Quality Management

Concepts

- What is quality?

Dictionary has many definitions: "Essential characteristic," "Superior," etc.

- Some definitions that are accepted in various organizations:
  - "Quality is customer satisfaction,"
  - "Quality is Fitness for Use."

- What is TQM?

A comprehensive, organization-wide effort to improve the quality of products and services, applicable to *all* organizations.

Concepts

- 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)

Concepts

- 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. (This is related to free from defects.)

Why Quality?

Reasons for quality becoming a cardinal priority for most organizations:

- Competition – Today's market demand high quality products at low cost. Having `high quality' reputation is not enough! Internal cost of maintaining the reputation should be less.

- Changing customer – The new customer is not only commanding priority based on volume but is more demanding about the "quality system."

- Changing product mix – The shift from low volume, high price to high volume, low price have resulted in a need to reduce the internal cost of poor quality.

Why Quality?

- Product complexity – As systems have become more complex, the reliability requirements for suppliers of components have become more stringent.
- Higher levels of customer satisfaction – Higher customers expectations are getting spawned by increasing competition.

Relatively simpler approaches to quality viz. product inspection for quality control and incorporation of internal cost of poor quality into the selling price, might not work for today's complex market environment.

Quality perspectives

Everyone defines Quality based on their own perspective of it. Typical responses about the definition of quality would include:

1. Perfection
2. Consistency
3. Eliminating waste
4. Speed of delivery
5. Compliance with policies and procedures
6. Doing it right the first time
7. Delighting or pleasing customers
8. Total customer satisfaction and service

Quality levels

At organizational level, we need to ask following questions:
- Which products and services meet your expectations?
- Which products and services you need that you are not currently receiving?

At process level, we need to ask:
- What products and services are most important to the external customer?
- What processes produce those products and services?
- What are the key inputs to those processes?
- Which processes have most significant effects on the organization's performance standards?

Additional Views of Quality in Services

- Technical Quality versus Functional Quality
  - Technical quality—the core element of the good or service.
  - Functional quality—customer perception of how the good functions or the service is delivered.
- Expectations and Perceptions
  - Customers' prior expectations (generalized and specific service experiences) and their perception of service performance affect their satisfaction with a service.
    - Satisfaction = (Perception of Performance) – (Expectation)

Historical Philosophies of Quality

The Quality Gurus

- Quality Gurus
  - Individuals who have been identified as making a significant contribution to improving the quality of goods and services.
    - Walter A. Shewhart
    - W. Edwards **Deming**
    - Joseph M. **Juran**
    - Armand Feigenbaum
    - Philip **Crosby**
    - Genichi Taguchi
    - Kaoru Ishikawa

Three of the Quality Gurus Compared

	Crosby	Deming	Juran
Definition of quality	Conformance to specifications	A predictable degree of uniformity and dependability at low cost and suited to the market	Fitness for use
Degree of senior management responsibility	Responsible for quality	Responsible for 85% of quality problems	Less than 20% of quality problems are due to workers
Performance standard/ motivation	Zero defects	Quality has many "scales": use statistics to measure performance in all areas; critical of zero defects	Avoid campaigns to do perfect work
General approach	Prevention, not inspection	Reduce variability by continuous improvement; cease mass inspection	General management approach to quality, especially human elements
Structure	14 steps to quality improvement	14 points for management	10 steps to quality improvement

Source: Modified from John S. Oakland, Total Quality Management (London: Heinemann Professional Publishing Ltd., 1989), pp. 291–92.

Three of the Quality Gurus Compared (cont'd)

	Crosby	Deming	Juran
Statistical process control (SPC)	Rejects statistically acceptable levels of quality	Statistical methods of quality control must be used	Recommends SPC but warns that it can lead to tool-driven approach
Improvement basis	A process, not a program; improvement goals	Continuous to reduce variation; eliminate goals without methods	Project-by-project team approach; set goals
Teamwork	Quality improvement teams; quality councils	Employee participation in decision making; break down barriers between departments	Team and quality circle approach
Costs of quality	Cost of nonconformance; quality is free	No optimum; continuous improvement	Quality is not free; there is an optimum

Source: Modified from John S. Oakland, Total Quality Management (London: Heinemann Professional Publishing Ltd., 1989), pp. 291–92.

Three of the Quality Gurus Compared (cont'd)

	Crosby	Deming	Juran
Purchasing and goods received	State requirements; supplier is extension of business; most faults due to purchasers themselves	Inspection too late; allows defects to enter system through AQLs; statistical evidence and control charts required	Problems are complex; carry out formal surveys
Vendor rating	Yes and buyers' quality audits useless	No, critical of most systems	Yes, but help supplier improve
Single sourcing of supply		Yes	No, can neglect to sharpen competitive edge

Source: Modified from John S. Oakland, Total Quality Management (London: Heinemann Professional Publishing Ltd., 1989), pp. 291–92.
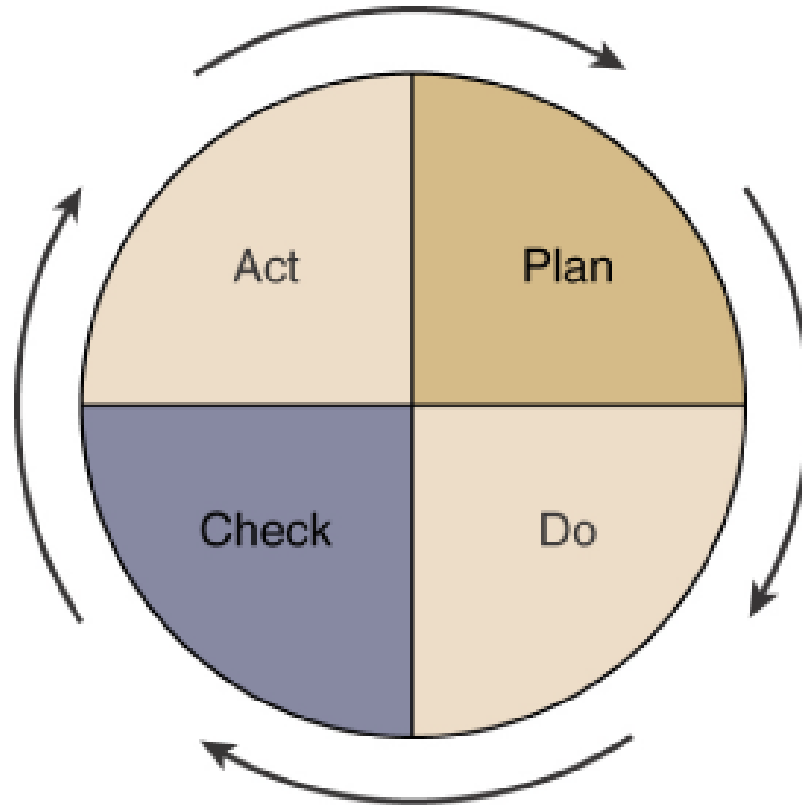
The Quality Gurus (cont'd)

- Walter A. Shewhart

  - Statistician at Bell Laboratories

    - Developed statistical control process methods to distinguish between random and nonrandom variation in industrial processes to keep processes under control.

    - Developed the "plan-do-check-act" (PDCA) cycle that emphasizes the need for continuous improvement.

    - Strongly influenced Deming and Juran.

Shewhart's Plan-Do-Check-Act (PDCA) Cycle

The Quality Gurus (cont'd)

- W. Edwards Deming
  - Advocated Statistical Process Control (SPC)
    - Methods which signal shifts in a process that will likely lead to products and/or services not meeting customer requirements.
    - Emphasized an overall organizational approach to managing quality.
    - Demonstrated that quality products are less costly than poor quality products.
    - Identified 14 points critical for improving quality.
  - The Deming Prize
    - Highest award for industrial excellence in Japan.

Deming's 14-Point Program for Improving Quality

1. Create constancy of purpose for improvement of product and service.
2. Adopt the new philosophy.
3. Cease dependence on mass inspection.
4. End the practice of awarding business on the price tag alone.
5. Improve constantly and forever the system of production and training.
6. Institute training.
7. Institute leadership.
8. Drive out fear.
9. Break down barriers between staff areas.
10. Eliminate slogans, exhortations, and targets for the workforce.
11. Eliminate numerical quotas.
12. Remove barriers to pride in workmanship.
13. Institute a vigorous program of education and retraining.
14. Take action to accomplish the program.

The Deming philosophy

14 points for management:

1. Create and publish to all employees a *statement of the aims and purposes* of the company. The management must demonstrate their commitment to this statement.

2. *Learn* the new philosophy.

3. Understand the *purpose of inspection* – to reduce the cost and improve the processes.

4. *End* the practice of awarding business on the *basis of price tag* alone.

5. *Improve constantly* and forever the system of production and service.

The Deming philosophy

6. Institute training

7. Teach and institute *leadership*.

8. Drive out fear. Create an *environment of innovation*.

9. *Optimize the team efforts* towards the aims and purposes of the company.

10. Eliminate exhortations for the workforce.

11. Eliminate *numerical quotas* for production.

12. Remove the barriers that rob *pride of workmanship*.

13. Encourage *learning and self-improvement*.

14. Take action to accomplish the transformation.

The Deming philosophy

- "A System of Profound Knowledge"

1. Appreciation for a system - A system is a set of functions or activities within an organization that work together to achieve organizational goals. Management's job is to *optimize the system*. (not parts of system, but the whole!). System requires *co-operation*.

2. Psychology – The designers and implementers of decisions are *people*. Hence understanding their psychology is important.

The Deming philosophy

3. **Understanding process variation** – A production process contains many sources of variation. *Reduction in variation improves quality*. Two types of variations- *common causes and special causes*. Focus on the special causes. Common causes can be reduced only by change of technology.

4. **Theory of knowledge** – Management decisions should be driven by *facts, data and justifiable theories*. Don't follow the managements fads!

The Quality Gurus (cont'd)

- Joseph M. Juran
  - Emphasized the importance of producing quality products through an approach focused on quality planning, control, and improvement.
  - Defined product quality as "fitness for use" as viewed by the customer in:
    - Quality of design
    - Quality of conformance
    - Availability
    - Safety
    - Field use
  - Categorized the cost of quality as:
    - Cost of prevention
    - Cost of detection/appraisal
    - Cost of failure

The Juran philosophy

- Pursue quality on two levels:
1. The *mission of the firm* as a whole is to achieve high *product quality*.
2. The *mission of each individual department* is to achieve high *production quality*.

- Quality should be talked about in a language senior management understands: money (cost of poor quality).
- At operational level, focus should be on conformance to specifications through elimination of defects- use of statistical methods.

The Juran philosophy

Quality Trilogy –

1. *Quality planning*: Process of preparing to meet quality goals. Involves understanding customer needs and developing product features.

2. *Quality control*: Process of meeting quality goals during operations. Control parameters. Measuring the deviation and taking action.

3. *Quality improvement*: Process for breaking through to unprecedented levels of performance. Identify areas of improvement and get the right people to bring about the change.

The Quality Gurus (cont'd)

- Armand Feigenbaum
  - Proposed the concept of "total quality control," making quality everyone's responsibility.
    - Stressed interdepartmental communication.
    - Emphasized careful measurement and report of quality costs
- Philip Crosby
  - Preached that "quality is free."
  - Believed that an organization can reduce overall costs by improving the overall quality of its processes.

The Crosby philosophy

Absolute's of Management

- Quality means *conformance to requirements* not elegance.
- There is no such thing as *quality problem*.
- There is no such thing as economics of quality: it is always cheaper to do the *job right the first time*.
- The only performance measurement is the *cost of quality*: the cost of non-conformance.

Basic Elements of Improvement

- *Determination* (commitment by the top management)
- *Education* (of the employees towards Zero Defects (ZD))
- *Implementation* (of the organizational processes towards ZD)

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.)

- 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.*

The Quality Gurus (cont'd)

- Genichi Taguchi
  - Emphasized the minimization of variation.
    - Concerned with the cost of quality to society.
    - Extended Juran's concept of external failure.
- Kaoru Ishikawa
  - Developed problem-solving tools such as the cause-and-effect (*fishbone*) diagram.
  - Called the father of quality circles.

Defining the Dimensions of Quality

- Quality in Goods
    - Performance
    - Features
    - Reliability
    - Durability
    - Conformance
    - Serviceability
    - Aesthetics
    - Perceived quality

- Quality in Services
    - Reliability
    - Tangibles
    - Responsiveness
    - Assurance
   - Empathy

Cost of Quality

The Cost of Quality

- Cost of Quality

  - Framework for identifying quality components that are related to producing both high quality products and low quality components, with the goal of minimizing the total cost of quality.

  - Costs of poor quality:

    - Detection/appraisal costs

    - Internal failure costs

    - External failure costs

"Costs" of Quality

Category	Definition	Example
Prevention	Costs associated with preventing defects.	Training, early reviews, quality planning, tools, process improvement initiatives.
Appraisal	Costs associated with analyzing and testing the product to ensure it conforms to specifications.	Inspections, testing, audits, quality control.
Internal Failure	Costs associated with fixing defects found prior to release.	Repair, retesting, updating documentation.
External Failure	Costs associated with fixing defects found after release.	Technical support, defect reporting and tracking, field updates, loss of future sales.

