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Chapter 6: Managing Quality

Chapter 6 Learning Outcomes:

- Define quality and TQM
- Describe the ISO international quality standards
- Explain what Six Sigma is
- Explain how benchmarking is used in TQM
- Explain quality robust products
- Use the seven tools of TQM

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Quality Management

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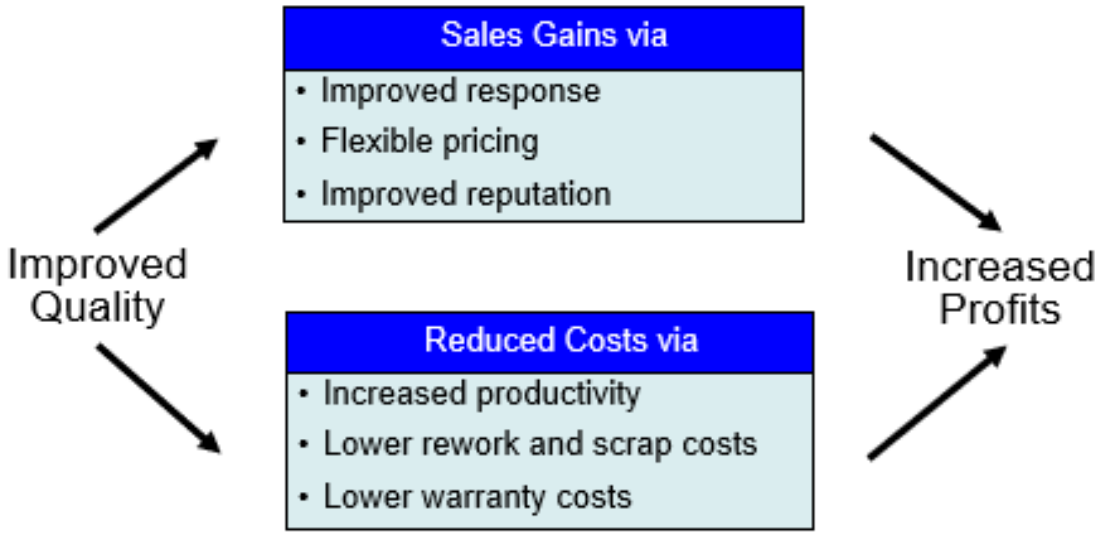
- Quality: the ability of a product or service to meet customer needs
- Quality management: systematic policies, methods, and procedures used to ensure that goods and services are produced with appropriate levels of quality to meet the needs of customers

- Two Ways Quality Improves Profitability



The Flow of Activities to Achieve Quality

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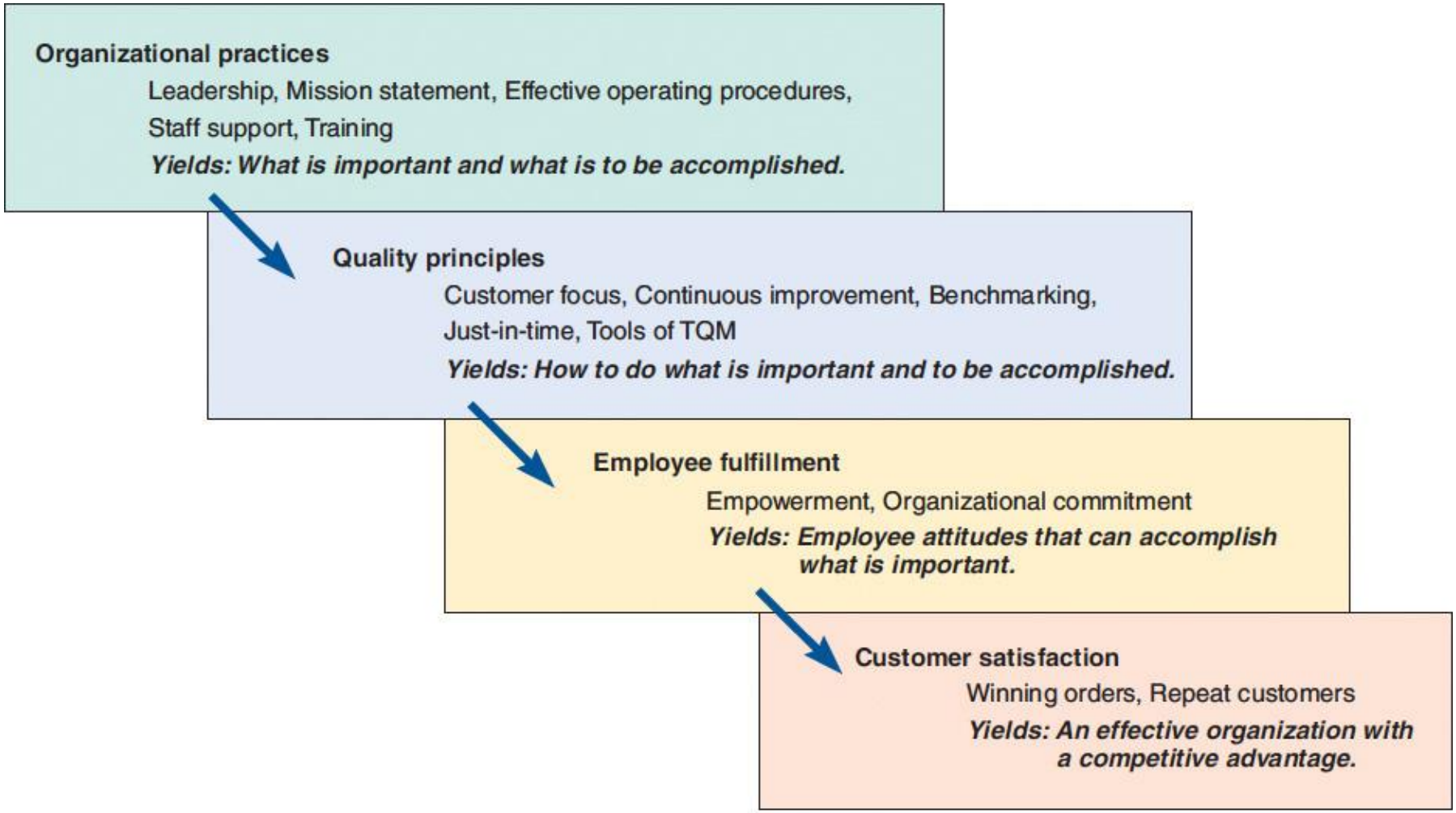

