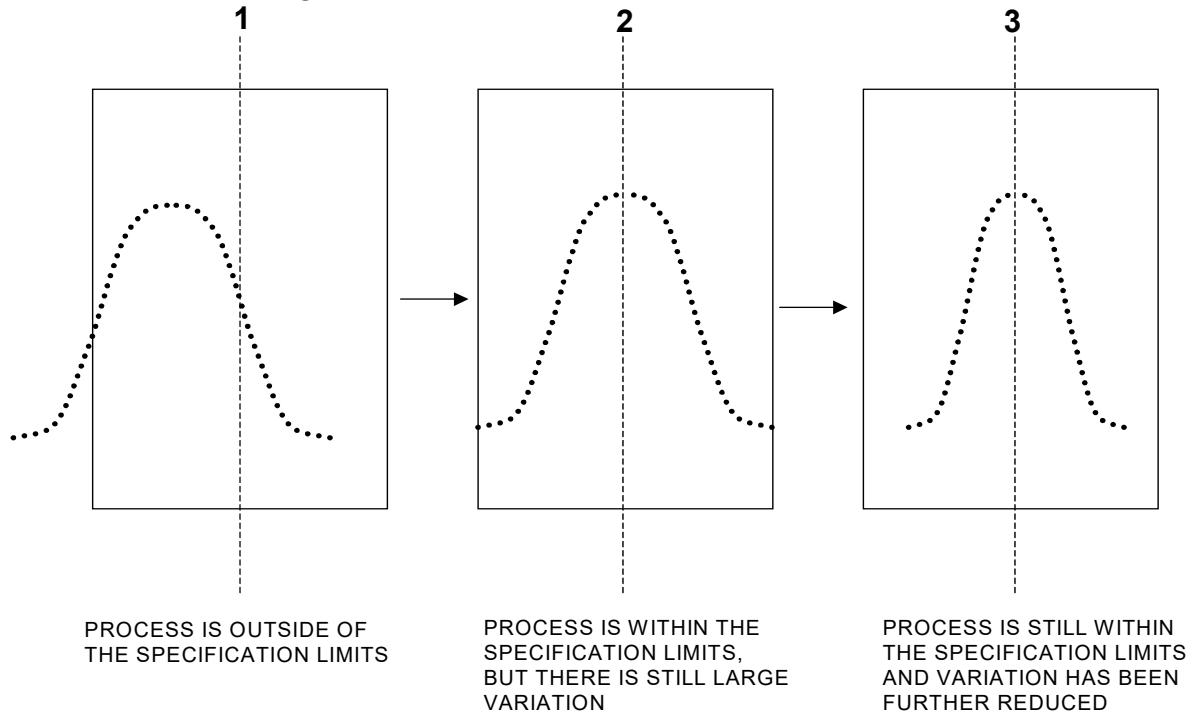


# Six Sigma DMAIC Tools



## SPECIFICATION BOXES

Related to SPC and Process Variation

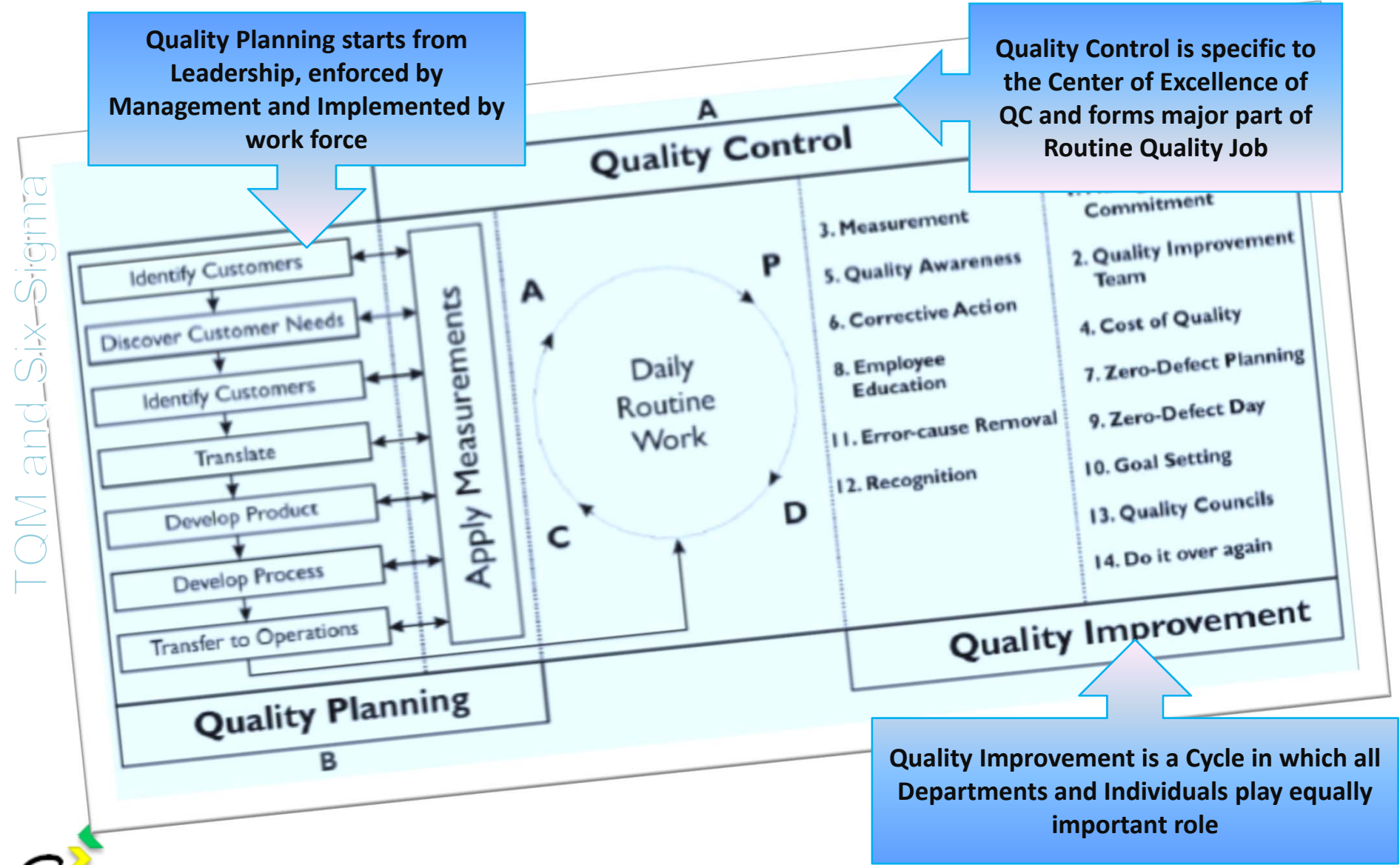


A Specification is a document that contains requirements for a product or a service!

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# TQM System Approach



TQM and Six Sigma





**COMPANY THAT**

**PRACTICES TQM**



# FORD Motor Company

- Is an American multinational automaker based in Dearborn, Michigan, a suburb of Detroit. The automaker was founded by Henry Ford and incorporated on June 16, 1903.
- Ford is the second largest automaker in the U.S. and the fifth-largest in the world based on annual vehicle sales in 2010. At the end of 2010, Ford was the fifth largest automaker in Europe. Ford is the eighth-ranked overall American-based company in the 2010 Fortune 500 list, based on global revenues in 2009 of \$118.3 billion.