"Costs" of Quality

Quality Cost Management shows how increased Prevention Costs reduce the Total Quality Costs.
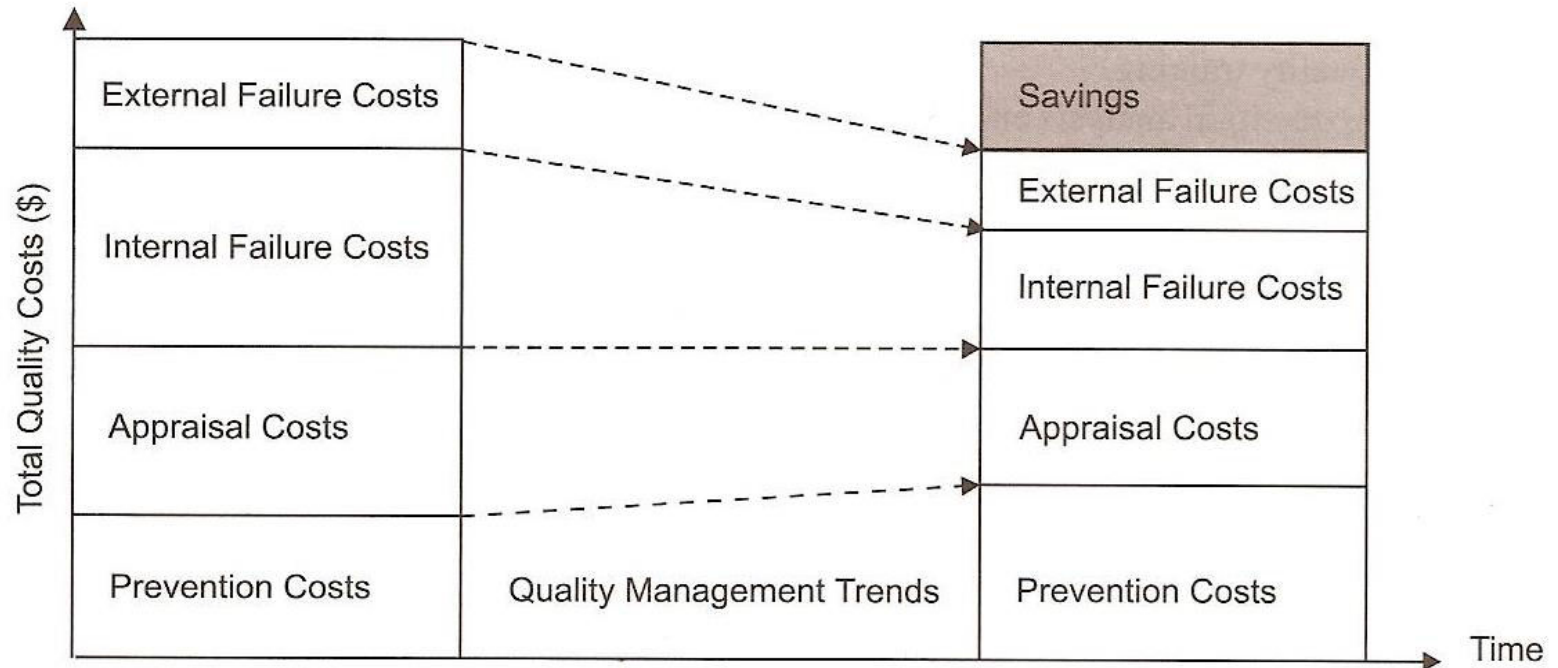
"Costs" of Quality

The equation "Cost of Quality" (COQ) allows to quantify the impact of POOR quality. It is used as a monitoring tool to track costs for inspection, internal errors, external errors, and prevention. As the prevention efforts are increased, the costs for inspection, internal failures and external failures drop.

$$COQ = \frac{\sum(E + I + A + P)}{S} \times 100\%$$

E: External Failure Costs

I: Internal Failure Costs

A: Appraisal Costs

P: Prevention Costs

S: Sales

Typical Quality Cost Ratios

Category	Feigenbaum	Juran and Gryna
Prevention costs	5%–10%	0.5%–5%
Detection/appraisal costs	20%–25%	10%–50%
Failure costs	65%–70%	Internal: 25%–40%
		External: 20%–40%
Total cost of quality	100%	100%

Source: A. V. Feigenbaum, *Total Quality Control,* 3rd ed. (New York: McGraw-Hill, 1983), p. 112; and Joseph M. Juran and F. M. Gryna, *Quality Planning and Analysis* (New York: McGraw-Hill, 1970), p. 60.

The Cost of Quality (Juran's Model)

Cost Category	
Cost of prevention	**Costs associated with the development of programs to prevent defectives from occurring in the first place**
Cost of detection/ appraisal	**Costs associated with the test and inspection of subassemblies and products after they have been made.**
Cost of failure	**Costs associated with the failure of a defective product.** *Internal failure costs*—**producing defective products that are identified before shipment.** *External failure costs*—**producing defective products that are delivered to the customer.**

Assuring Customer Satisfaction

- Service Recovery
  - How quickly a firm rectifies a service mistake has a strong effect on establishing customer loyalty and creating customer satisfaction.
- Service Guarantees
  - Provide customer feedback on service operations
  - Effective guarantees
    - Unconditional
    - Easy to understand
    - Meaningful
    - Easy and painless to invoke
    - Easy and quick to collect on

Elements of TQM & Implementation

Elements of TQM

- Leadership
  - Top management vision, planning and support
- Employee involvement
  - All employees assume responsibility for inspecting the quality of their work.
- Product/Process Excellence
  - Involves product design quality and monitoring the process for continuous improvement.
    - Poka-yokes are devices that prevent defects from being produced.

Elements of TQM (cont'd)

- Continuous Improvement
  - A concept that recognizes that quality improvement is a journey with no end and that there is a need for continually looking for new approaches for improving quality.
- Customer Focus (on "Fitness for Use")
  - Design quality
    - Specific characteristics of a product that determine its value in the marketplace.
  - Conformance quality
    - The degree to which a product meets its design specifications.

Implementing TQM

- Successful Implementation of TQM
  - Requires total integration of TQM into day-to-day operations.
- Causes of TQM Implementation Failures
  - Lack of focus on strategic planning and core competencies.
  - Obsolete, outdated organizational cultures.

Implementation of TQM

For TQM to be successful, the organization must concentrate on the following key elements:

Integrity
 Ethics
  Trust
   Training
    Teamwork
     Communication
      Recognition
       Leadership

Implementation of TQM

The key elements of TQM can be divided into four groups according to their function:

Foundation: Integrity, Ethics, Trust

Building Bricks: Leadership, Teamwork,Training

Roof: Recognition (Motivation)

Binding Mortar: Communication

Hoshin planning

- Hoshin kanri: Japanese for management cycle build around Plan, Do, Check, Act. Elements of this cycle include –
- ✓ Quality policies
- ✓ Quality goals
- ✓ Deployment of goals
- ✓ Plans to meet goals
- ✓ Organizational structure
- ✓ Resources
- ✓ Measurement feedback
- ✓ Review of progress
- ✓ Training

Process Management
Statistical Process Control (SPC)

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*.

- Process *simplification* reduces opportunities for errors and rework.

- 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)

Process management

- 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.

- To apply the techniques of process management, a process must be *repeatable and measurable*.

- *Process owners* are responsible for process performance and should have authority to manage the process. Owners could range from high-level executive to workers who run a cell.

- Assigning owners ensures *accountability*.

Process management
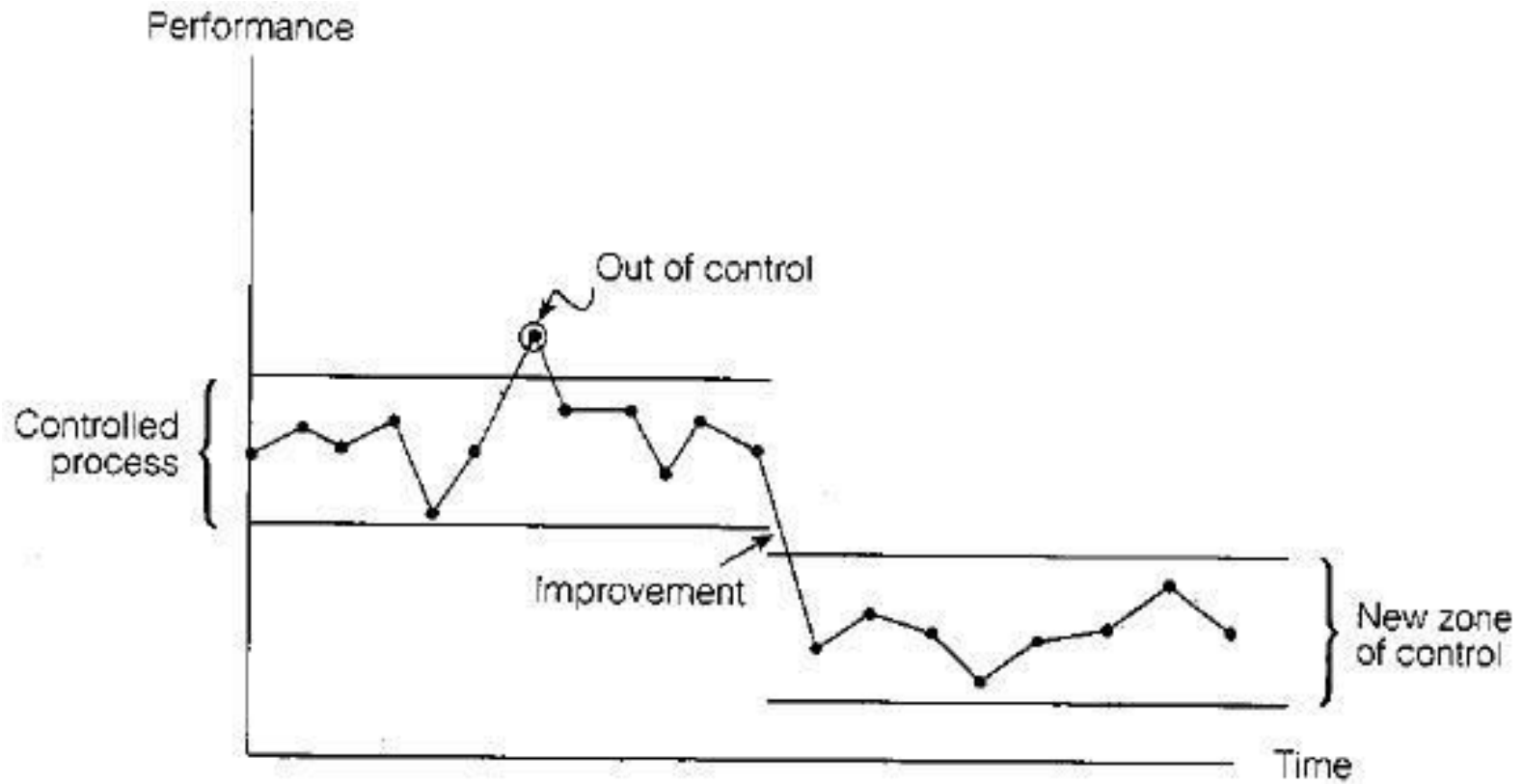
Process control

- Control is the activity of ensuring the conformance to the requirements and taking corrective action when necessary.
- Two reasons for controlling the process
1. Process control methods are the basis of *effective daily management of processes*.
2. *Long-term improvements* can not be made to a process unless the process is first brought under control.
- Short-term corrective action should be taken by the process owners. Long-term remedial action should be the responsibility of the management.

Process control

Effective quality control systems include

1. Documented procedures for all key processes
2. A clear understanding of the appropriate equipment and working environment
3. Methods of monitoring and controlling critical quality characteristics
4. Approval processes for equipment
5. Criteria for workmanship: written standards, samples etc.
6. Maintenance activities

Process improvement

- Customer loyalty is driven by delivered value.

- Delivered value is created by business processes.

- Sustained success in competitive markets require a business to continuously improve delivered value.

- To continuously improve value creation ability, a business must continuously improve its value creation processes.

- Continuous process improvement is an old management concept dating back to 1895. However, those approaches were mainly *productivity related*.

- More recently (1951) Toyota implemented *Just-In-Time* which relies on *zero defects* and hence continuous improvement!

Process improvement: Kaizen

- *Japanese for gradual and orderly continuous improvement over a long period of time with minimum financial investment, and with participation by everyone in the organization*.
- Improvement in all areas of business serves to enhance quality of the firm.
- Three things required for successful kaizen program: operating practices, total involvement, and training.
- *Operating practices* expose opportunities for improvement. JIT reveals waste and inefficiency as well as poor quality.

