Regents Park Publishers

Tutorial

DEN 423

Total Quality Management

Learning Objectives

- Discuss and define the dimensions of quality.
- Articulate the benefits and costs of good quality, and the costs of poor quality
- Understand how quality management systems
- Utilize quality tools and the DMAIC methodology in problem solving
- Explain the philosophy of six sigma quality approach
- Learn about quality awards and ISO certifications

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1. Defining Quality

What Is Quality?

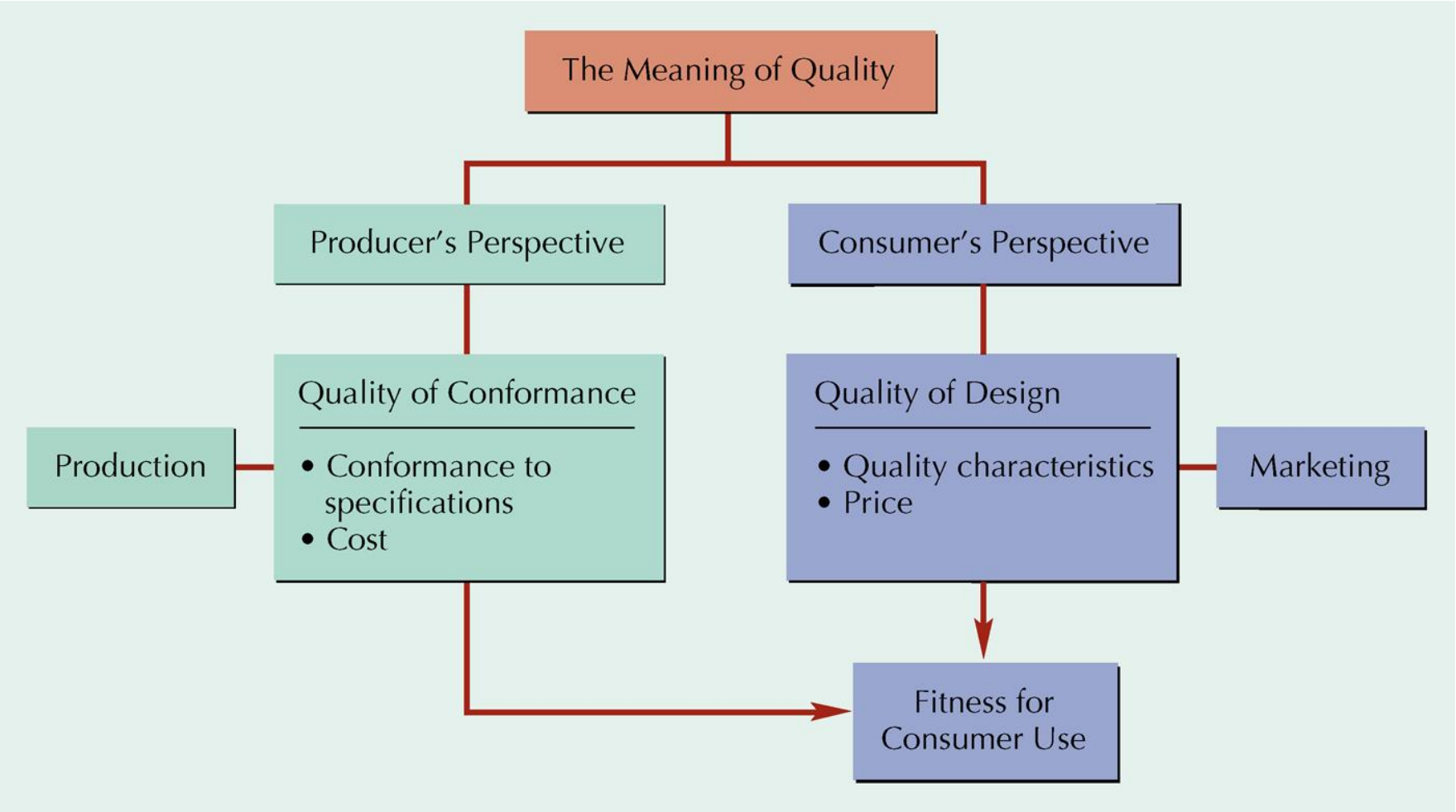
Oxford American Dictionary

- a degree or level of excellence

American Society for Quality

- the totality of features and characteristics of a product or service that bears on its ability to satisfy stated or implied needs

Meaning of Quality



Different Views

- ☑ **User-based** – better performance, more features
- ☑ **Manufacturing-based** – conformance to standards, making it right the first time
- ☑ **Service Environment** based

Manufacturer’s Perspective

Dimensions of Quality: Manufactured Products

- **Performance**

  basic operating characteristics of a product; how well a car handles or its gas mileage

- **Features**

  "extra" items added to basic features, such as a stereo CD or a leather interior in a car

- **Reliability**

  probability that a product will operate properly within an expected time frame; that is, a TV will work without repair for about seven years

Dimensions of Quality: Manufactured Products

- **Conformance**

  degree to which a product meets pre–established standards

- **Durability**

  how long product lasts before replacement; with care, L. L. Bean boots may last a lifetime

- **Serviceability**

  ease of getting repairs, speed of repairs, courtesy and competence of repair person

Dimensions of Quality: Manufactured Products

- **Aesthetics**
  how a product looks, feels, sounds, smells, or tastes

- **Safety**
  assurance that customer will not suffer injury or harm from a product; an especially important consideration for automobiles

- **Perceptions**
  subjective perceptions based on brand name, advertising, etc.

Consumer’s Perspective

What Is Quality: Customer's Perspective

- **Fitness for use**
  - how well product or service does what it is supposed to
- **Quality of design**
  - designing quality characteristics into a product or service
  - a Mercedes and a Ford are equally "fit for use," but with different design dimensions.

Importance of Customer Satisfaction

- It costs 5 or 6 times more to attract a new customer as it does to keep an existing one.
- Between 94 and 96 percent of dissatisfied customers don't complain, they just walk away and about 91 percent of them don't come back.
- Between 54 and 70 percent of customers who complain will do business with the company again if their complaints are resolved satisfactorily; and it increases to around 95 percent if the complaint is resolved quickly.
- A typical dissastisfied customer will tell 8 to 10 people about their problem; one in five will tell 20 (and the Internet now makes it possible to tell thousands). A satisfied complainer will tell an average of five people about how a problem was resolved to their satisfaction.
- It takes about 12 positive service encounters to make up for a single negative one.
- Only about five percent of customers who cannot buy a product because it's out of stock return to make the originally planned purchase.