Customer Perception of Quality

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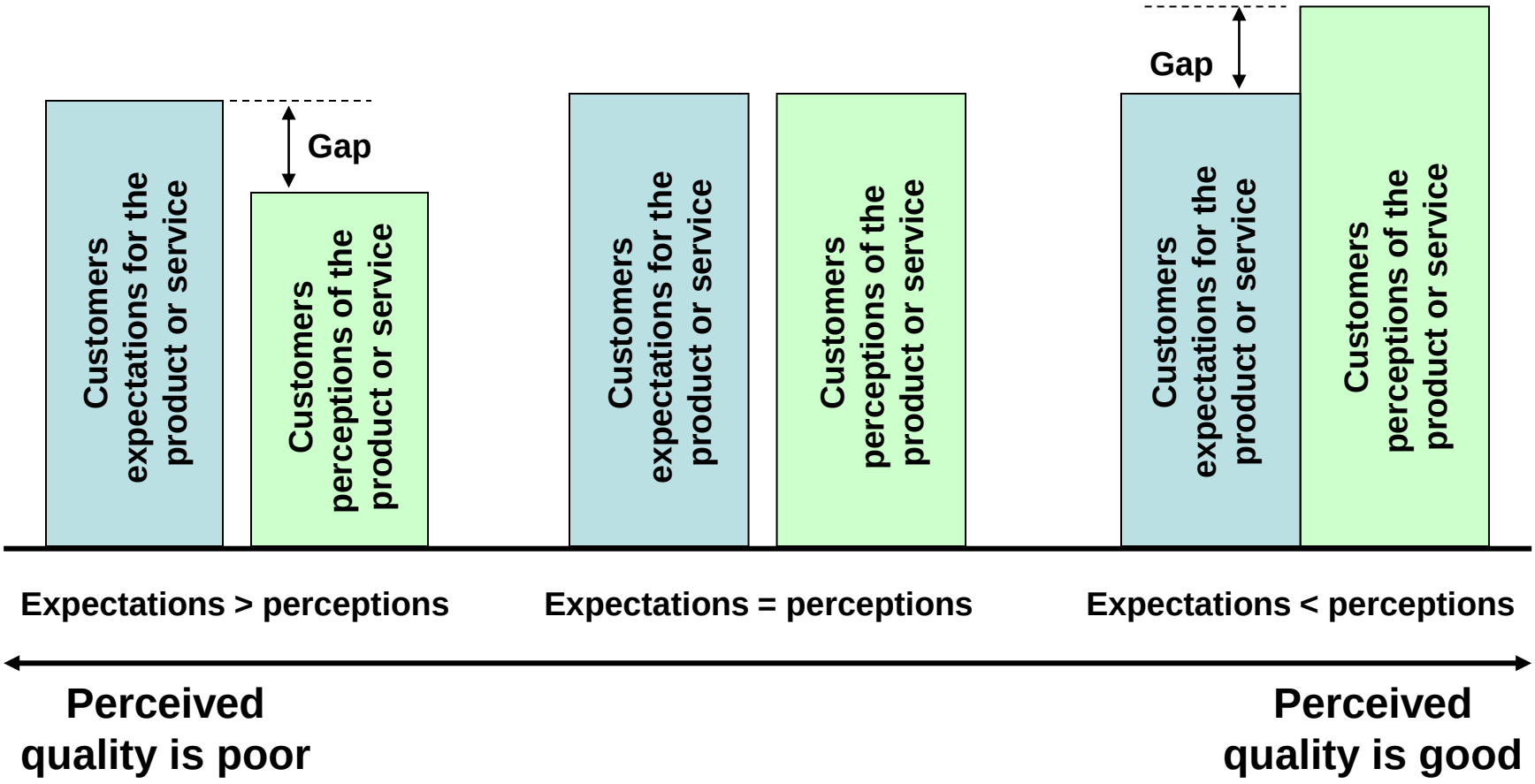

Implications of Quality

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- The consequences of Poor Quality can result in:
  - Loss of business
  - Loss in Productivity
  - Increased Costs
  - Diminished company reputation
  - Product liability
  - Global implications

A Brief History of Quality Management

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- Historical uses of quality management include the precision involved in building of Egyptian pyramids, interchangeable parts during Industrial Revolution, and statistical tools used for quality control during World War II
- The Japanese integrated quality ideas and methods throughout their organizations and developed a culture of continuous improvement
- Dr. W. Edwards Deming, Dr. Joseph Juran and Philip Crosby were pioneers in the field (“quality gurus”)

Takumi
is a Japanese character that symbolizes a broader dimension than quality, a deeper process than education, and a more perfect method than persistence

W. Edwards Deming

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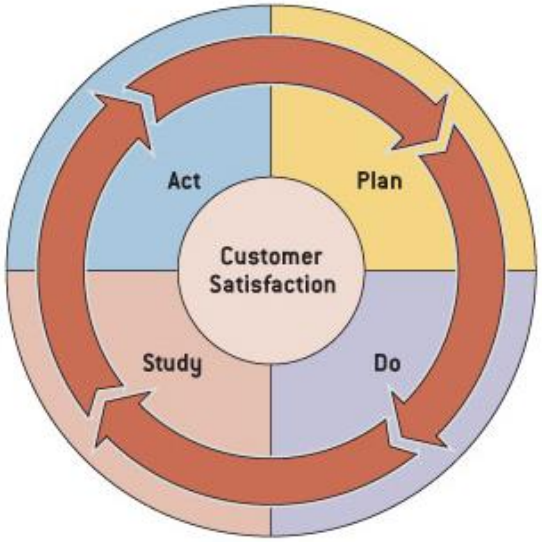
- Focus on bringing about improvements in product and service quality by reducing uncertainty and variability in goods and services design and associated processes
- Higher quality leads to higher productivity and lower costs
- “14 Points” management philosophy
- The Deming Prize: Japan’s highly coveted award honoring Deming, main focus on statistical quality control



PDSA Cycle
Plan, Do, Study, & Act

W. Edwards Deming

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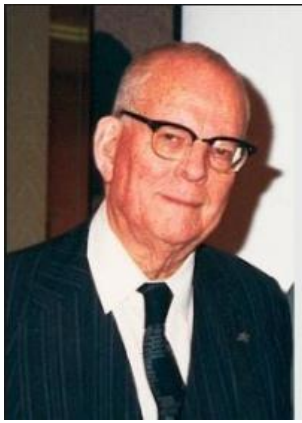
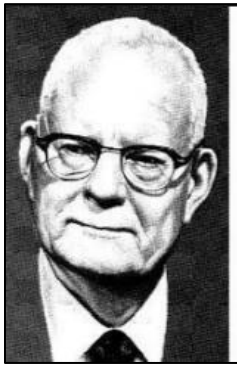


"It is not enough to do your best; you must know what to do, and then do your best."

W. Edwards Deming



"Without data you're just another person with an opinion"

- W. Edwards Deming

"In God we trust.
All others must bring data."