Process improvement: Kaizen

- *Every employee* strives for improvement. Top management views improvement as part of strategy and supports it. Middle management can implement top management's improvement goals by establishing, maintaining, and upgrading operating standards. Workers can engage through suggestions, small group activity.

- Middle management can help create conducive environment for improvement by *improving cooperation amongst departments*, and by *making employees conscious of their responsibilities* for improvement.

- Supervisors can direct their *attention more on improvement* than supervision, which will facilitate communication.

Kaizen: Implementation

- *The Deming cycle*: Originally developed by Walter Shewart, but renamed in 1950s because Deming promoted it extensively.
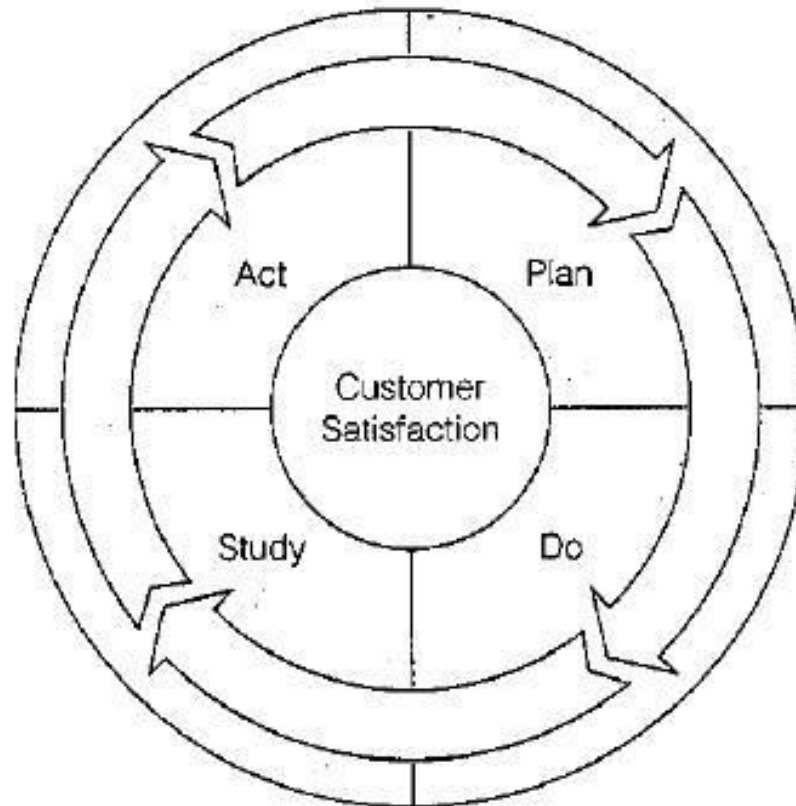
Kaizen: Implementation

- Plan – Study the current system; identifying problems; testing theories of causes; and developing solutions.

- Do – Plan is implemented on a trial basis. Data collected and documented.

- Study – Determine whether the trial plan is working correctly by evaluating the results.

- Act – Improvements are standardized and final plan is implemented.

- Variation of PDSA cycle: *FADE – Focus, Analyze, Develop, Execute cycle*!

Kaizen: Implementation

Juran's breakthrough sequence:

1. Proof of the need

2. Project identification

3. Organization for breakthrough – two paths identified: *symptom to cause* (diagnostic) and *cause to remedy* (remedial) paths.

4. Diagnostic journey

5. Remedial journey

6. Holding the gains.

Process improvement tools

1. Flow charts
2. Check sheets
3. Histograms
4. Pareto diagrams
5. Cause-and-effect diagrams
6. Scatter diagrams
7. Control charts

The Seven TQM Tools

With correct implemention of the Seven TQM Tools **95%** of quality related problems can be solved.

The Seven TQM Tools

1. Check Sheets
   2. Histograms
      3. Scatter Diagrams
         4. Control Charts
            5. Run Charts
               6. Ishikawa Diagram
                  7. Pareto Diagram

Check Sheets

Check Sheets are simple documents that are used for collecting data in real-time.
A Check Sheet is typically a blank form that is designed for the quick, easy and efficient recording of the desired information, which can be either quantitative or qualitative.
When the information is quantitative, the check sheet is called a **Tally Sheet**.

Histograms

A **histogram** divides up the range of possible values in a data set into classes or groups.
For each group, a rectangle is constructed with a base length equal to the range of values in that specific group, and an area proportional to the number of observations falling into that group.
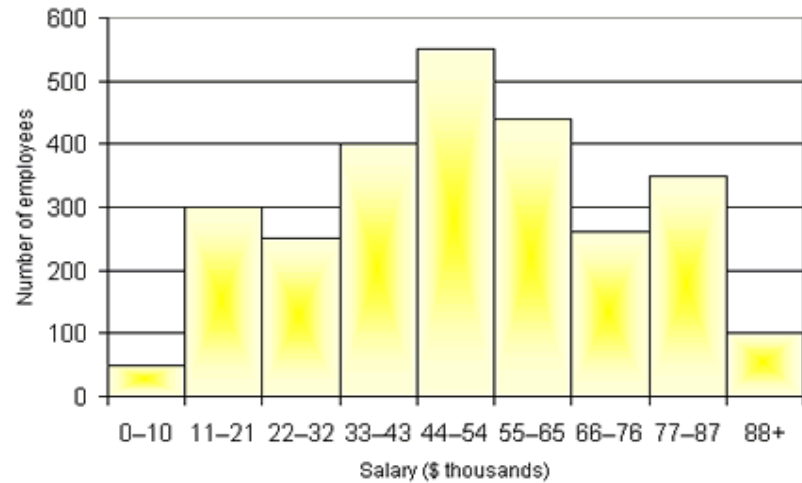
Scatter Diagrams

**Scatter Diagrams** are used to present measurements of two or more related variables. A Scatter Diagram does not specify dependent or independent variables. Either type of variable can be plotted on either axis. Scatter Diagrams represent the association (not causation) between two variables.
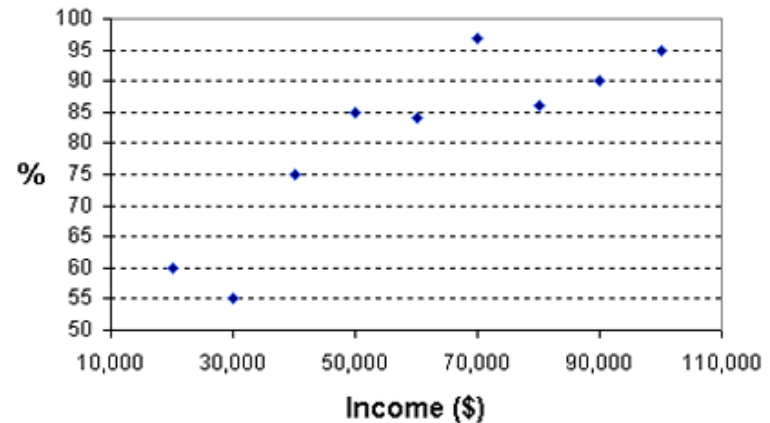
Control Charts

A control chart consists of the following:

A Centre Line (CL) drawn at the process mean value.
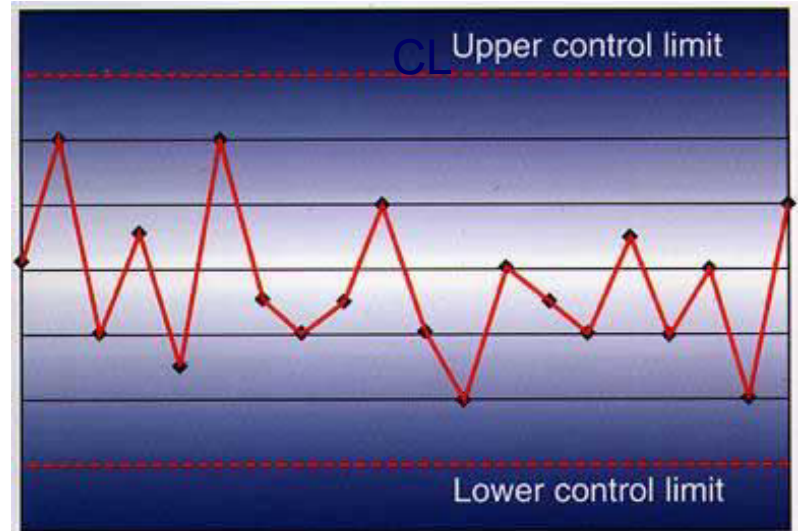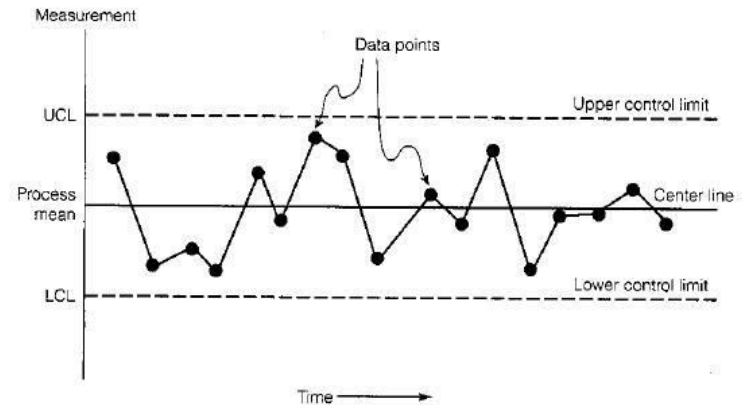
Lower and Upper Control Limits that indicate the threshold at which the process output is considered statistically unlikely.

Run Charts

**Run Charts** are similar in some regards to Contol Charts, but do not show the control limits of the process. They are therefore simpler to produce, but do not allow for the full range of analytic techniques supported by Control Charts.
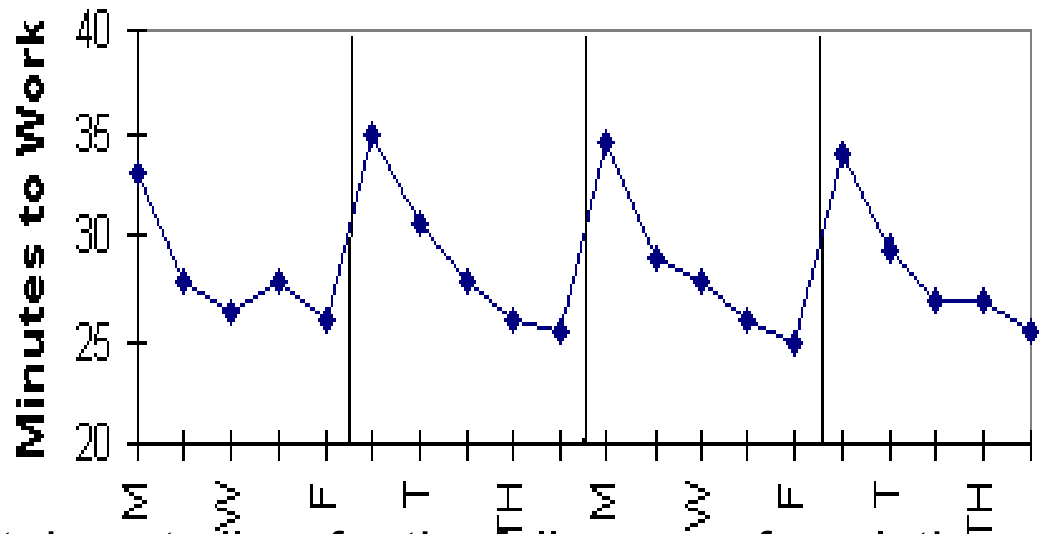
- Run chart: Measurement against progression of time.
- Control chart: Add Upper Control Limit and Lower Control Limit to the run chart.

Ishikawa Diagram

Also called *fishbone diagrams* (because of their shape) or Ishikawa diagrams. Helps in identifying root causes of the quality failure. (Helps in the *diagnostic journey*.)

Machine

Manpower

Problem

Method

Material
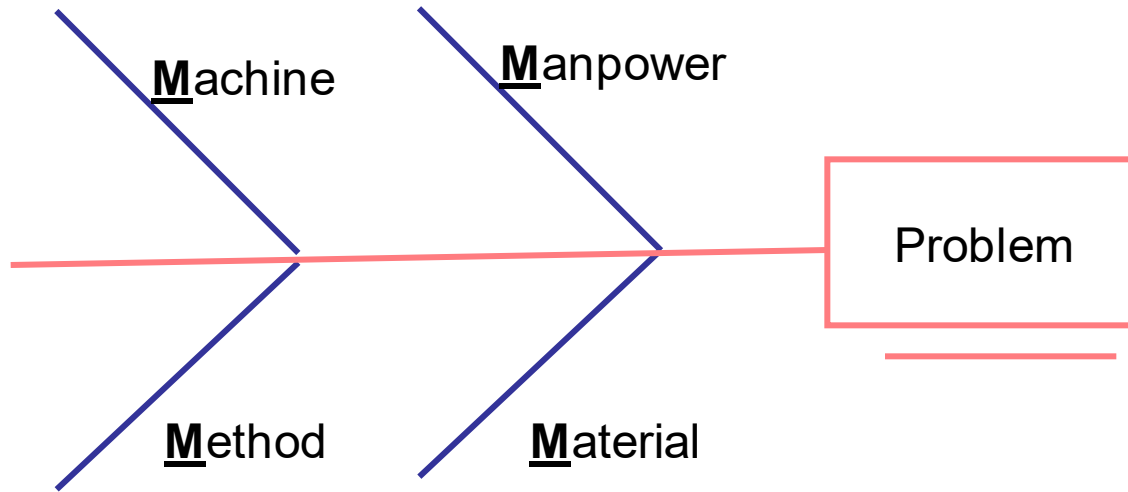
Ishikawa Diagram is also called Cause-and-Effect Diagram. Often are four generic heading used: **4 M´s**!