Importance of Customer Satisfaction

- Only about five percent of customers who cannot buy a product because it's out of stock return to make the originally planned purchase.
- Around 68 percent of customers stop doing business with suppliers because they perceive an attitude of indifference toward them; only 14 percent leave because they are dissatisfied with a product, and only 9 percent leave for competitive reasons.
- Between 80 and 90 percent of customers who defect say they are "satisfied;" but "very satisfied" customers are four to seven times more likely to repeat their purchase within the next 18 months than those who were merely "satisfied."
- An increase of as little as five percent in customer retention can result in an 80 to 100 percent increase in profits.
- Businesses with low quality service average only one percent return on sales and lose market share at a rate of two percent annually; businesses with a high-quality service average a 12 percent return on sales and gain market share at the rate of 6 percent annually (and charge significantly higher prices).

Source: The British Quality Foundation, "Back to Basics" *Quality World* 32 (5; May 2006), p. 37

Measuring Customer Satisfaction

- An important component of any QMS
- Use customer surveys to hear
  - **"Voice of the Customer"**
- **American Customer Satisfaction Index**
  - Click on the link (ACSI)

Customer Focused Best Practices

- ☑ Make it easy for clients to complain
- ☑ Respond quickly to complaints
- ☑ Resolve complaints on first contact
- ☑ Use computers to manage complaints
- ☑ Recruit the best for customer service jobs

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2. Service Environment Perspective

Quality in Services

- Service defects are not always easy to measure because service output is not usually a tangible item
- Services tend to be labor intensive
- Services and manufacturing companies have similar inputs but different processes and outputs

Quality Attributes in Services

- Principles of TQM apply equally well to services and manufacturing
- Timeliness is an important dimension
  - how quickly a service is provided
- Benchmark
  - “best” level of quality achievement in one company that other companies seek to achieve

Dimensions of Quality: Services

- **Time and timeliness**
  - how long must a customer wait for service, and is it completed on time?
  - is an overnight package delivered overnight?
- **Completeness**
  - is everything customer asked for provided?
  - is a mail order from a catalogue company complete when delivered?

Dimensions of Quality: Service

- **Courtesy**
  - how are customers treated by employees?
  - are catalogue phone operators nice and are their voices pleasant?
- **Consistency**
  - is same level of service provided to each customer each time?
  - is your newspaper delivered on time every morning?

Dimensions of Quality: Service

- **Accessibility and convenience**
  - how easy is it to obtain service?
  - does service representative answer you calls quickly?
- **Accuracy**
  - is service performed right every time?
  - is your bank or credit card statement correct every month?

Dimensions of Quality: Service

- Responsiveness
  - how well does company react to unusual situations?
  - how well is a telephone operator able to respond to a customer's questions?

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3. Quality Gurus

Evolution of Quality Management: Quality Gurus

- **Walter Shewhart**
  - In 1920s, developed control charts
  - Introduced term "*quality assurance*"

- **W. Edwards Deming**
  - Developed courses during WW II to teach statistical quality-control techniques to engineers and executives of military suppliers
  - After war, began teaching statistical quality control to Japanese companies

Evolution of Quality Management: Quality Gurus

- **Armand V. Feigenbaum**
  - In 1951, introduced concepts of total quality control and continuous quality improvement
- **Philip Crosby**
  - In 1979, emphasized that costs of poor quality far outweigh cost of preventing poor quality
  - In 1984, defined absolutes of quality management—conformance to requirements, prevention, and "zero defects"

Evolution of Quality Management: Quality Gurus

- **Joseph M. Juran**
  - Followed Deming to Japan in 1954
  - Focused on strategic quality planning
  - Quality improvement achieved by focusing on projects to solve problems and securing breakthrough solutions

- **Kaoru Ishikawa**
  - Promoted use of quality circles
  - Developed “fishbone” diagram
  - Emphasized importance of internal customer

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4. Total Quality Management

Total Quality Management

- Encompasses entire organization, from supplier to customer.
- Stresses a commitment by management to have a continuing, companywide drive toward excellence in all aspects of products and services that are important to the customer.

TQM Principles

- Quality can and must be **managed**
- The **customer** defines quality
- Management must be involved and provide **leadership**
- Continuous quality improvements is "the" **strategic** goal
- Quality problems are found **in processes**
- The quality standard is "**no defects**"
- Quality must be **measured**

TQM and QMS

- **Total Quality Management (TQM)**
  - customer-oriented, leadership, strategic planning, employee responsibility, continuous improvement, cooperation, statistical methods, and training and education
- **Quality Management System (QMS)**
  - system to achieve customer satisfaction that complements other company systems

Focus of Quality Management—Customers

- TQM and QMSs
- Serve to achieve customer satisfaction
- Satisfied customers are less likely to switch to a competitor
- It costs 5-6 times more to attract new customers as to keep an existing one
- 94-96% of dissatisfied customers don't complain
- Small increases in customer retention mean large increases in profits

The Flow and Activities

Organizational Practices:

Leadership, Mission statement, Effective operating procedures, Staff support, Training

Yields: What is important and what is to be accomplished

Quality Principles:

Customer focus, Continuous improvement, Benchmarking, Just-in-time, Tools of TQM

Yields: How to do what is important and to be accomplished

The Flow and Activities

Employee Fulfilment:
Empowerment, Organizational commitment

Yields: Employee attitudes that can accomplish what is important

Customer Satisfaction:
Winning orders, Repeat customers

Yields: An effective organization with a competitive advantage

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5. TQM Implementation

Continuous Improvement

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

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

Supply Chain Management

- ☑ Companies need support of their suppliers to satisfy their customers
- ☑ Win-win not zero sum arrangement
- ☑ Reduction of the number of suppliers

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6. Quality Tools

Quality Tools

- Process Flow Chart
- Cause-and-Effect Diagram
- Check Sheet
- Pareto Analysis
- Histogram
- Scatter Diagram
- Statistical Process Control Chart