- Dr. W. Edwards Deming

"YOU CAN'T MANAGE WHAT YOU DON'T MEASURE.

- W. Edward Deming

Joseph Juran

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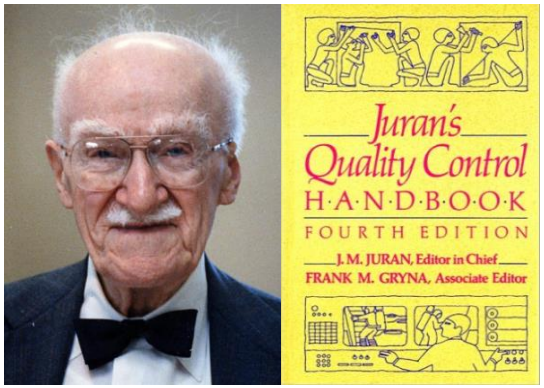
- Wrote Quality Control Handbook in 1951, a comprehensive quality manual
- Defined quality as “fitness for use”
- Advocated use of quality cost measurement
- Quality Trilogy: quality planning, quality control, and quality improvement



Joseph Juran

Quality and Finance Parallels	
Quality Trilogy Processes	**Financial Processes**
Quality Planning	Budgeting
Quality Control	Cost Control, Expense Control
Quality Improvement	Cost Reduction, Profit Improvemer

Philip B. Crosby

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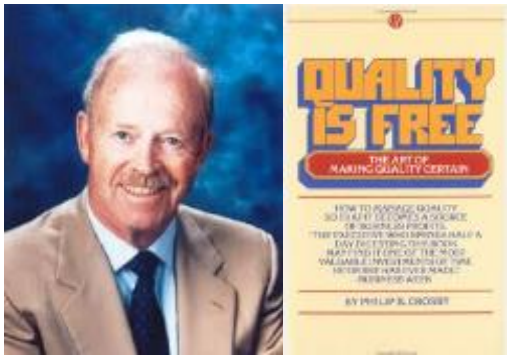
- Wrote Quality is Free in 1979, which brought quality to the attention of top corporate managers in the U.S.

- Crosby's Absolutes of Quality Management include:
  - Quality means conformance to requirements, not elegance
  - There is no such thing as a quality problem
  - There is no such thing as the economics of quality; doing the job right the first time is always cheaper
  - The only performance measurement is the cost of quality, which is the expense of nonconformance
  - The only performance standard is Zero Defects (ZD)



Philip Crosby

Malcolm Baldrige National Quality Award

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- Baldrige Award: Annual award given by the U.S. government to recognize quality achievements of U.S. companies

- Purpose: to stimulate efforts to improve quality, to recognize quality achievements and to publicize successful programs
- Categories
  - Manufacturing, Service and Small Business categories since 1988
  - The education and health care categories were added in 1999
  - The nonprofit category was added in 2007
- Since its inception: 1613 applications, 334 site visits (20.7%), 113 awards (6.5%)

Baldrige Award

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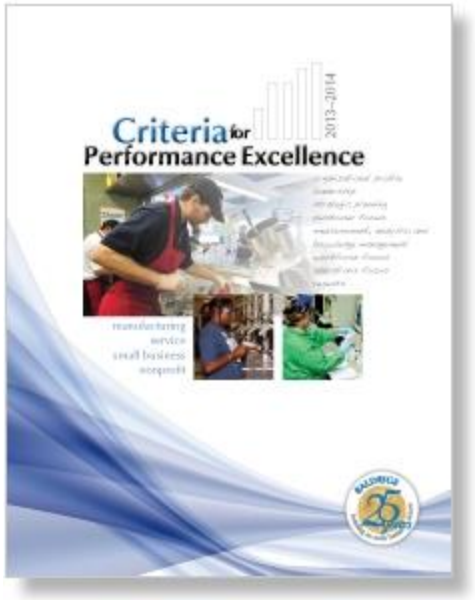
- Core Values and Concepts are embodied in seven categories:
  1. Leadership (125 points)
  2. Strategic Planning (85 points)
  3. Customer and Market Focus (85 points)
  4. Information and Analysis (85 points)
  5. Human Resource Focus (85 points)
  6. Process Management (85 points)
  7. Business Results (450 points)



- Benefits of Baldrige Competition
  - The process provides a well-designed quality system
  - The process requires obtaining data and provides feedback
  - Financial success
  - Winners share their knowledge
  - The process motivates employees

ISO Certification

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- The International Organization of Standardization (ISO) promotes worldwide standards for improvement of quality, productivity and operating efficiency through a series of standards and guidelines
  - Internationally recognized (and sometimes required to do business in certain countries)
  - Standardizes key terms in quality and provides a set of basic principles for initiating quality management systems

- ISO 9000: Set of international standards on quality management and quality assurance, critical to international business

ISO 9000 Quality Standards

ISO 9000 Quality Management Principles

- Eight quality management principles form the basis of the latest version of ISO 9000:

1. Top Management Leadership
2. Customer satisfaction
3. Continual improvement
4. Involvement of people
5. Process analysis
6. Use of data-driven decision making
7. A system approach to management
8. Mutually beneficial supplier relationships