Pareto Diagram

The purpose of the Pareto Diagram is to highlight the most important set of factors among a typically large amount of causes for a problem.
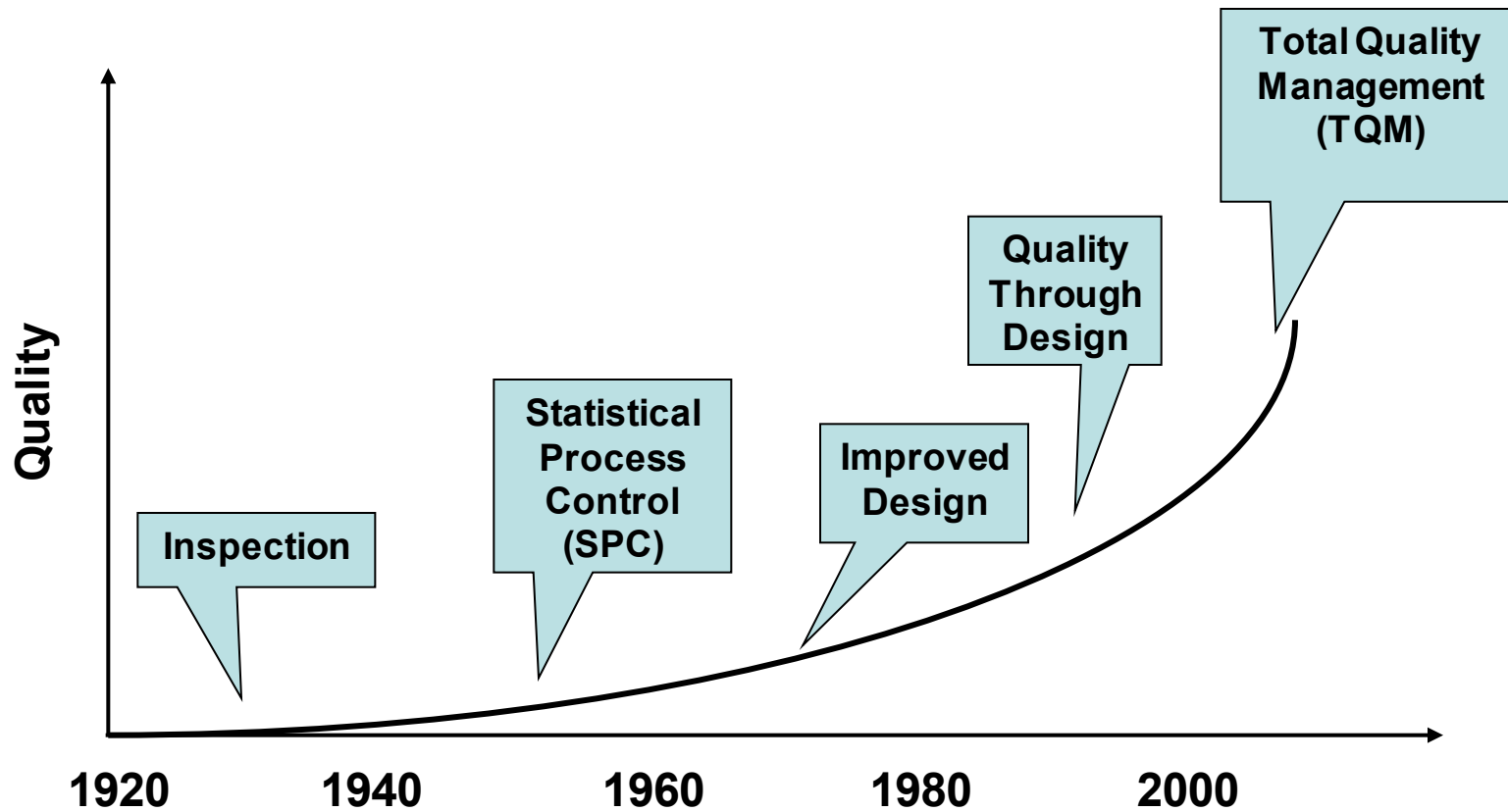
In order to develop the Pareto Diagram for a specific process, the knowledge of Frequncy, Relative Frequency, Cumulative Frequency and Percentage Frequency is needed.

Pareto Diagram
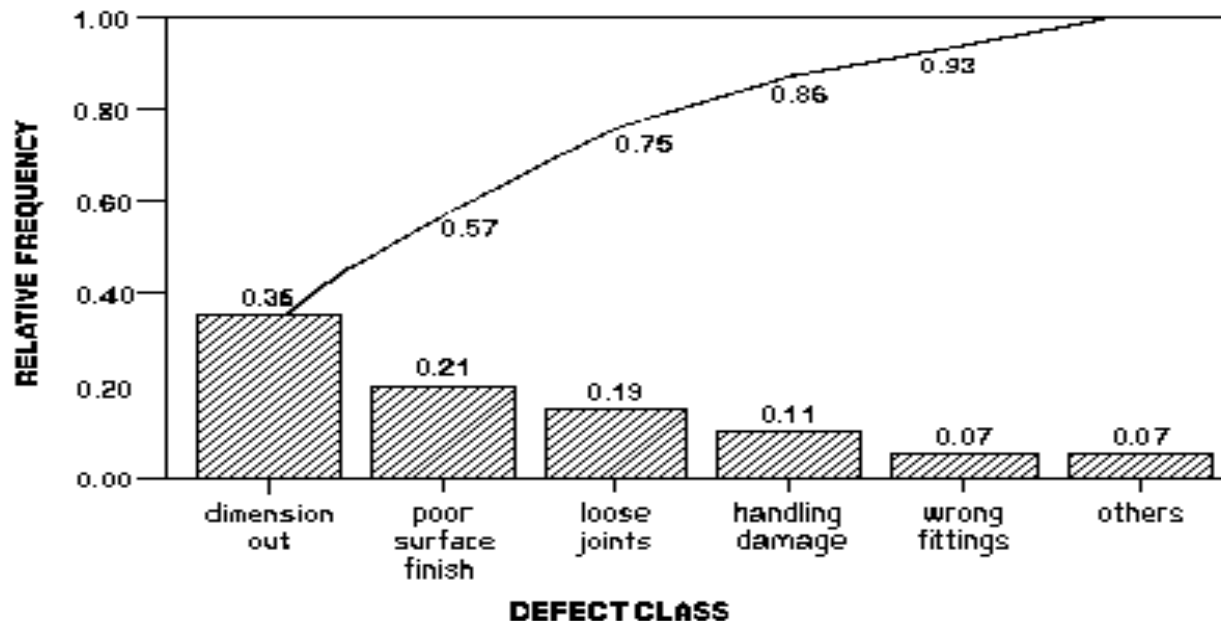
It can be noted that the 3 defects of out-of-dimension, poor surface finish and loose joints account for 75% of the rejections.

Quality as a Function of Time and Methods

Other tools: Flow charts

- Process map identifies the *sequence of activities* or the flow in a process.

- Objectively provides a *picture of the steps* needed to accomplish a task.

- Helps all employees understand *how they fit into the process* and who are their suppliers and customers.

- Can also pinpoint places where quality-related measurements should be taken.

- Also called process mapping and analysis.

- Very successfully implemented in various organizations. e.g. Motorola reduced manufacturing time for pagers using flow charts.

Scatter diagrams

- Graphical components of the regression analysis.

- Often used to point out *relationship between variables*. Statistical correlation analysis used to interpret scatter diagrams.

TQM for the Workforce

Kaizen teams

Quality Circles

Quality circles

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

- Developed by *Kaoru Ishikawa* at University of Tokyo.

- Became immediately popular in Japan as well as USA.

- *Lockheed Missiles and Space Division* was the leader in implementing Quality circles in USA in 1973 (after their visit to Japan to study the same).

- 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.

Additional process improvement tools

Kaizen blitz

- 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.

- Short time "burst" rather than long range simmer- hence the name.

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

Additional process improvement tools

Poka-Yoke (Mistake proofing)

- Approach for mistake-proofing processes using automatic devises or methods to avoid simple human error.

- Developed and refined in the 1960s by the late Shigeo Shingo, a Japanese manufacturing engineer who developed the Toyota production system.

- Focused on two aspects:

1. Prediction – Recognizing that a defect is about to occur and provide a warning.

2. Detection – Recognizing that a defect has occurred and stop the process.

Quality Management Awards and Framework

- ISO 9000: 2000
- Six Sigma
- Awards: Malcolm Baldrige National Quality Award, EFQM Model, Deming Prize

ISO 9000

- The International Organization for Standardization (ISO)
- ISO 9000 Series of Quality Standards
  - An international set of standards for documenting the processes that an organization uses to produce its goods and services.

ISO 9001:2000	Quality Management Systems: Requirements
ISO 9004:2000	Quality Management Systems: Guidelines for Performance Improvement
ISO 9000:2000	Quality Management Systems: Fundamentals and Standards

ISO 9000 (cont'd)

- ISO 9000 Certification

  – First party certification—A firm audits itself.

  – Second party certification—Customers audit their suppliers.

  – Third party assessment—Company is assessed by outside registrars from ASQ's Registration Accreditation Board (RAB).

  – ISO 9000/Q90 Registration Process

    - Application to registrar

    - Preliminary assessment

    - Full audit

ISO 9000: 2000

- Created by *International Organization for Standardization* (IOS) which was created in 1946 to standardize quality requirement within the European market.

- IOS initially composed of representatives from 91 countries: probably most wide base for quality standards.

- *Adopted a series of written quality standards* in 1987 (first revised in 1994, and *more recently (and significantly) in 2000*).

- Prefix "ISO" in the name refers to the scientific term *"iso" for equal*. Thus, certified organizations are assured to have quality equal to their peers.

ISO 9000: 2000

- Defines quality systems standards based on the premise that certain *generic characteristics of management principles can be standardized*.

- And that a well-designed, well-implemented and well managed quality system *provides confidence that outputs will meet customer expectations and requirements*.

- Standards are recognized by 100 countries including Japan and USA.

- Intended to apply to all types of businesses. (Recently, B2B firm *bestroute.com became the first e-commerce company to get ISO certification*.)

ISO 9000: 2000

Created to meet five objectives:

1.   Achieve, maintain, and seek to continuously improve product quality in relation to the requirements.

2.   Improve the quality of operations to continually meet customers' and stakeholders' needs.

3.   Provide confidence to internal management that quality requirements are being met.

4.   Provide confidence to the customers that quality requirements are being met.

5.   Provide confidence that quality system requirements are fulfilled.

ISO 9000: 2000 structure

- Consists of three documents

1. ISO 9000 – Fundamentals and vocabulary.

2. ISO 9001 – Requirements.

Organized in four sections: Management Responsibility; Resource Management; Product Realization; and Measurement, Analysis and Improvement.

3. ISO 9004 – Guidelines for performance improvements.

ISO 9000: 2000 Quality Management Principles

- Principle 1: Customer Focus
- Principle 2: Leadership
- Principle 3: Involvement of people
- Principle 4: Process approach
- Principle 5: Systems approach for management
- Principle 6: Continual improvement
- Principle 7: Factual approach to decision making
- Principle 8: Mutually beneficial supplier relationships.

ISO 9000: 2000 registration

- Originally intended to be a two-party process where the supplier is audited by its customers, the ISO 9000 process became a *third-party accreditation process*.

- Independent laboratory or a certification agency conducts the audit.

- Recertification is required *every three years*.

- *Individual sites* – not entire company – must achieve registration individually.

- All costs are to be borne by the applicant.

- A registration audit may cost anywhere from $10,000 to $40,000.

(more information at http://www.iso.ch)

Six Sigma

- Business improvement approach that seeks to *find and eliminate causes of defects and errors in processes* by focusing on outputs that are critical to customers.

- The term Six Sigma is based on a statistical measure that equates *3.4 or fewer errors or defects per million opportunities*.

- Motorola pioneered the concept of Six Sigma.

- The late Bill Smith, a reliability engineer is credited with conceiving the idea of Six Sigma.

- GE (specifically CEO Jack Welch) extensively promoted it.

Six Sigma

Core philosophy based on key concepts:

- Think in terms of key business processes and customer requirements with focus on strategic objectives.