## TQM techniques that Ford used:

- Six Sigma
- Quality Operating System or (QOS)
- developed their own quality process or 5S.
- The DMAIC process, or define, measure, analyze, improve, and control has built an overall strategy for consistency in their teams,





# XEROX

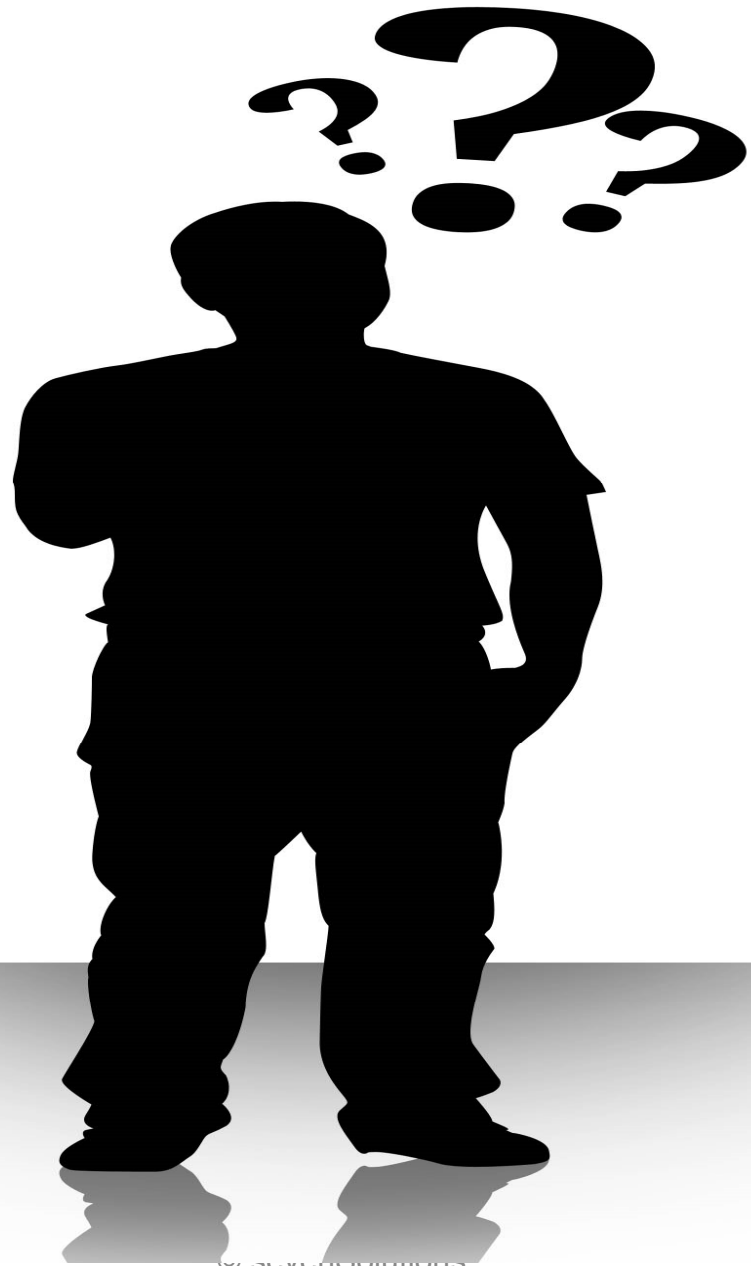
- ◎ Xerox has established a program called Leadership Through Quality (LTQ) and a Quality Training Task Force for its company's leadership teams. "Today, more than 100,000 Xerox employees worldwide have been trained in this process, which stresses continuous improvement and defines quality precisely as meeting customer requirements" (Evans-Correia, 1997, 135).



## The XEROX Corporation focuses on:

- Benchmarking
- a reduced supplier base
- and leadership teams





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2. Need and Applicability of TQM ✓
3. Key Elements of TQM ✓
4. TQM and Six Sigma ✓