Costs of Quality

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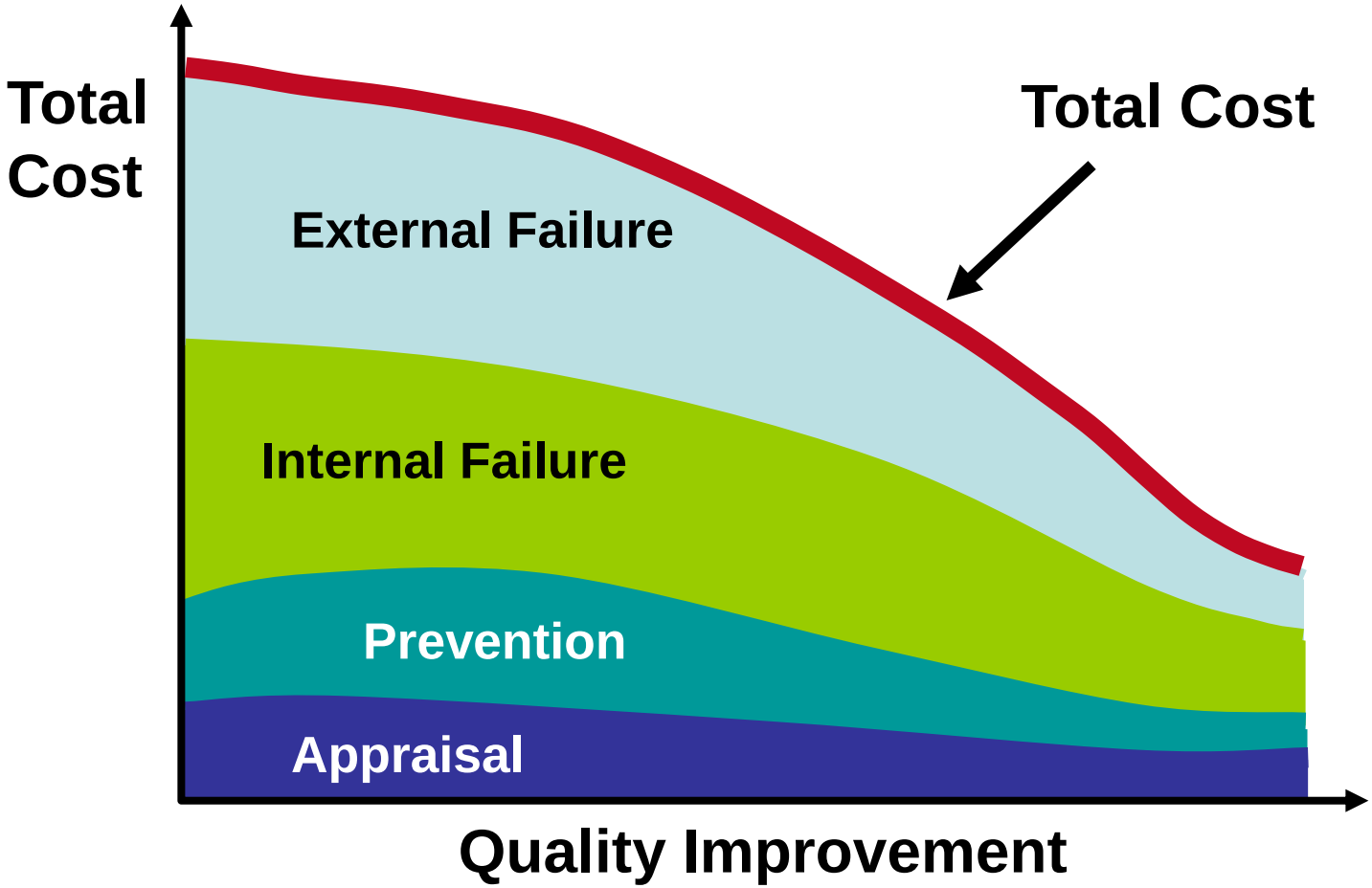
- Cost of quality: the costs associated with avoiding poor quality or those incurred as a result of poor quality
  - Appraisal Costs: costs of activities designed to ensure quality or *uncover* defects
  - Prevention Costs: all quality training, planning, customer assessment, process control, and quality improvement costs to *prevent* defects from occurring
  - Failure Costs: costs incurred by defective parts/products or faulty services.
    - Internal Failure Costs: costs incurred to fix problems that are detected *before* the product/service is delivered to the customer
    - External Failure Costs: all costs incurred to fix problems that are detected *after* the product/service is delivered to the customer

Costs of Quality



Ethics and Quality

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- Operations managers must deliver healthy, safe, quality products and services
- Poor quality risks injuries, lawsuits, recalls, and regulation
- Organizations are judged by how they respond to problems
- All stakeholders must be considered
- Substandard work
  - Defective products
  - Substandard service
  - Poor designs
  - Shoddy workmanship
  - Substandard parts and materials

Having knowledge of this and failing to correct and report it in a timely manner is unethical

Total Quality Management

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- Total Quality Management (TQM): management of an entire organization so that it excels in all aspects of products and services that are important to the customer

- There are seven concepts that make up the heart of an effective TQM program:
  - Continuous improvement
  - Six Sigma
  - Employee empowerment
  - Benchmarking
  - Just-in-time (JIT)
  - Taguchi concepts **
  - Knowledge of TQM tools

TQM: #1 Continuous Improvement

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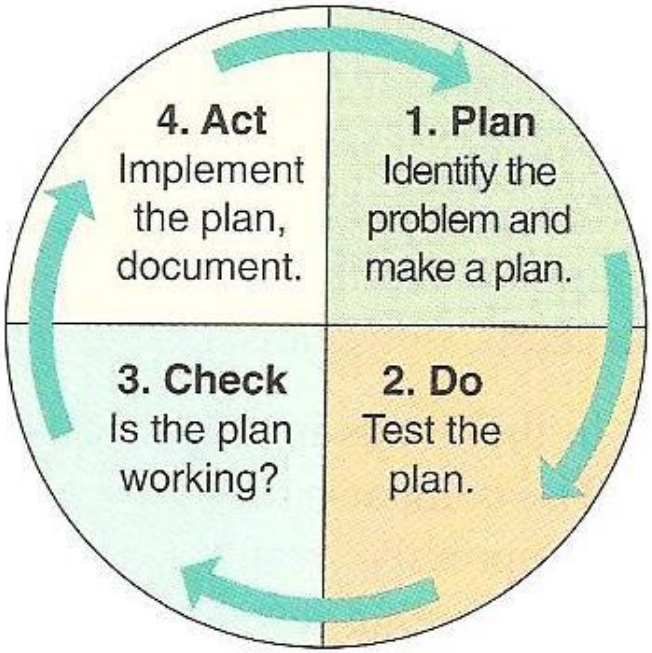
- Represents continual improvement of all processes
- Involves all operations and work centers including suppliers and customers
  - People, Equipment, Materials, Procedures

- Walter Shewhart (another pioneer in quality management) developed the PDCA Model (Deming later took this concept to Japan after WWII)



Shewhart's PDCA Model

TQM: #2 Six Sigma

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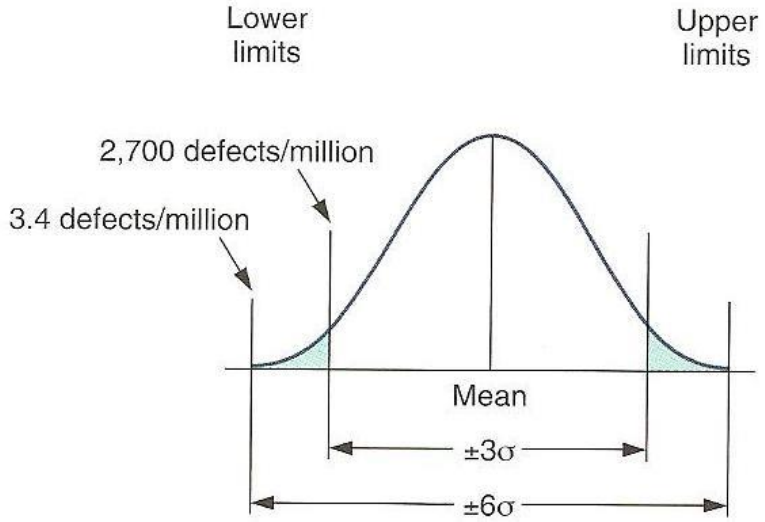
- Two meanings
  - **Statistical** definition of a process that is 99.9997% capable, having no more than 3.4 defects per million opportunities (DPMO)
    - Defects: any mistakes or errors that are passed on to the customer (many people also use the term "non-conformance")
    - Unit of work: the output of a process or an individual process step
  - A **program** designed to reduce defects, lower costs, and improve customer satisfaction