Cause-and-Effect Matrix

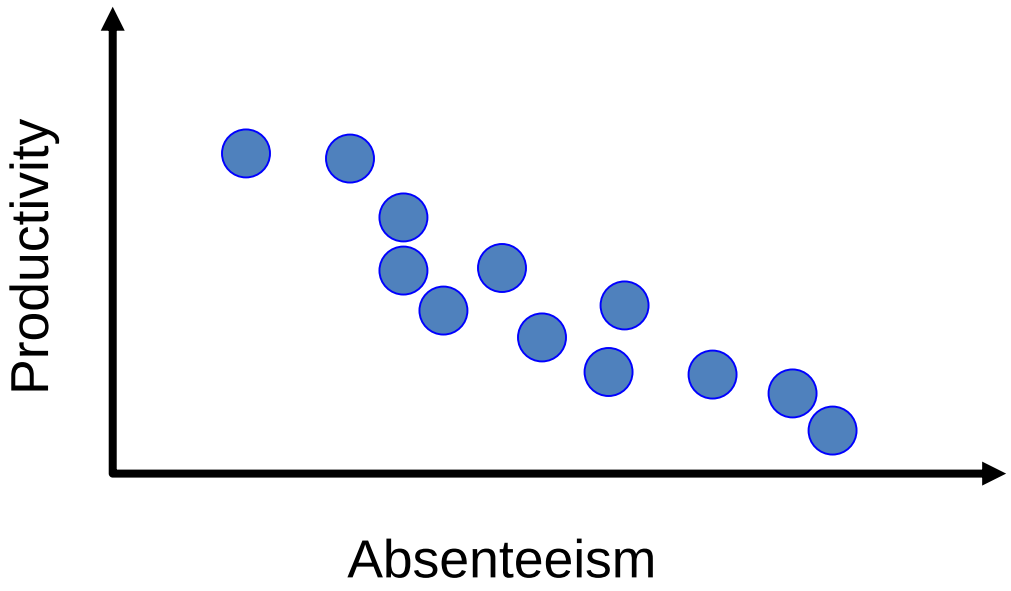
Grid used to prioritize causes of quality problems

			Key Output (Y) Variables (*CTQC's*)							
			1	2	3	4	5	6		
			Turnaround time	Patient flow	Physician time	Emergency dept.	Patient time	Operating room		Rank of X Variables/ Importance to Customer
	Key Input	Customer rank	1	3	2	5	6	4		
	(X) Variables	Weight	*10*	*9*	*9*	*7*	*7*	*8*	Score	
1	BTS		9	8	10	8		5	348	3
2	Beepers		7	5	8		5		222	7
3	Volume		7	10	6	7	5	5	338	4
4	Beds		4		9				121	10
5	Time of day		3	4	5	4	10		209	8
6	Day of week		9	10	6			6	282	5
7	Communication		9	8	10	8	7	9	429	1
8	BTS competence		10	9	7		7	7	349	2
9	Room cleaning		7	5	3		8	4	230	6
10	Supplies		8	9					161	9