- Focus on corporate sponsors responsible for championing projects.

- Emphasize quantifiable measures such as defects per million opportunities (*dpmo*).

- Ensure appropriate metrics is identified to maintain accountability.

- Provide extensive training.

- Create highly qualified process improvement experts -"belts".

- Set stretch objectives for improvement.

Six Sigma

Contrasts between traditional TQM and Six Sigma (SS) -

- TQM is based largely on worker empowerment and teams; SS is owned by business leader champions.

- TQM is process based; SS projects are truly cross-functional.

- TQM training is generally limited to simple improvements tools and concepts; SS is more rigorous with advanced statistical methods.

- TQM has little emphasis on financial accountability; SS requires verifiable return on investment and focus on bottom line.

Quality Performance Levels
for Various Processes

Process Description	Quality Performance Level
IRS phone-in tax advice	2.2σ
Restaurant bills, doctors' prescription writing, payroll processing	2.9σ
Average company	3.0σ
Airline baggage handling	3.2σ
Best-in-class companies	5.7σ
U.S. Navy aircraft accidents	5.7σ
Watch off by 2 seconds in 31 years	6.0σ
Airline industry fatality rate	6.2σ

Source: Dave Harold, "Designing for Six Sigma Capability,"

Exhibit 9.7

Recognizing and Rewarding Quality

- Promotion of High Quality Goods and Services
  - Malcolm Baldrige National Quality Award (MBNQA) (United States)
  - Deming Prize (Japan)
  - European Quality Award (European Union)
  - ISO9000 certification

Malcolm Baldrige National Quality Award (MBNQA)

- Background

  - Established in 1987 to recognize total quality management in American industry.

- Purpose

  - Stimulate U.S. companies to improve quality and productivity.

  - Establish guidelines and criteria to evaluate quality.

  - Recognize those firms that improve their quality.

  - Provide guidance in how to achieve quality.

The Integrated Framework of the Baldrige Award Criteria
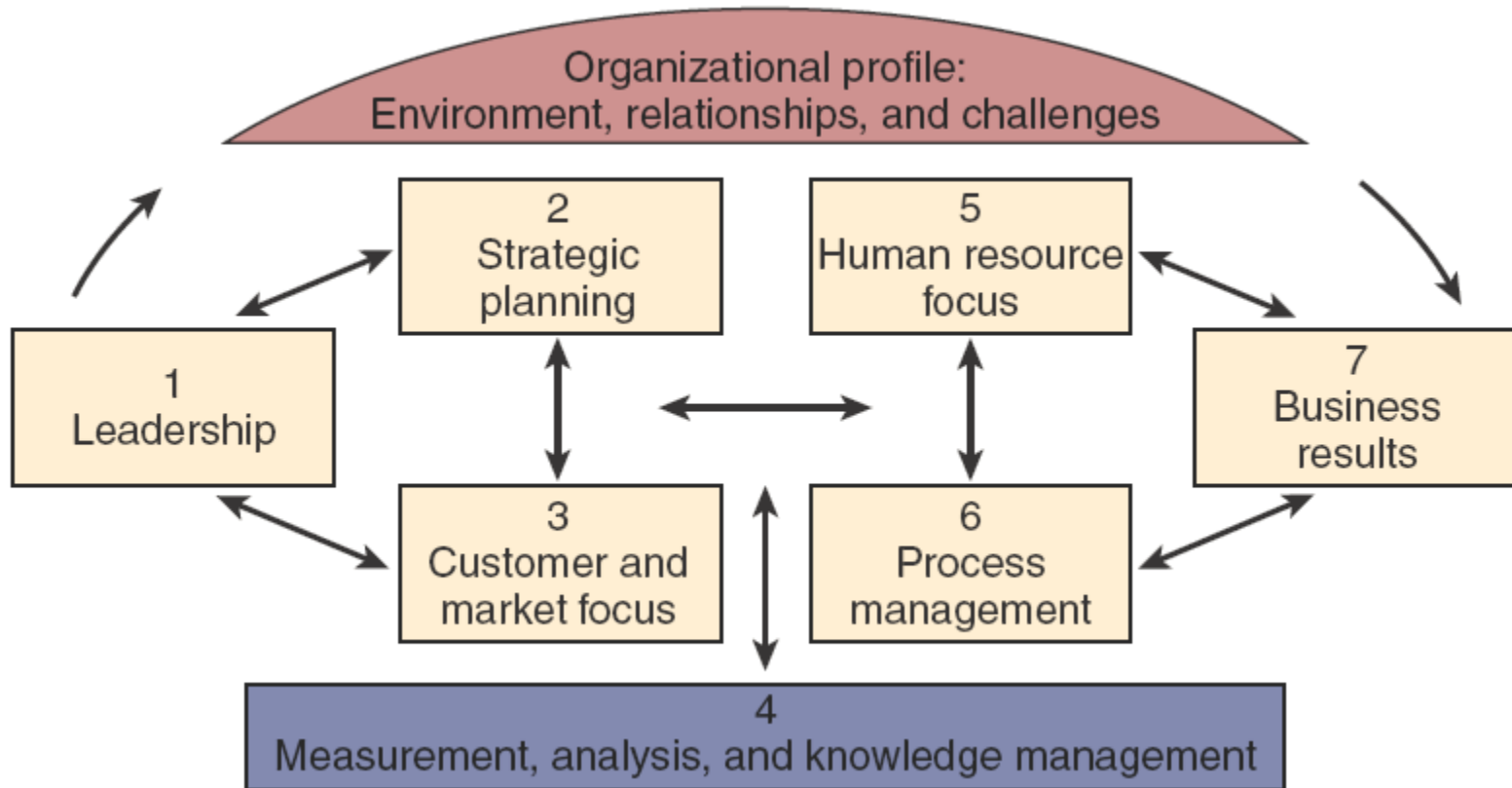
Organizational profile:
Environment, relationships, and challenges

2 Strategic planning

5 Human resource focus

1 Leadership

7 Business results

3 Customer and market focus

6 Process management

4 Measurement, analysis, and knowledge management

McGraw-Hill/Irwin   9–91

Exhibit 9.9

2001 Award Criteria—Item Listing

Categories/Items	Points Values
1.0 Leadership	120
2.0 Strategic planning	85
3.0 Customer and market focus	85
4.0 Measurement, analysis, and knowledge management	90
5.0 Human resource focus	85
6.0 Process management	85
7.0 Business results	450
Total Points	1,000

Benefits of the Baldrige Quality Criteria

- Baldrige guidelines can be used to:

  - Help define and design a total quality system.

  - Evaluate ongoing internal relationships among department, divisions, and functional units within an organization.

  - Assess and assist outside suppliers of goods and services to a company.

  - Assess customer satisfaction.

European Quality Award (EQA)

- European Foundation for Quality Management (EFQM)

  - Stimulate and assist European organizations in quality improvement activities.

  - Support managers in the adoption of TQM.

- EFQM Excellence Model

  - A non-prescriptive frame work based on nine criteria that recognizes that there are many approaches to achieving sustainable excellence.

Overview of the EFQM Excellence Model

Exhibit 9.11
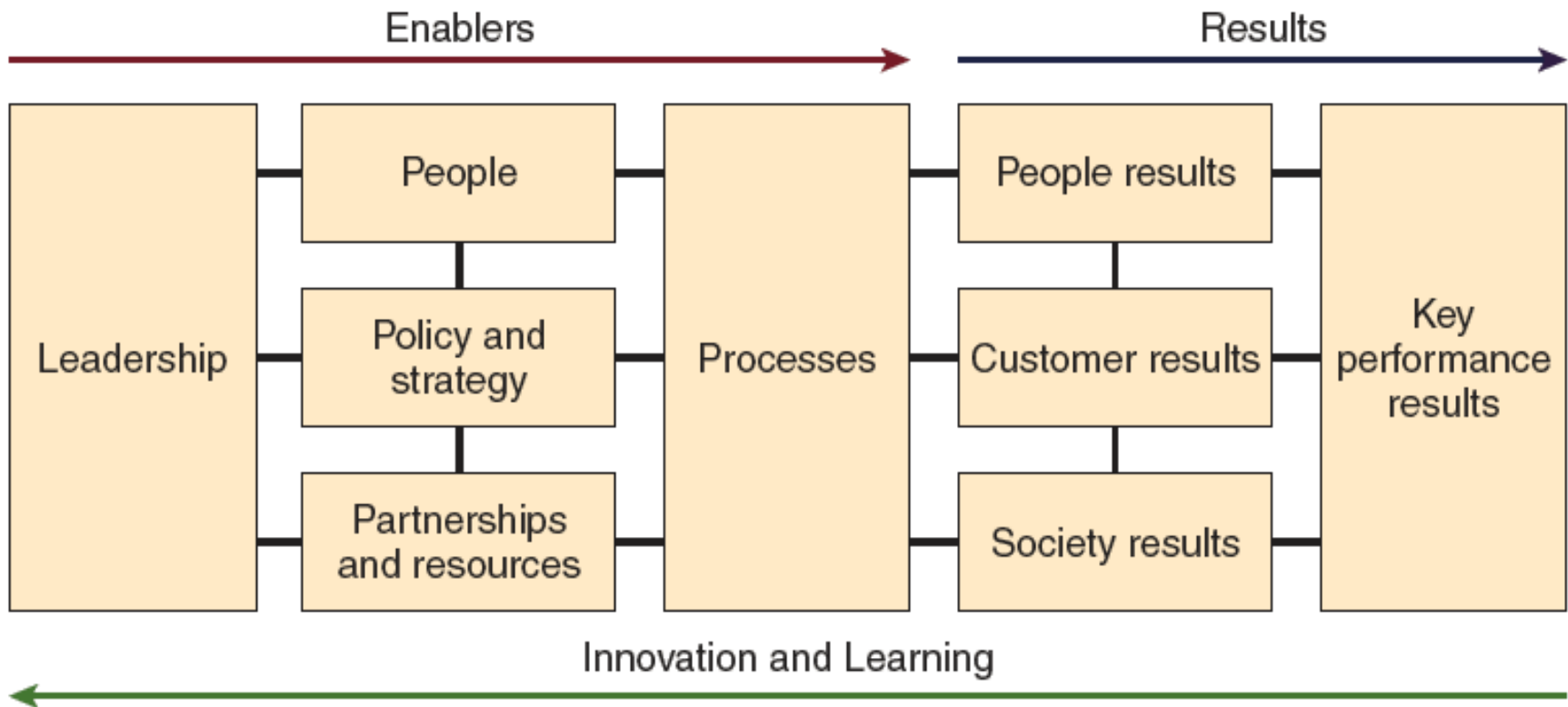
Recent Winners of the European Quality Award

Year	Category	Company
2003	Large Organizations	Siemens Nederland (The Netherlands)
	Operational Units	Bosch Sanayi ve Ticaret AS (Turkey)
	Public Sector	Runshaw College (United Kingdom)
	Subsidiary SMEs	Maxi SA–"Coco-Mat" (Greece)
	Independent SMEs	Edinburgh International Conference Centre Limited (Scotland)
2002	Independent SMEs	Springfarm Architectural Mouldings Ltd. (United Kingdom)
2001	Public Sector	St. Mary's College (Northern Ireland)
	Independent SMEs	Zahnarztpraxis (Switzerland)
2000	Large businesses	Nokia Mobile Phones (Finland)
	Public sector	Inland Revenue, Accounting Office (United Kingdom, Scotland)
	Subsidiary SMEs	Burton-Apta Refractory Manufacturing Ltd. (Hungary)
1999	Large businesses	Yellow Pages (United Kingdom)
	Operational units	Volvo Cars Gent (Belgium)
	Independent SMEs	DIEU, Danish International Continuing Education (Denmark)
	Subsidiary SMEs	Servitique Network Services (France)
1998	Large businesses	TNT United Kingdom (United Kingdom)
	Independent SMEs	Schlinderhof (Germany)
	Subsidiary SMEs	Beko Ticaret (Turkey)

Exhibit 9.11

The Deming Prize

- Deming Prize

  - Initiated by Japan in 1951 to recognize the importance of high quality products.

  - Name after W. Edwards Deming

  - Categories of the Deming Prize:

    - The Deming Prize for Individuals

    - The Deming Application Prize

    - The Quality Control Award for Operations/ Business Units

SIX SIGMA
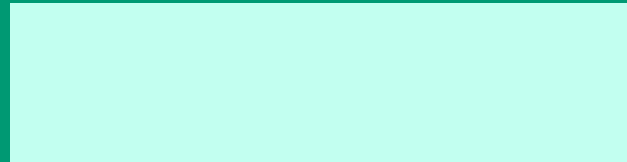
WHAT IS SIGMA ?

- A term (Greek) used in statistics to represent standard deviation from mean value, an indicator of the degree of variation in a set of a process.

- Sigma measures how far a given process deviates from perfection. Higher sigma capability, better performance

WHAT IS SIX SIGMA?

- Six Sigma - A highly disciplined process that enables organizations deliver nearly perfect products and services.