Six Sigma DPMO

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- Defects (or Errors) Per Million Opportunities (DPMO or EPMO): the Six Sigma metric to characterize quality performance in terms of its variability

$$\text{DPMO} = \frac{\text{Number of defects}}{\text{Number of opportunities for error per unit} * \text{Number of units}} * 1{,}000{,}000$$

- Note:
  - Manufacturing: Defects Per Million Opportunities (DPMO)
  - Service: Errors Per Million Opportunities (EPMO)

Six Sigma Solved Problem

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- Customers of a mortgage bank expect to have their mortgage applications processed within 10 days of filing. Suppose all defects are counted (loans in a monthly sample taking more than 10 days to process) and it is determined that there are 150 loans in the 1,000 applications processed last month that don't meet this customer requirement. What is the EPMO of this process?

$$\text{EPMO} = \frac{\text{Number of defects}}{\text{Number of opportunities for error per unit} * \text{Number of units}} * 1{,}000{,}000$$

$$\text{EPMO} = \frac{150}{(1)1000} * 1{,}000{,}000 = 150{,}000 \text{ loan errors out of every million}$$

Six Sigma DMAIC Methodology

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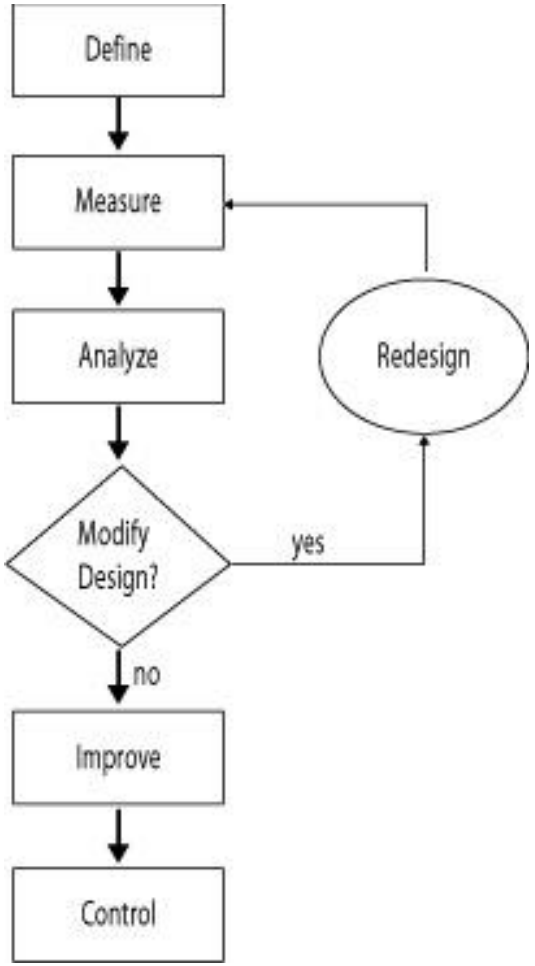
- DMAIC: Five-step process improvement model - focus on understanding and achieving what the customer wants
  - Define: identify customers and their priorities
  - Measure: determine how to measure the process and how it is performing
  - Analysis: determine the most likely causes of defects
  - Improve: identify means to remove the causes of defects
  - Control: determine how to maintain the improvements



TQM: #3 Employee Empowerment

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- Employee Empowerment: getting employees involved in product and process improvements
  - 85% of quality problems are due to process and material

- Techniques
  - Build communication networks that include employees
  - Develop open, supportive supervisors
  - Move responsibility to employees
  - Build a high-morale organization
  - Create formal team structures

TQM: #4 Benchmarking

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- Benchmarking: selecting "best practices" to use as a standard for performance
  - Determine what to benchmark
  - Form a benchmark team
  - Identify benchmarking partners
  - Collect and analyze benchmarking information
  - Take action to match or exceed the benchmark
- Benchmarks often take the form of best practices found in other firms or in other divisions

BEST PRACTICE TO RESOLVE CUSTOMER COMPLAINTS	JUSTIFICATION
Make it easy for clients to complain	It is free market research
Respond quickly to complaints	It adds customers and loyalty
Resolve complaints on first contact	It reduces cost
Use computers to manage complaints	Discover trends, share them, and align your services
Recruit the best for customer service jobs	It should be part of formal training and career advancement

TQM: #5 Just-in-Time

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- Just-in-Time (JIT): philosophy of continuing improvement and enforced problem solving. JIT systems are designed to produce or deliver goods just when they are needed.
  - JIT cuts the cost of quality
  - JIT improves quality
  - Better quality means less inventory and better, easier-to-employ JIT system

*** Remember we will skip TQM tool #6: Taguchi Concepts**

Inventory Hides Problems

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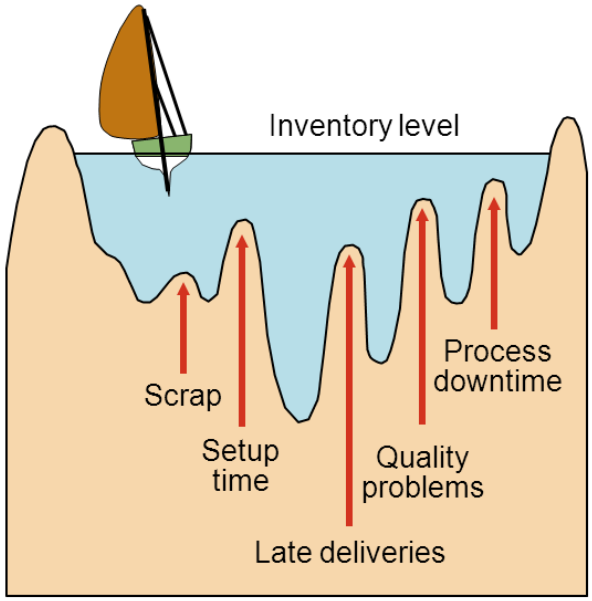
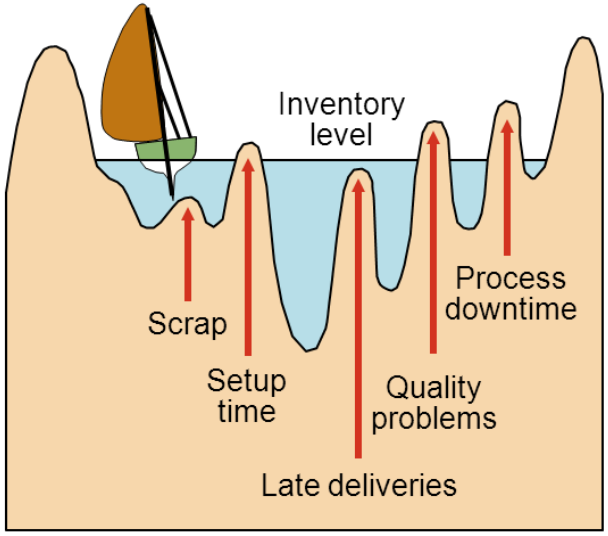
a) High levels of inventory hide problems