$(8)(10) + (9)(9) = 161$

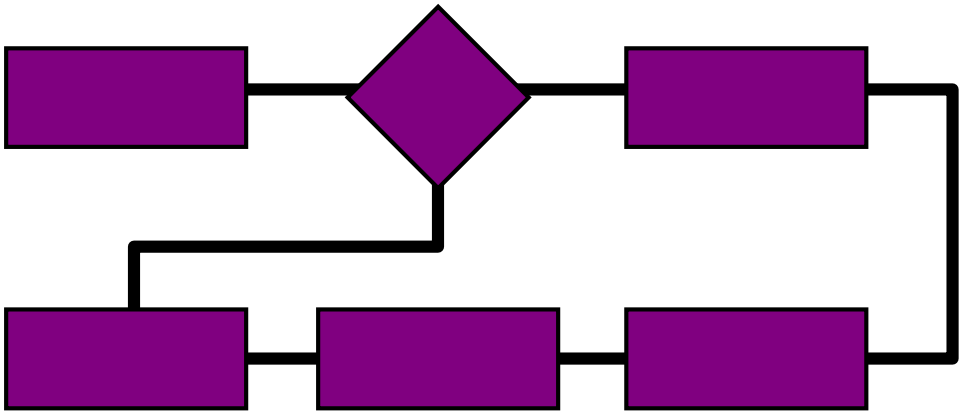
Scatter Diagram

A graph of the value of one variable vs. another variable



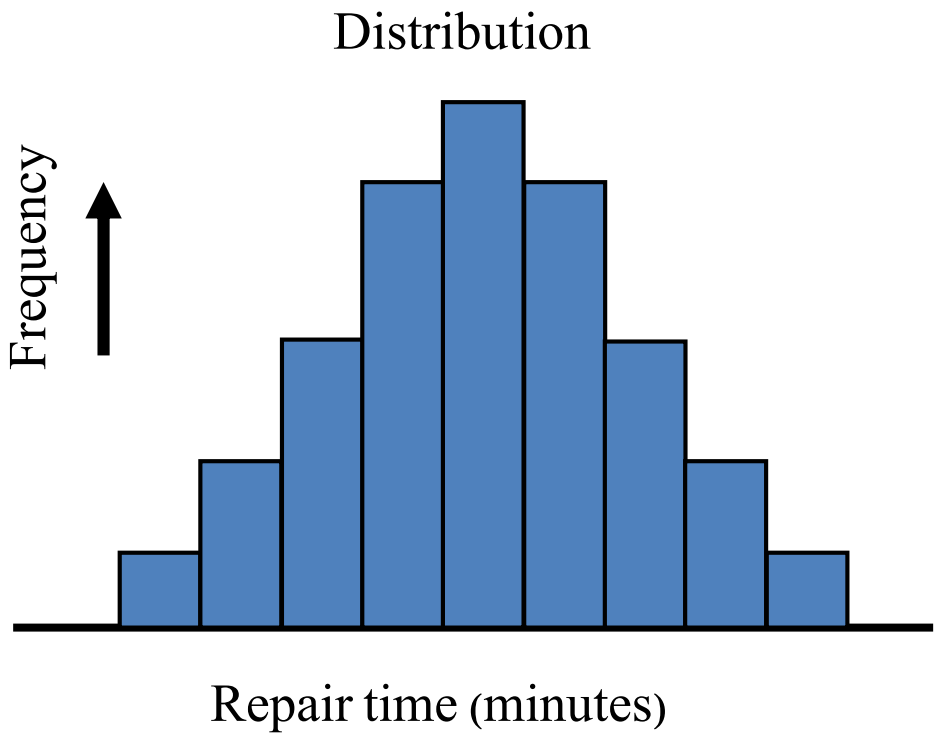
Process Diagrams

A chart that describes the steps in a process



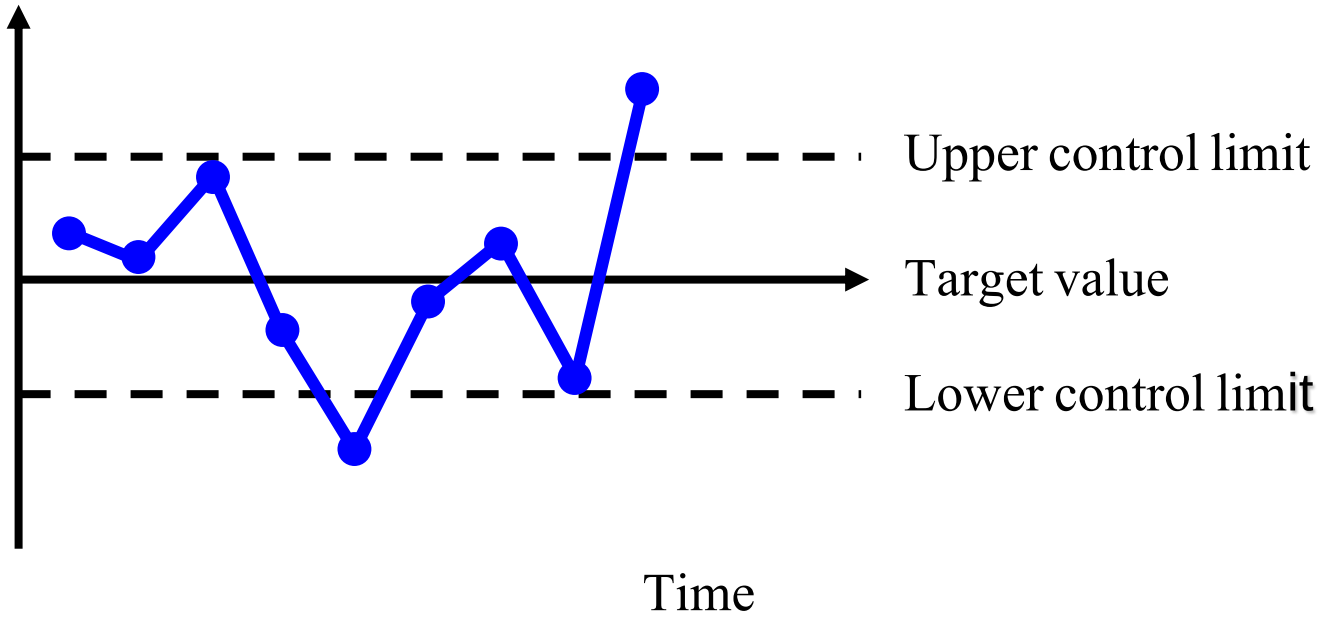