- The figure of six arrived statistically from current average maturity of most business enterprises

- A philosophy and a goal: as perfect as practically possible.

- A methodology and a symbol of quality.

WHAT IS SIX SIGMA?

- A statistical concept that measures a process in terms of defects – at the six sigma level, there 3.4 defects per million opportunities.

But, it is much more!

WHAT IS SIX SIGMA

Six Sigma is not:

- A standard

- A certification

- Another metric like percentage

Rather!

- It is a Quality Philosophy and the way of improving performance by knowing where you are and where you could be.

- Methodology to measure and improve company's performance, practices and systems

WHY SIX SIGMA ?

- Six Sigma emerged as a natural evolution in business to increase profit by eliminating defects

- The Current business environment now demands and rewards innovation more than ever before due to:

➢ Customer Expectations

➢ Technological Change

➢ Global Competition

➢ Market Fragmentation

SIGMA LEVELS

Sigma Level (Process Capability)	Defects per Million Opportunities
2	308,537
3	66,807
4	6,210
5	233
6	3.4

COMPANIES USING 6σ

Six Sigma is in use in virtually all industries around the world. Some of companies can be listed as:

- Motorola

- Ericsson

- General Electric
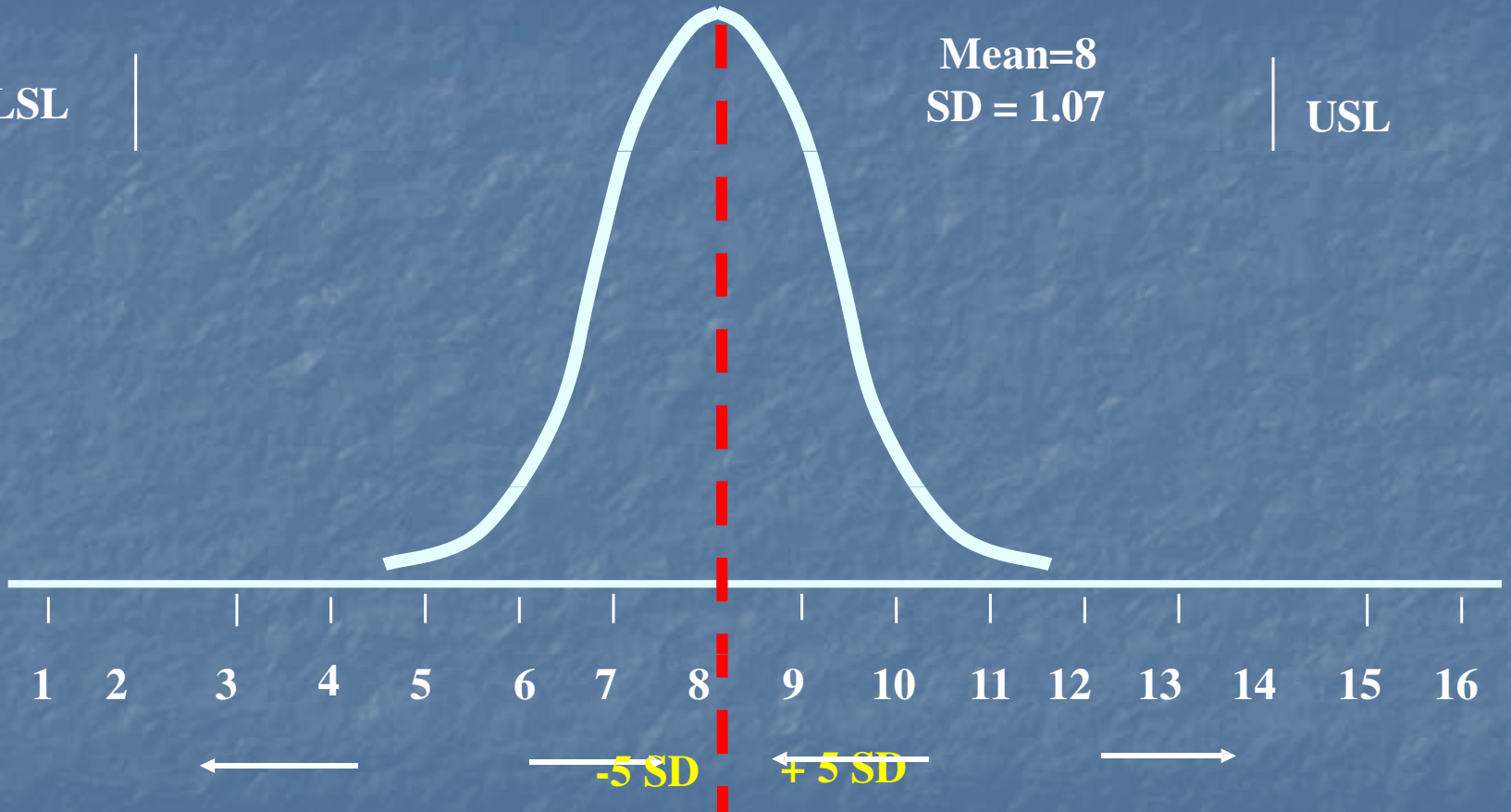
- Sony

- Ford Motor Co.

- CITI bank
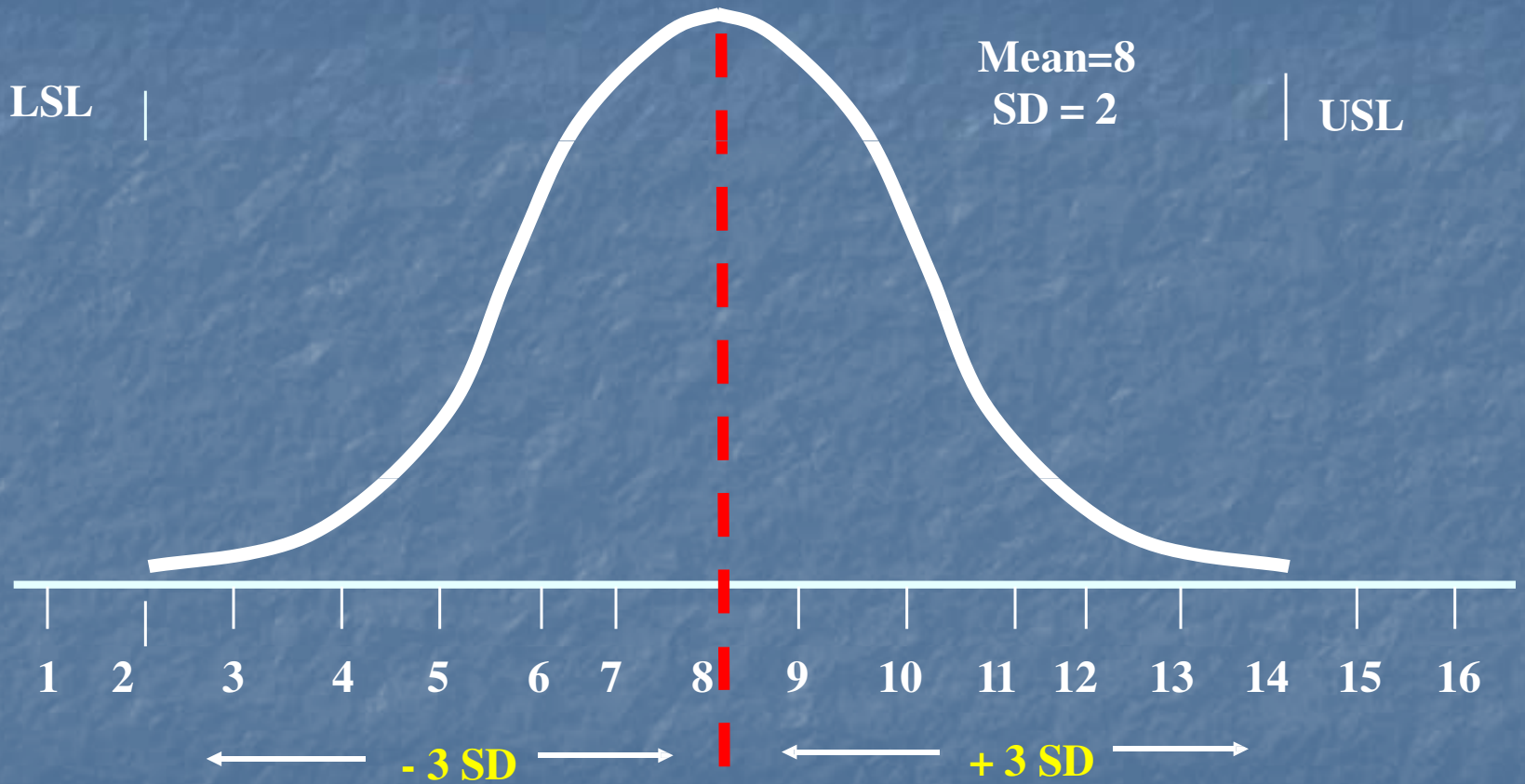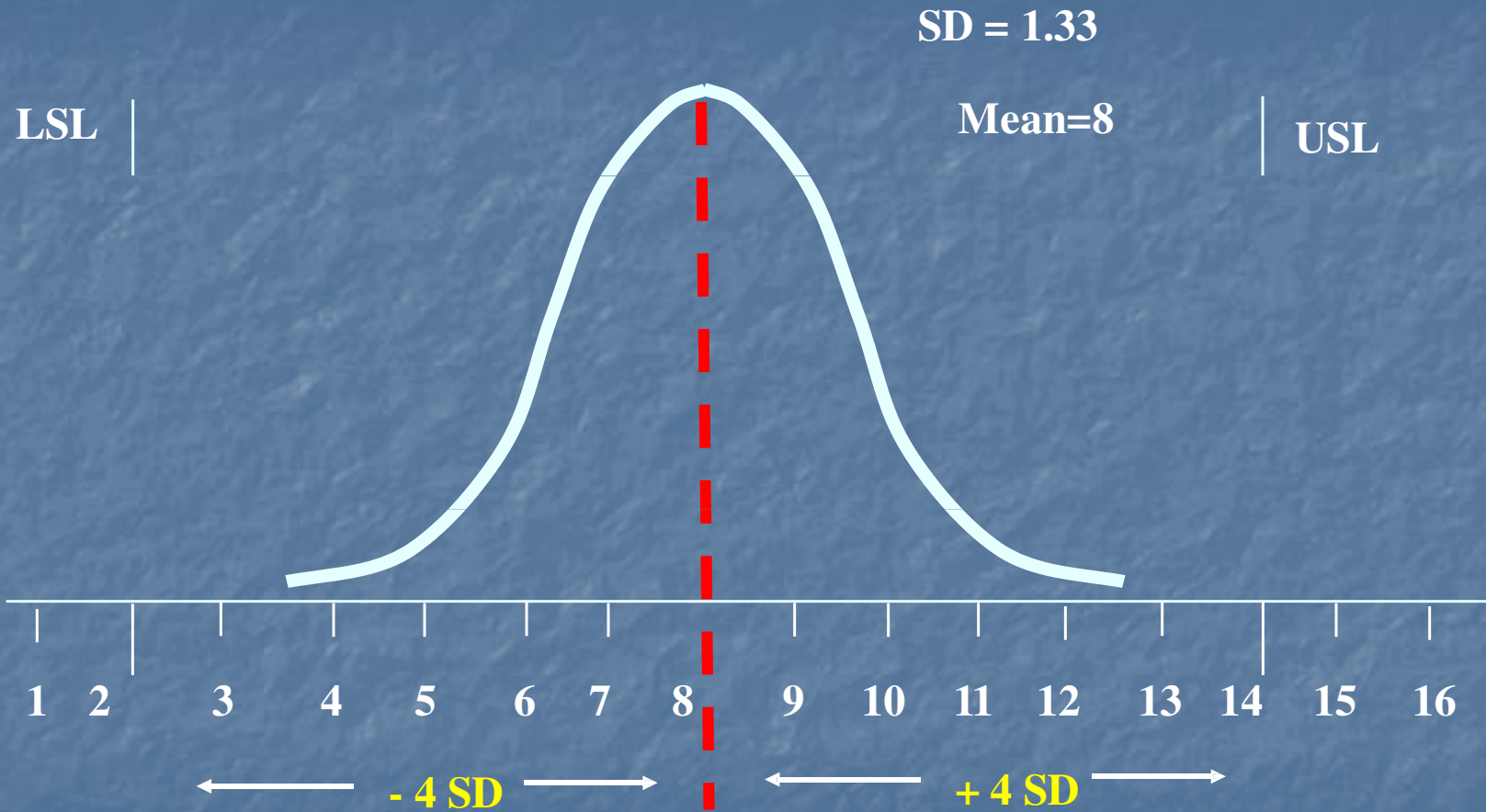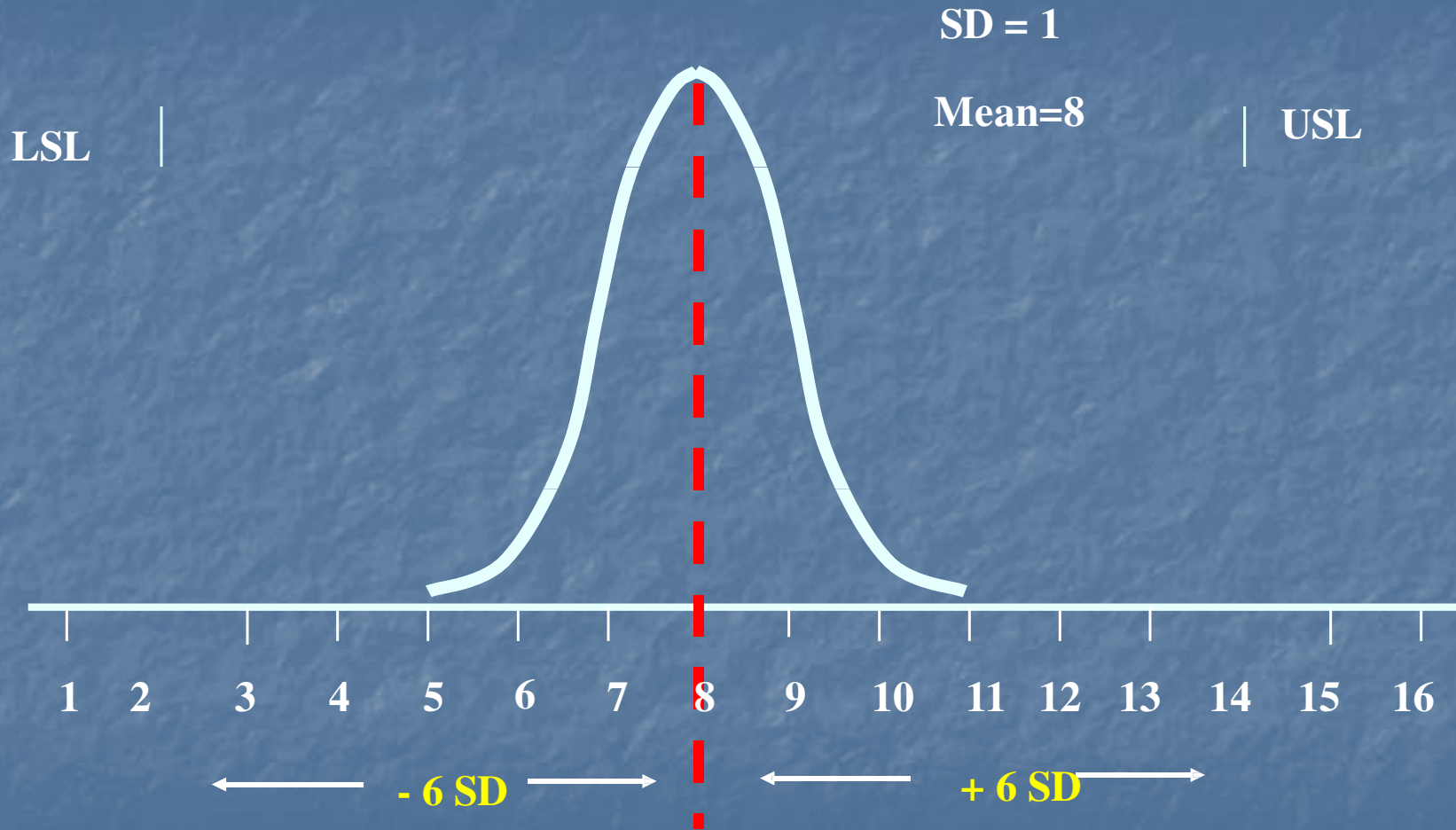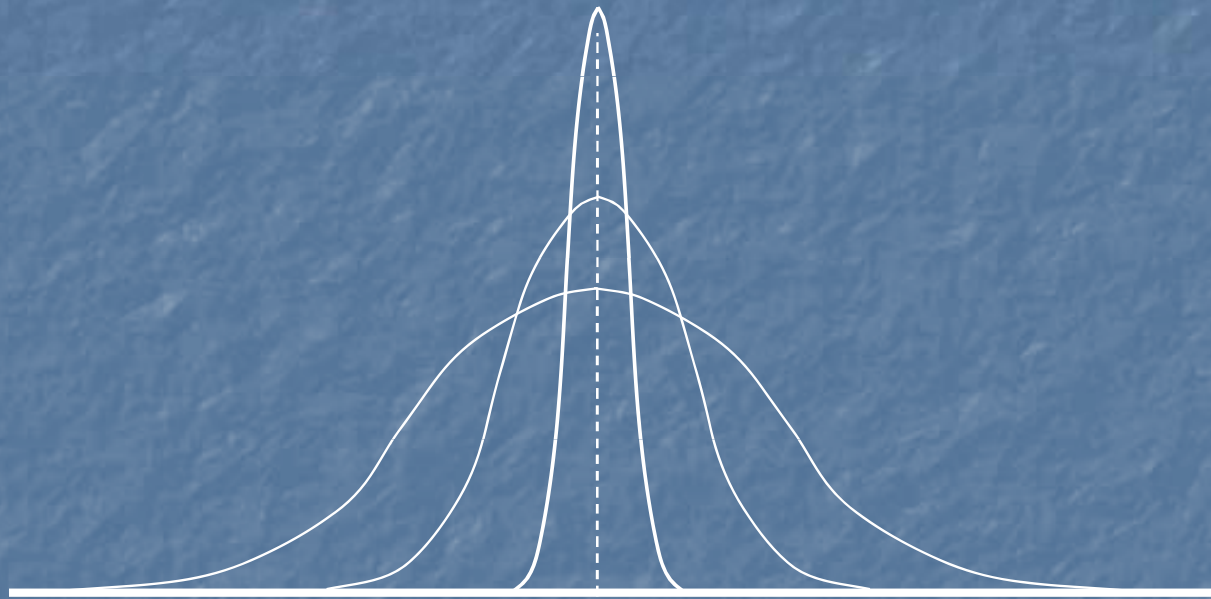
Lesser the standard deviation of the process, more precise or consistent is the process