b) As we reduce inventory, problems are exposed

c) After reducing inventory and removing problems, we have lower inventory and lower costs



a)



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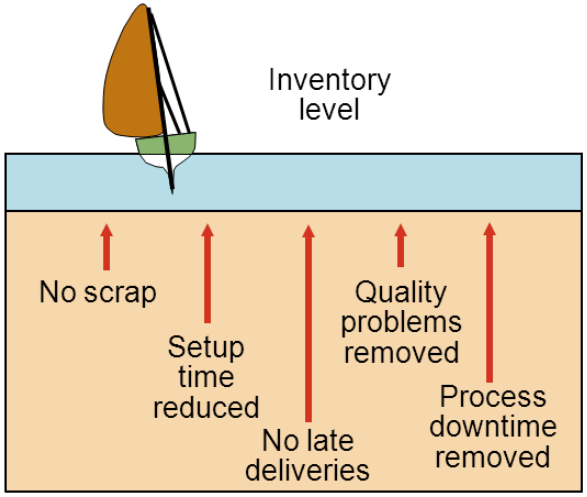

c)

TQM In Services

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- Service quality is more difficult to measure than the quality of goods.

- Service quality perceptions depend on:
  - Intangible differences between products
  - Intangible expectations customers have of those products

- The operations manager must recognize:
  - The tangible component of services is important
  - The service process is important
  - The service is judged against the customer's expectations
  - Exceptions will occur

Tools of Total Quality Management: The 7 QC Tools

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- Tools for *generating ideas*
  1. Check sheets
  2. Scatter diagrams
  3. Cause-and-effect diagrams
- Tools to organize the data
  4. Pareto charts
  5. Flowcharts
- Tools for *identifying problems*
  6. Histogram
  7. Statistical process control chart

TQM Tools: Check Sheet

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A tool for organizing and collecting data;
a tally of problems or other events by category

	Hour							
Defect	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
A	///	/		/	/	/	///	/
B	//	/	/	/			//	///
C	/	//					//	////

TQM Tools: Scatter Diagram

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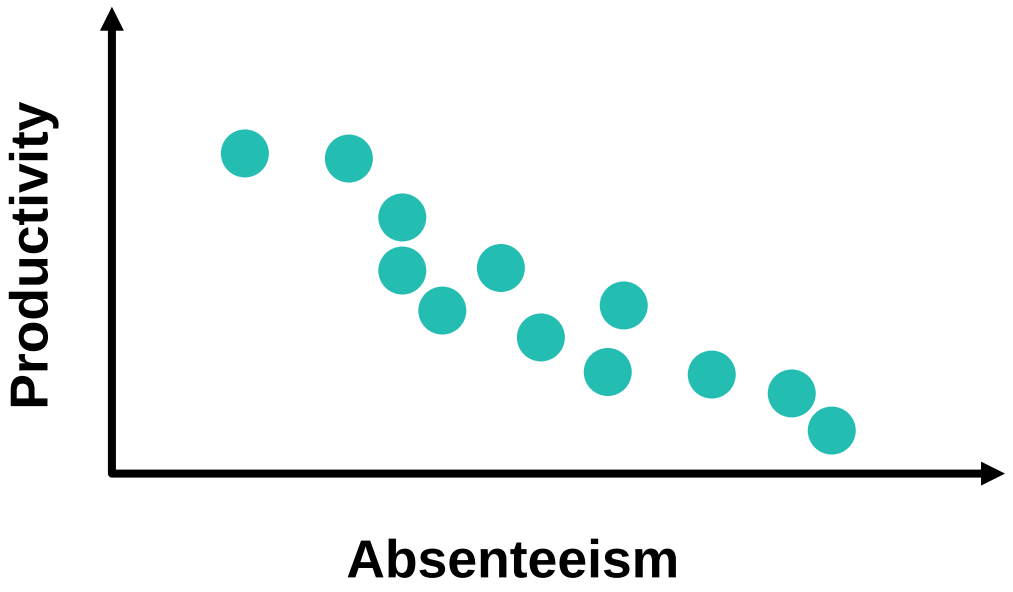
A graph that shows the degree and direction of a relationship between two variables