Histogram

A distribution showing the frequency of occurrence of a variable

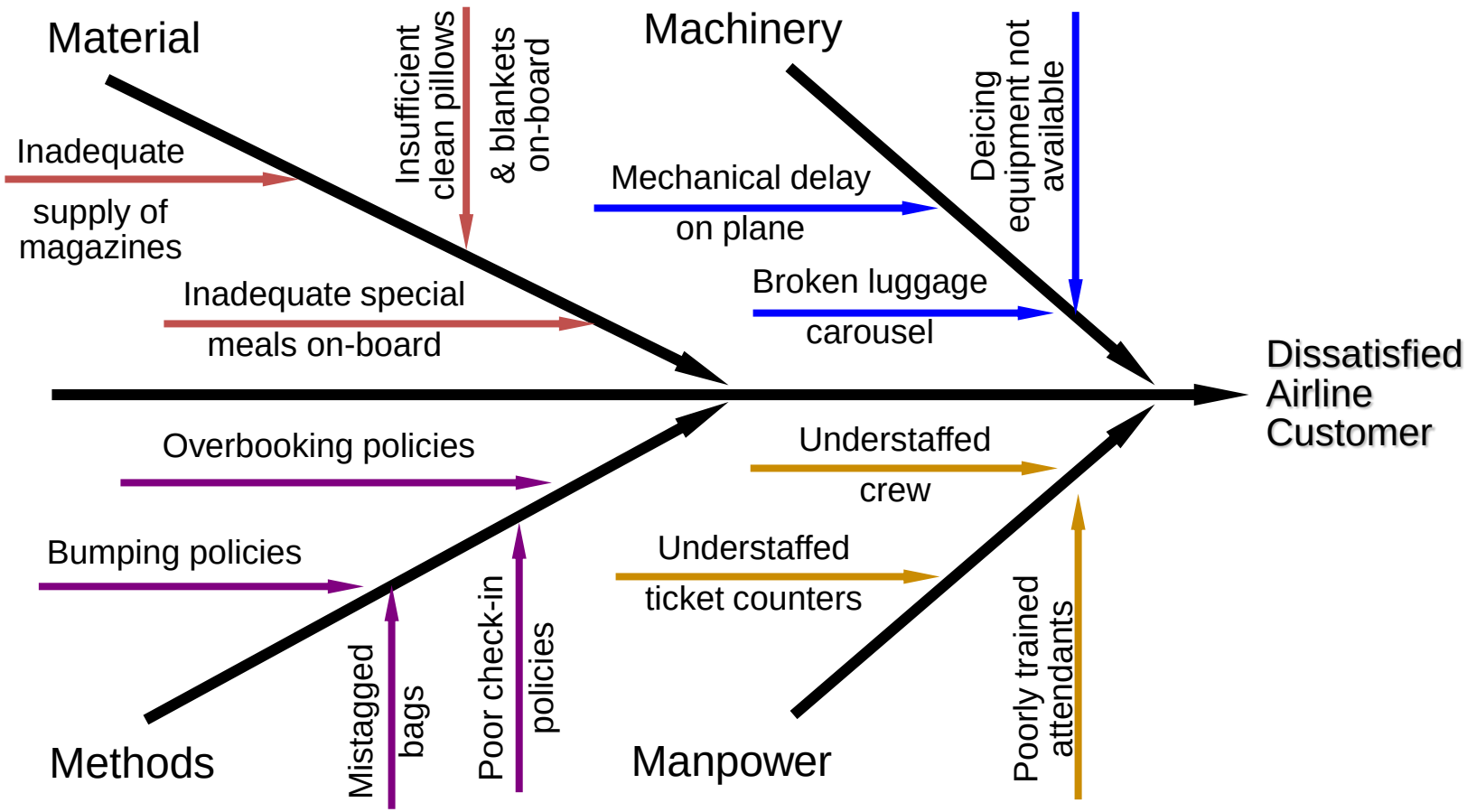


Statistical Process Control

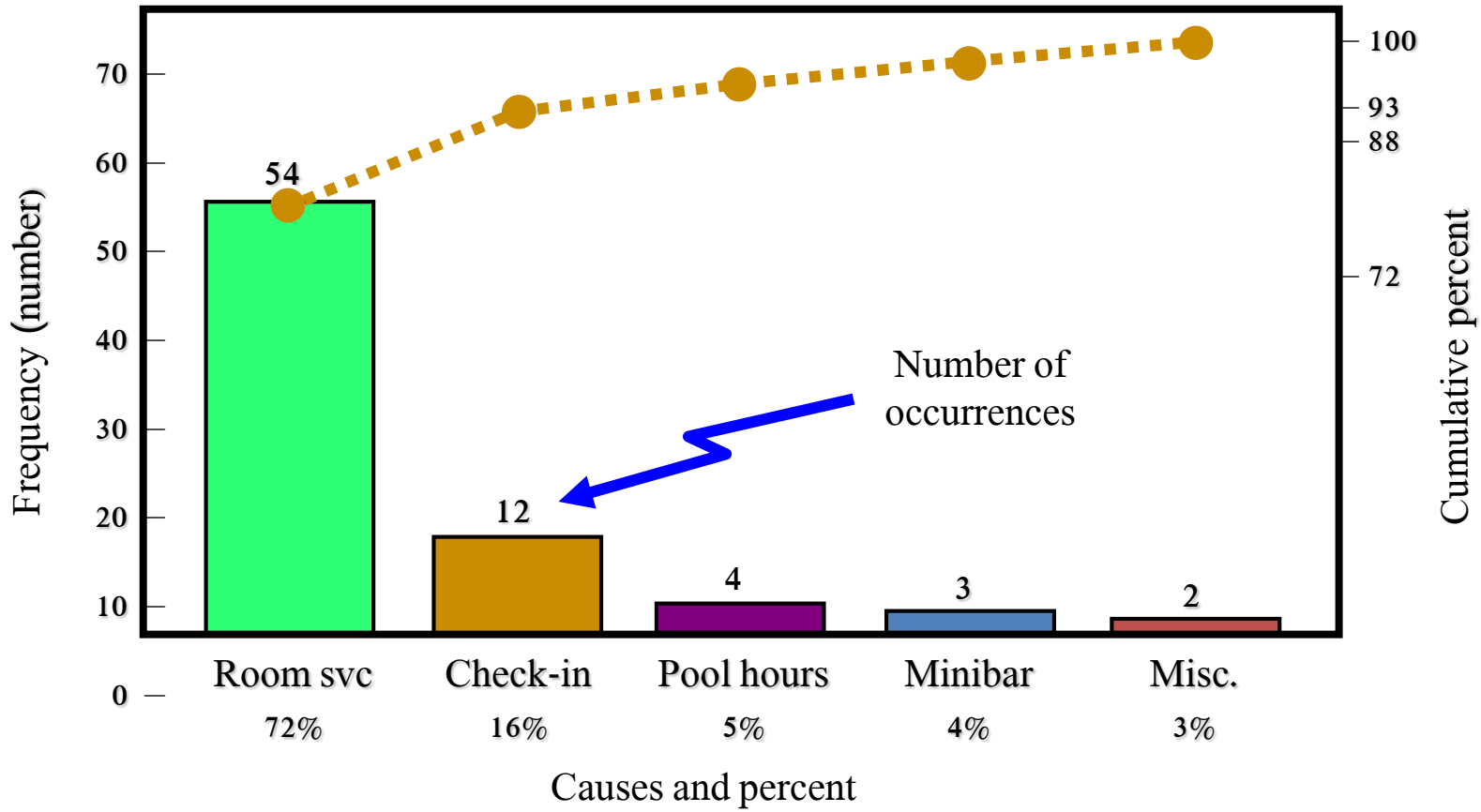
A chart with time on the horizontal axis to plot values of a statistic