SIX SIGMA METHODOLOGY
(It takes money to save money)

- BPMS
  - ➢ Business Process Management System

- DMAIC
  - ➢ Six Sigma Improvement Methodology

- DMADV
 - ➢ Creating new process which will perform at Six Sigma

BUSINESS PROCESS MANAGEMENT SYSTEM:

- BPM strategies emphasize on process improvement and automation to derive performance

- Combining BPM strategies with sigma six is most powerful way to improve performance

- Both strategies are not mutually exclusive but some companies produced dramatic results by combining them.

WHAT IS DMAIC?

(Define,Measure,Analyse,Improve.Control)

- A logical and structured approach to problem solving and process improvement.

- An iterative process (continuous improvement)

- A quality tool which focus on change management style.
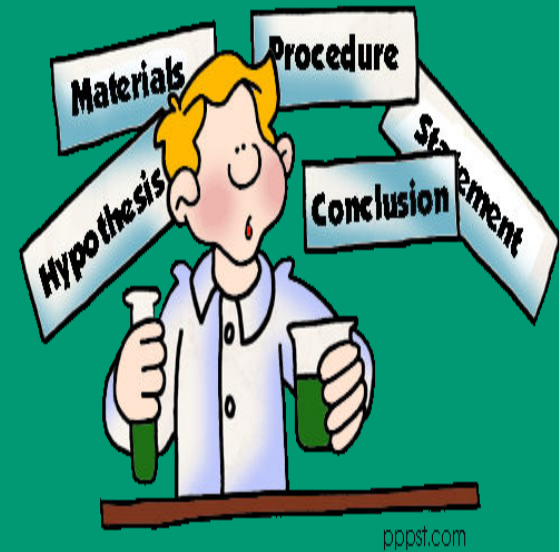
PHASES

Phases of Six Sigma are:

- Define specific goals to achieve outcomes, consistent with customers demand and business strategy

- Measure reduction of defects

- Analyze problems ,cause and effects must be considered

- Improve process on bases of measurements and analysis

- Control process to minimize defects

WHAT IS DMADV?

- Acronym for:
- ➢ Define the project
- ➢ Measure the opportunity
- ➢ Analyze the process options
- ➢ Design the process
- ➢ Verify the performance

WHEN SHOULD SIX SIGMA BE USED?

Its usage depends on the type of business. In general,

"If there are processes that generate a lot of negative customer feedback, whether that customer is internal or external, the components of Six Sigma should be considered as a means to study and rectify the problem."

BENEFITS OF SIX SIGMA

- Generates sustained success
- Sets performance goal for everyone
- Enhances value for customers
- Accelerates rate of improvement
- Promotes learning across boundaries
- Executes strategic change

USAGE OF SIX SIGMA
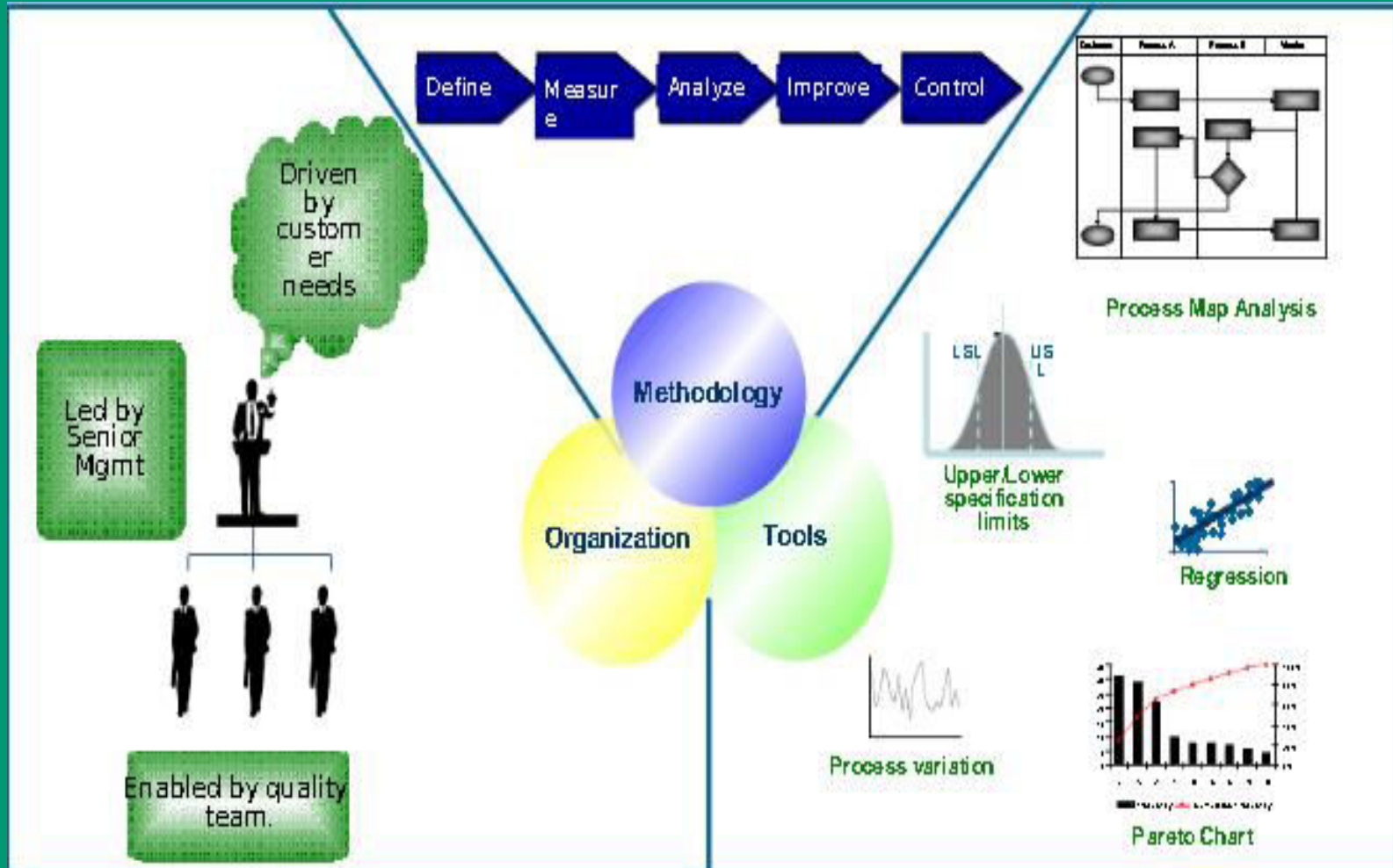
SIX SIGMA MANAGEMENT

When practiced as a management system, Six Sigma is a high performance system for executing business strategy.