TQM Tools:
Cause-and-Effect Diagram

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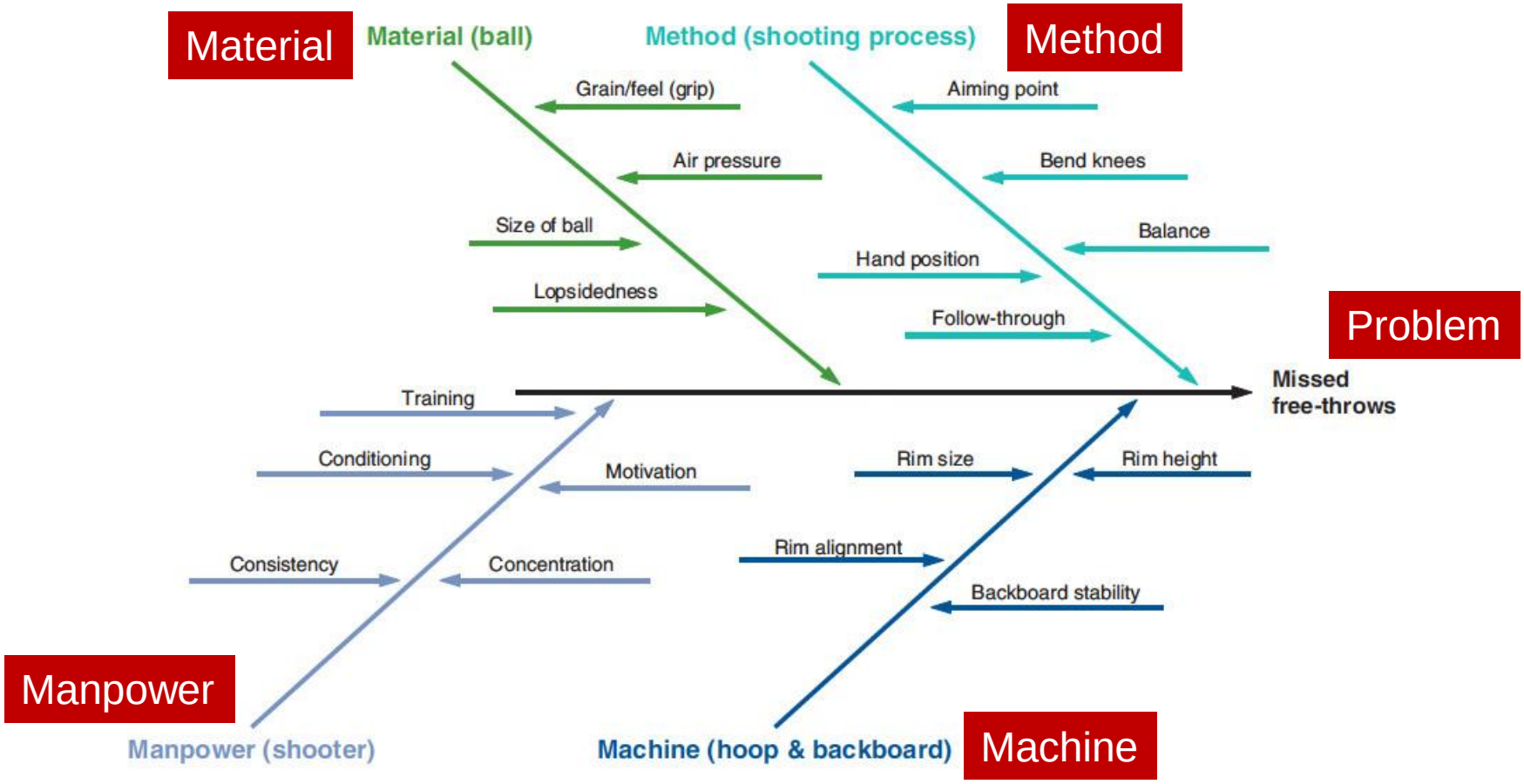
A diagram used to organize a search for the causes of a problem (materials, methods, manpower, machine); also known as a fishbone diagram



TQM Tools: Pareto Charts

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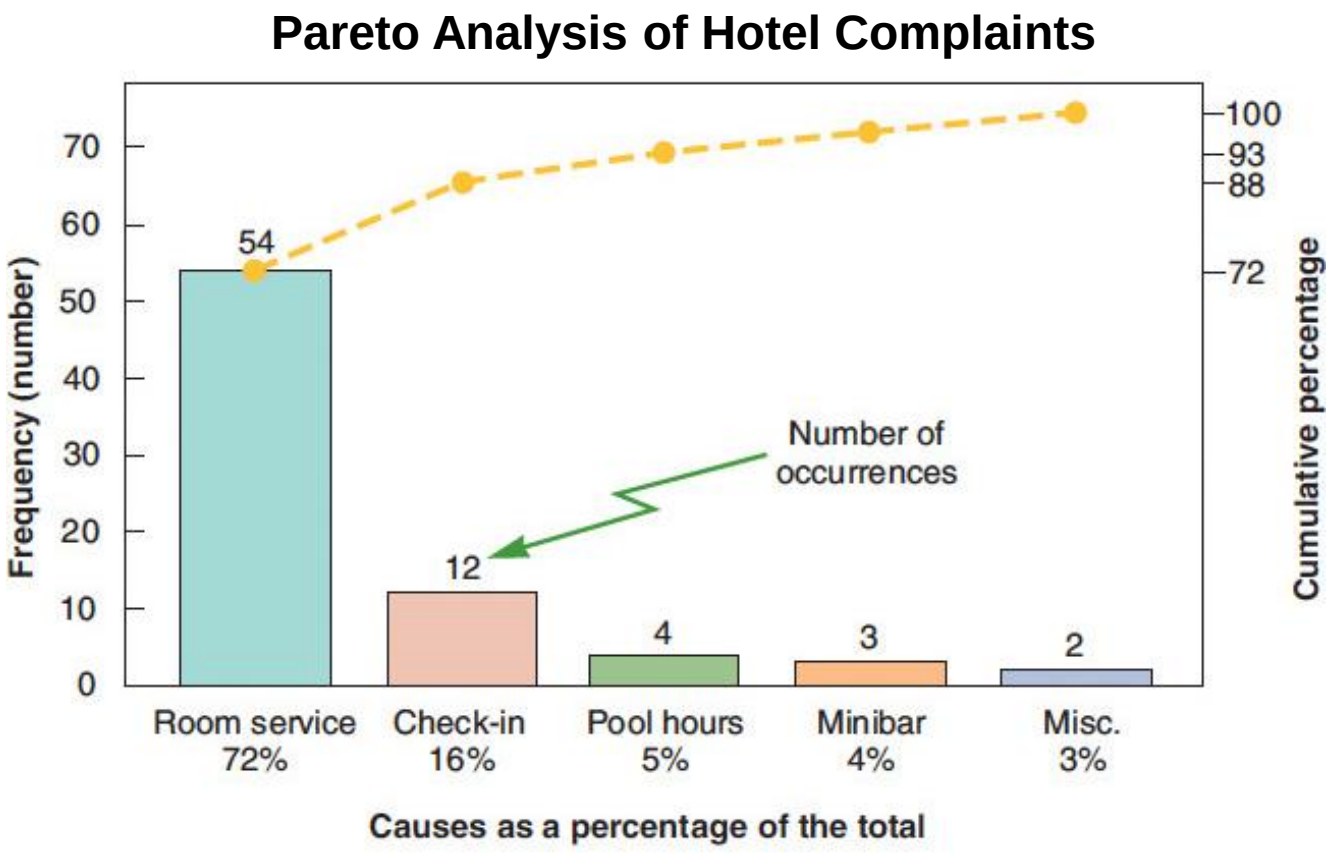
A graph that identifies and plots problems or defects in descending order of frequency