Cause-Effect Diagram



Pareto Charts



Role of Employees in Quality Improvement

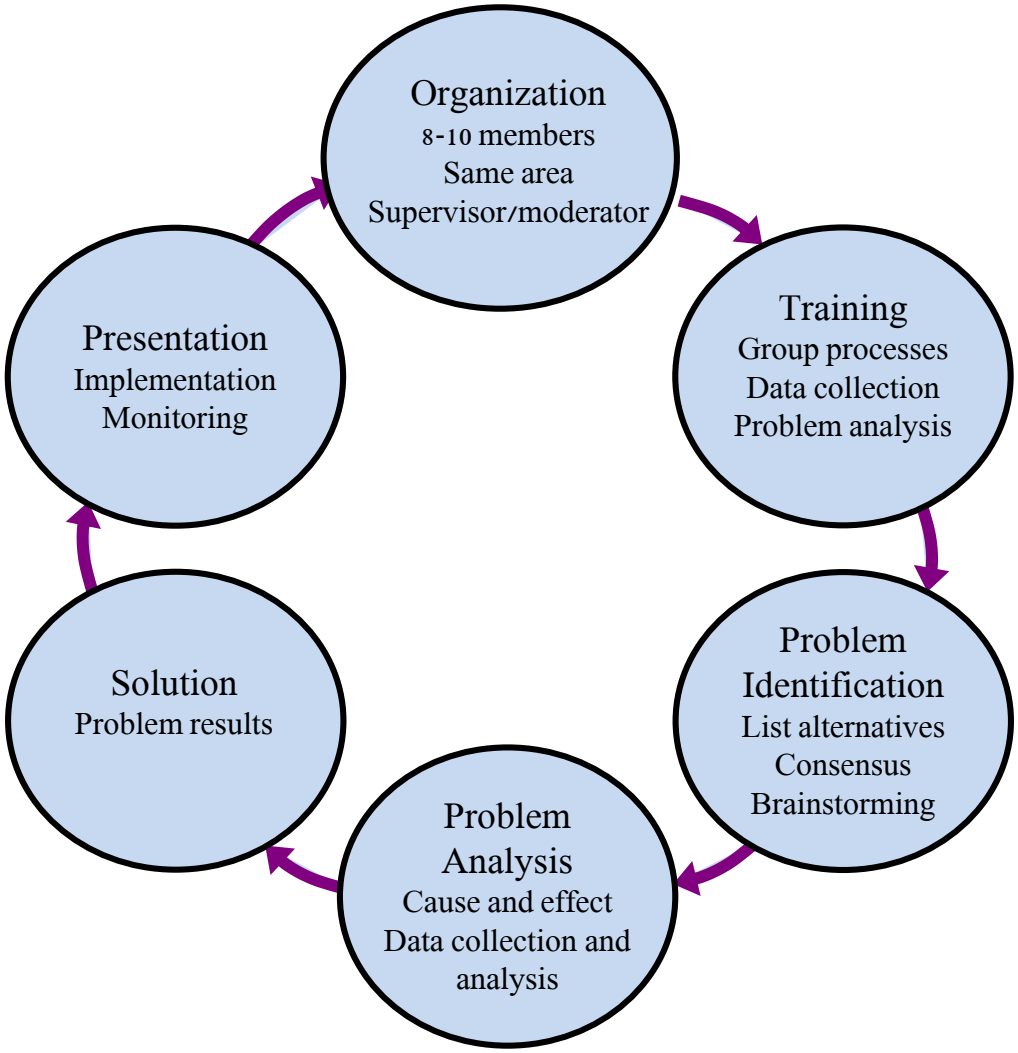
- **Participative problem solving**
  - employees involved in quality-management
  - every employee has undergone extensive training to provide quality service to Disney's guests

- **Kaizen**
  - involves everyone in process of continuous improvement
  - employees determining solutions to their own problems

Quality Circles

- ☑ Group of employees, from the same functional area, who meet regularly to solve problems
- ☑ Trained in planning, problem solving, and statistical methods
- ☑ Often led by a facilitator
- ☑ Very effective when done properly

Quality Circles



Process (Quality) Improvement Teams

- Focus attention on business processes rather than separate company functions
- Includes members from the interrelated departments which make up a process
- Important to understand the process the team is addressing
- Process flowcharts are key tools

Six Sigma

Six Sigma

- ☑ Originally developed by Motorola, Six Sigma refers to an extremely high measure of process capability
- ☑ A Six Sigma capable process will return no more than 3.4 defects per million operations (DPMO)
- ☑ Highly structured approach to process improvement

Six Sigma Process

1. **Align**

   executives create balanced scorecard

2. **Mobilize**

   project teams formed and empowered to act

3. **Accelerate**

   black and green belts execute project

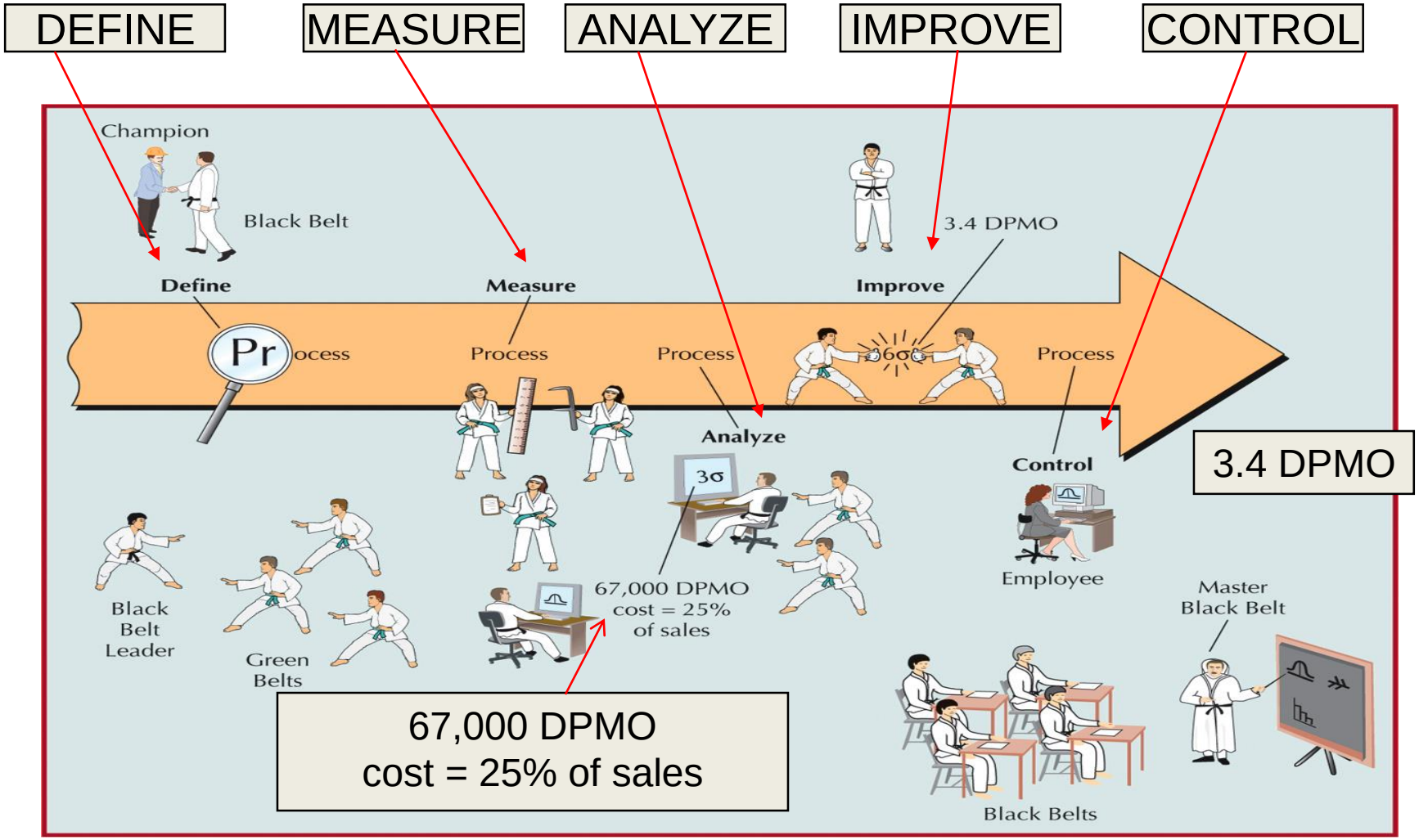
4. **Govern**

   monitor and review projects

5. **Champion**

   an executive responsible for project success

Six Sigma Process



Black Belts and Green Belts

- **Black Belt -** project leader
- **Master Black Belt -** a teacher and mentor for Black Belts
- **Green Belts -** project team members