Six Sigma is a top down solution to help organizations:

- Align their business strategy to critical improvement efforts

- Mobilize teams to attack high impact projects

- Accelerate improved business results

- Govern efforts to ensure improvements are sustained

KEY ROLES FOR SIX SIGMA

Six Sigma identifies several key roles for its successful implementation:

- Executive leadership

- Champions

- Master Black Belts (Identify projects& functions)

- Black Belts (Identify non value added activities)

- Green Belts (works on small projects)

Top

Bottom

23
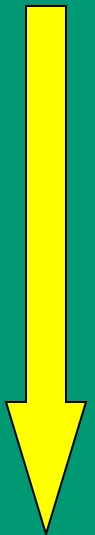
TOOLS & TECHNIQUES

- 7QC tools
- ✓ Check Sheets (collect data to make improvements)
- ✓ Pareto Charts(define problem and frequency)
- ✓ Cause and effect diagram (Identify possible causes to solve problem)
- ✓ Histogram (Bar charts of accumulated data to evaluate distribution of data)
- ✓ Scatter diagram (plots many data points and pattern between two variables)
- ✓ Flow Chart (Identify unwanted steps)
- ✓ Control charts (Control limits around mean value)

TRAININGS & CERTIFICATIONS

If you want to make yourself more valuable and attractive to employers then get training and certification

- Option I – Certification as Six Sigma Green Belt

- Option II – Certification as Six Sigma Black Belt

CONCLUSION

Six Sigma is methodology used for:

- Aligning key business processes to achieve those requirements.

- Utilizing rigorous data analysis to minimize data variation in those processes.

- Driving rapid and sustainable improvement to business processes.

Assignment – Six Sigma

1. What is six sigma. Why it is needed.

2. Explain sigma levels as defects per million opportunities.

3. When should Six Sigma be used ? What are its benefits.

4. Explain BPMS, DMAIC and DMADV.

5. Explain six-sigma applications to any one of the following.

   (a) manufacturing, (b) service sector (c) IT
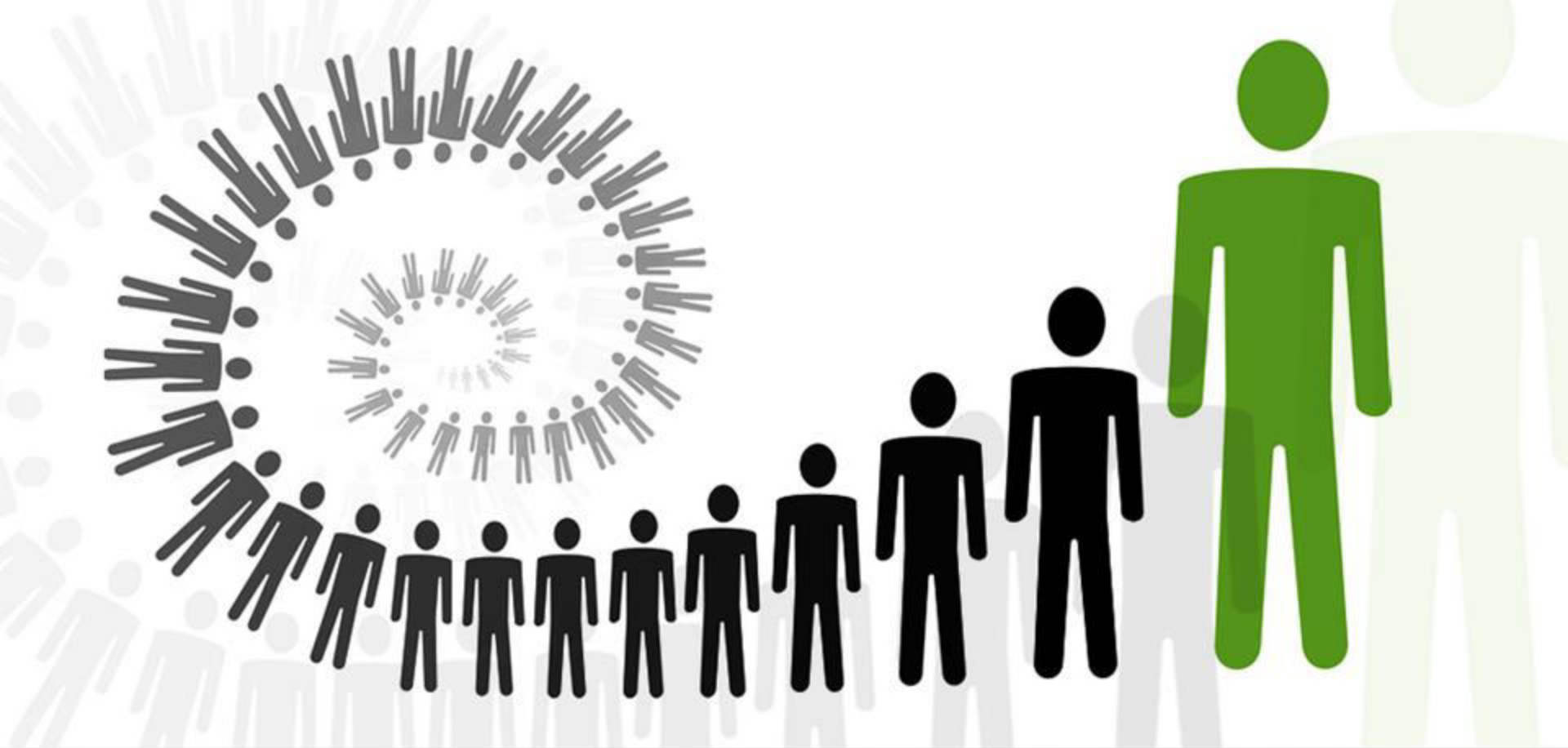
BENCHMARKING

BENCHMARKING
INTRODUCTION

- **Benchmarking** is the process of comparing one's business processes and performance metrics to industry bests or best practices from other companies.

- Dimensions typically measured are quality, time and cost. In the process of best practice benchmarking, management identifies the best firms in their industry, or in another industry where similar processes exist, and compares the results and processes of those studied (the "targets") to one's own results and processes.

- In this way, they learn how well the targets perform and, more importantly, the business processes that explain why these firms are successful.

BENCHMARKING
INTRODUCTION

- **Benchmarking** is used to measure performance using a specific indicator (cost per unit of measure, productivity per unit of measure, cycle time of x per unit of measure or defects per unit of measure) resulting in a metric of performance that is then compared to others.

BENCHMARKING
INTRODUCTION

Also referred to as "best practice benchmarking" or "process benchmarking", this process is used in management and particularly strategic management, in which **organizations evaluate various aspects of their processes in relation to best practice companies' processes, usually within a peer group defined for the purposes of comparison.**

This then allows organizations to develop plans on how to make improvements or adapt specific best practices, usually with the aim of increasing some aspect of performance.

Benchmarking may be a one-off event, but is often treated as a continuous process in which organizations continually seek to improve their practices.

OBJECTIVES OF BENCHMARKING

A measurement of the quality of an organization's policies, products, programs, strategies, etc., and their comparison with standard measurements, or similar measurements of its peers.

The objectives of benchmarking are
(1) to determine what and where improvements are called for,
(2) to analyze how other organizations achieve their high performance levels, and
(3) to use this information to improve performance.

Benchmarking Procedure

- There is no single benchmarking process that has been universally adopted. The wide appeal and acceptance of benchmarking has led to the emergence of benchmarking methodologies.

- Robert Camp (who wrote one of the earliest books on benchmarking in 1989) developed a 12-stage approach to benchmarking.

The 12 stage methodology:

The 12 stage methodology consists of:

- Select subject
- Define the process
- Identify potential partners
- Identify data sources
- Collect data and select partners
- Determine the gap
- Establish process differences
- Target future performance
- Communicate
- Adjust goal
- Implement
- Review and recalibrate

A TYPICAL BENCHMARKING METHODOLOGY:

Identify problem areas: Because benchmarking can be applied to any business process or function, a range of research techniques may be required. They include informal conversations with customers, employees, or suppliers; exploratory research techniques such as focus groups; or in-depth marketing research, quantitative research, surveys, questionnaires, re-engineering analysis, process mapping, quality control variance reports, financial ratio analysis, or simply reviewing cycle times or other performance indicators.

Before embarking on comparison with other organizations it is essential to know the organization's function and processes; base lining performance provides a point against which improvement effort can be measured.

A TYPICAL BENCHMARKING METHODOLOGY:

•**Identify other industries that have similar processes:** For instance, if one were interested in improving hand-offs in addiction treatment one would identify other fields that also have hand-off challenges. These could include air traffic control, cell phone switching between towers, transfer of patients from surgery to recovery rooms.

•**Identify organizations that are leaders in these areas:** Look for the very best in any industry and in any country. Consult customers, suppliers, financial analysts, trade associations, and magazines to determine which companies are worthy of study.

A TYPICAL BENCHMARKING METHODOLOGY:

- **Survey companies for measures and practices:** Companies target specific business processes using detailed surveys of measures and practices used to identify business process alternatives and leading companies. Surveys are typically masked to protect confidential data by neutral associations and consultants.

- **Visit the "best practice" companies to identify leading edge practices:** Companies typically agree to mutually exchange information beneficial to all parties in a benchmarking group and share the results within the group.

Costs in Benchmarking:

The three main types of costs in benchmarking are:

1. Visit Costs - This includes hotel rooms, travel costs, meals, a token gift, and lost labor time.

2 .Time Costs - Members of the benchmarking team will be investing time in researching problems, finding exceptional companies to study, visits, and implementation. This will take them away from their regular tasks for part of each day so additional staff might be required.

Costs in Benchmarking:

3. Benchmarking Database Costs - Organizations that institutionalize benchmarking into their daily procedures find it is useful to create and maintain a database of best practices and the companies associated with each best practice now.

The cost of benchmarking can substantially be reduced through utilizing the many internet resources that have sprung up over the last few years. These aim to capture benchmarks and best practices from organizations, business sectors and countries to make the benchmarking process much quicker and cheaper.

Technical/product benchmarking

The technique initially used to compare existing corporate strategies with a view to achieving the best possible performance in new situations (see above), has recently **been extended to the comparison of technical products.**

This process is usually referred to as **"technical benchmarking" or "product benchmarking".** Its use is well-developed within the automotive industry ("automotive benchmarking"), where it is vital to design products that match precise user expectations, at minimal cost, by applying the best technologies available worldwide.

Technical/product benchmarking

Data is obtained by fully disassembling existing cars and their systems. Such analyses were initially carried out in-house by car makers and their suppliers.

However, as these analyses are expensive, they are increasingly being outsourced to companies who specialize in this area.

Outsourcing has enabled a drastic decrease in costs for each company (by cost sharing) and the development of efficient tools (standards, software).

Types of Benchmarking

Types of Benchmarking:

Benchmarking can be internal (comparing performance between different groups or teams within an organization) or external (comparing performance with companies in a specific industry or across industries).

Within these broader categories, there are three specific types of benchmarking:
1) Process benchmarking,
2) Performance benchmarking and
3) strategic benchmarking.

Types of Benchmarking

• **Process benchmarking** - the initiating firm focuses its observation and investigation of business processes with a goal of identifying and observing the best practices from one or more benchmark firms. Activity analysis will be required where the objective is to benchmark cost and efficiency; increasingly applied to back-office processes where outsourcing may be a consideration.

• **Financial benchmarking** - performing a financial analysis and comparing the results in an effort to assess your overall competitiveness and productivity.

• **Benchmarking from an investor perspective**- extending the benchmarking universe to also compare to peer companies that can be considered alternative investment opportunities from the perspective of an investor.

Types of Benchmarking

•**Benchmarking in the public sector** - functions as a tool for improvement and innovation in public administration, where state organizations invest efforts and resources to achieve quality, efficiency and effectiveness of the services they provide.

•**Performance benchmarking** - allows the initiator firm to assess their competitive position by comparing products and services with those of target firms.

•**Product benchmarking** - the process of designing new products or upgrades to current ones. This process can sometimes involve reverse engineering which is taking apart competitors products to find strengths and weaknesses.

Types of Benchmarking

•**Strategic benchmarking** - involves observing how others compete. This type is usually not industry specific, meaning it is best to look at other industries.

•**Functional benchmarking** - a company will focus its benchmarking on a single function to improve the operation of that particular function.

•Complex functions such as Human Resources, Finance and Accounting and Information and Communication Technology are unlikely to be directly comparable in cost and efficiency terms and may need to be disaggregated into processes to make valid comparison.

Types of Benchmarking

•**Best-in-class benchmarking** - involves studying the leading competitor or the company that best carries out a specific function.

•**Operational benchmarking** - embraces everything from staffing and productivity to office flow and analysis of procedures performed.

•**Energy benchmarking** - process of collecting, analysing and relating energy performance data of comparable activities with the purpose of evaluating and comparing performance between or within entities. Entities can include processes, buildings or companies. Benchmarking may be internal between entities within a single organization, or - subject to confidentiality restrictions - external between competing entities.

Assignment - Benchmarking

1. What is Benchmarking ? What are the objectives of benchmarking.
2. What is the methodology of Benchmarking.
3. Explain a typical Benchmarking Methodology.
4. Explain in details types of benchmarking.
5. What are the main costs in Benchmarking.

Thank You