TQM Tools: Pareto Diagrams for Progressive Analysis

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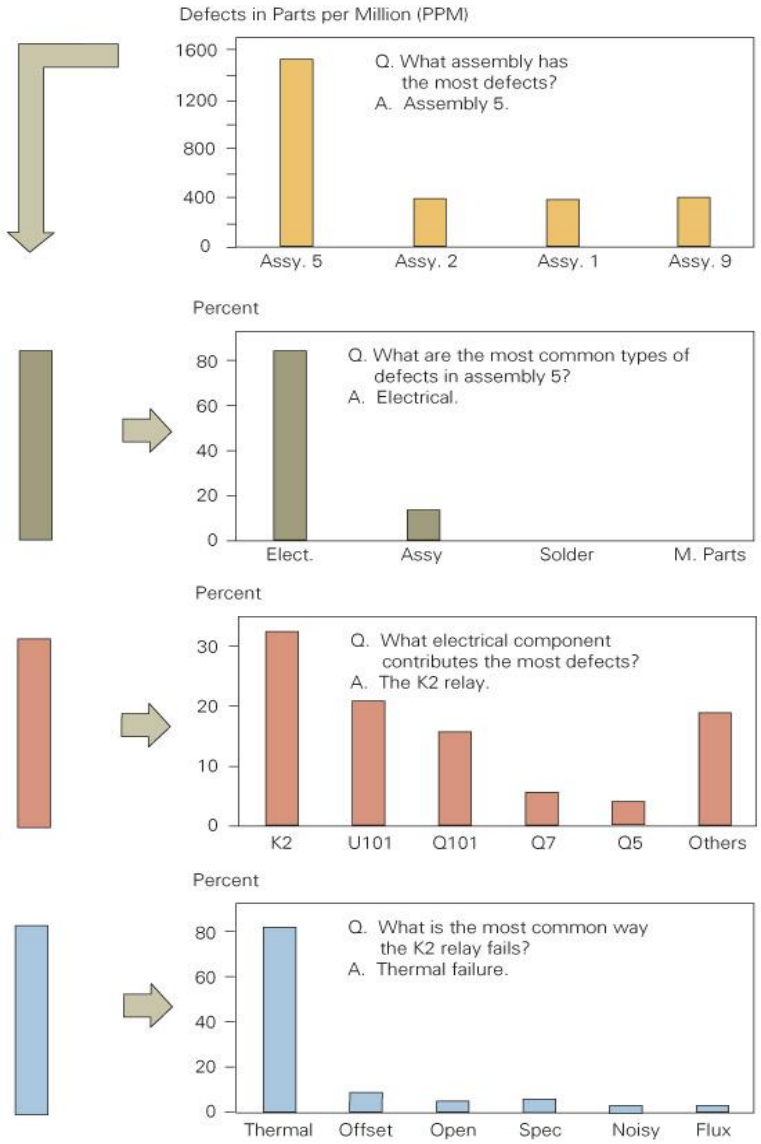

80% of the problems may be attributed to 20% of the causes

TQM Tools: Flow Charts

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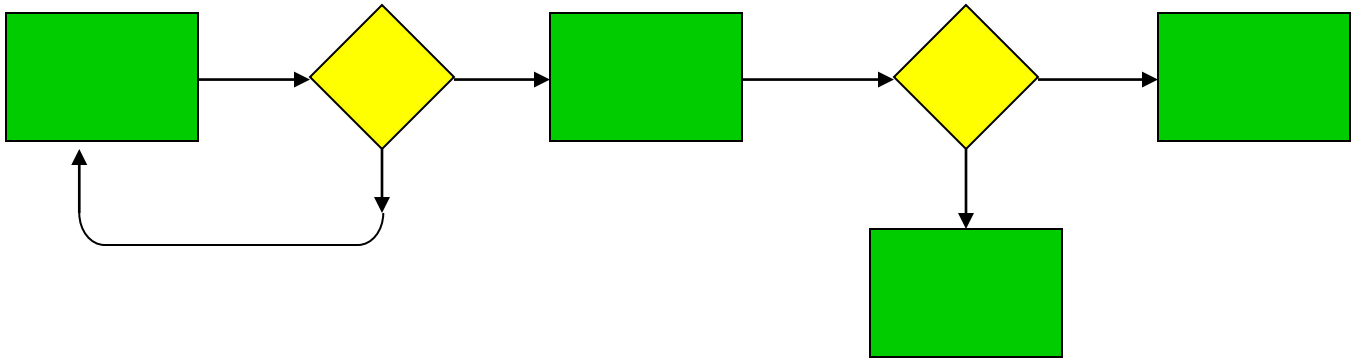
A diagram of the steps in a process



TQM Tools: Histogram

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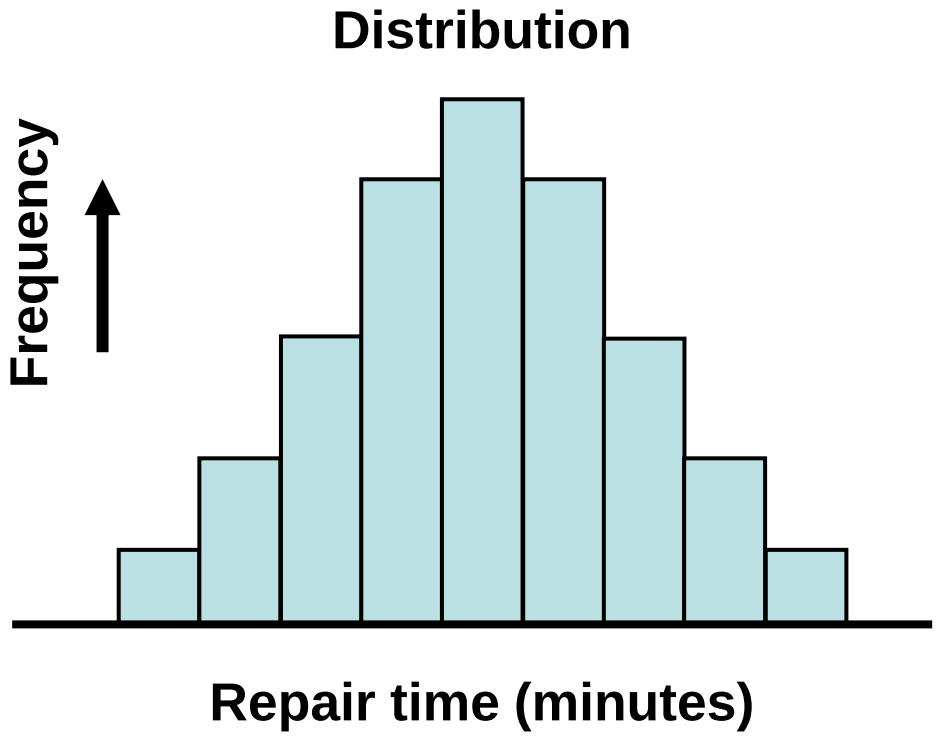
A chart that shows an empirical frequency distribution



TQM Tools: Control Chart

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A run chart with two horizontal lines called control limits to interpret patterns and draw conclusions