Six Sigma Tools - 1

- **Quality Function Deployment (QFD)**
  - capture the "voice of the customer"
- **Cause & Effect Matrix**
  - identify and prioritize causes of a problem
- **Failure Modes and Affects Analysis (FMEA)**
  - analyze potential problems before they occur

Six Sigma Tools - 2

- **t-Test**
  - test for differences between groups
- **Statistical Process Control (SPC) Chart**
  - monitor a process over time for variations
- **Design of Experiments (DOE)**
  - determining relationships between factors affecting inputs and outputs of a process

Design for Six Sigma (DFSS)

- A systematic approach to designing products and processes that will achieve Six Sigma
- Uses same basic approach as breakthrough strategy
- Employs the strategy up front in the design and development phases
- A more effective and less expensive way to achieve Six Sigma

Lean Six Sigma

- Integrate Six Sigma and “lean systems”
- Lean seeks to optimize process flows
- Lean extends earlier efforts in efficiency
- Lean process improvement steps
  1. determine what creates value for customers
  2. identify “value stream”
  3. remove waste in the value stream
  4. make process responsive to customer needs
  5. continually repeat attempts to remove waste

DMAIC Approach

- **Define** critical outputs and identify gaps for improvement
- **Measure** the work and collect process data
- **Analyze** the data
- **Improve** the process
- **Control** the new process to make sure new performance is maintained

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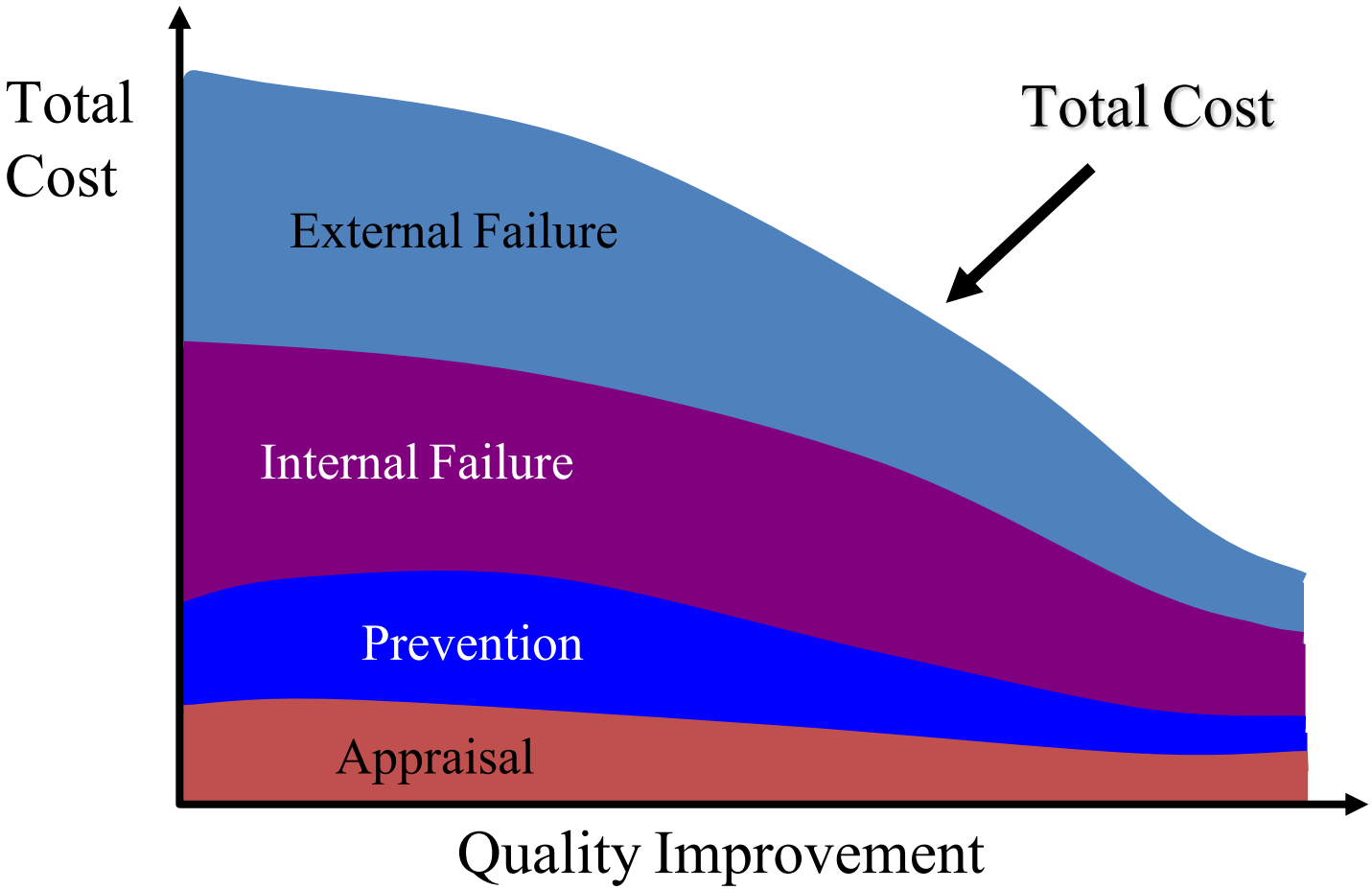
7. Cost of Quality

Cost of Quality

- ☑ Prevention costs - reducing the potential for defects
- ☑ Appraisal costs - evaluating products, parts, and services
- ☑ Internal failure - producing defective parts or service before delivery
- ☑ External costs - defects discovered after delivery

Cost of Quality



Cost of Quality

- **Cost of Achieving Good Quality**
  - Prevention costs
    - costs incurred during product design
- **Appraisal costs**
    - costs of measuring, testing, and analyzing
- **Cost of Poor Quality**
  - Internal failure costs
    - include scrap, rework, process failure, downtime, and price reductions
- **External failure costs**
    - include complaints, returns, warranty claims, liability, and lost sales

Prevention Costs

- **Quality planning costs**
  - costs of developing and implementing quality management program
- **Product-design costs**
  - costs of designing products with quality characteristics
- **Process costs**
  - costs expended to make sure productive process conforms to quality specifications
- **Training costs**
  - costs of developing and putting on quality training programs for employees and management
- **Information costs**
  - costs of acquiring and maintaining data related to quality, and development and analysis of reports on quality performance

Appraisal Costs

- **Inspection and testing**
  - costs of testing and inspecting materials, parts, and product at various stages and at end of process
- **Test equipment costs**
  - costs of maintaining equipment used in testing quality characteristics of products
- **Operator costs**
  - costs of time spent by operators to gather data for testing product quality, to make equipment adjustments to maintain quality, and to stop work to assess quality

Internal Failure Costs

- **Scrap costs**
  - costs of poor-quality products that must be discarded, including labor, material, and indirect costs
- **Rework costs**
  - costs of fixing defective products to conform to quality specifications
- **Process failure costs**
  - costs of determining why production process is producing poor-quality products
- **Process downtime costs**
  - costs of shutting down productive process to fix problem
- **Price-downgrading costs**
  - costs of discounting poor-quality products—that is, selling products as "seconds"

External Failure Costs

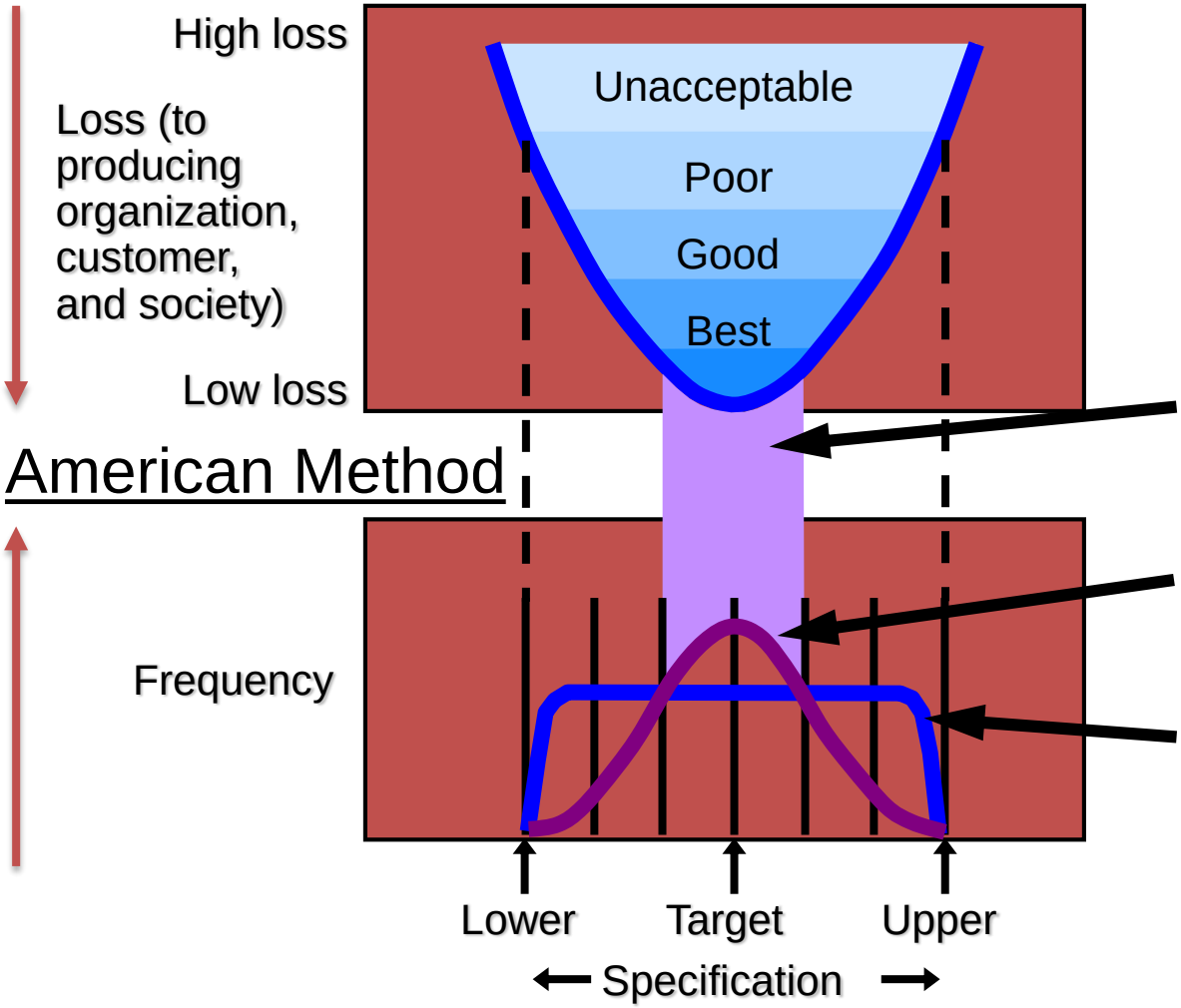
- **Customer complaint costs**
  - costs of investigating and satisfactorily responding to a customer complaint resulting from a poor-quality product
- **Product return costs**
  - costs of handling and replacing poor-quality products returned by customer
- **Warranty claims costs**
  - costs of complying with product warranties
- **Product liability costs**
  - litigation costs resulting from product liability and customer injury
- **Lost sales costs**
  - costs incurred because customers are dissatisfied with poor-quality products and do not make additional purchases

Quality Loss Function

- ☑ Shows that costs increase as the product moves away from what the customer wants
- ☑ Costs include customer dissatisfaction, warranty and service, internal scrap and repair, and costs to society
- ☑ Traditional conformance specifications are too simplistic

Quality Loss Function

⑩ Japanese Method



$$L = D^2C$$

where

L = loss to society

D = distance from target value

C = cost of deviation

Target-oriented quality yields more product in the "best" category

Target-oriented quality brings product toward the target value

Conformance-oriented quality keeps products within 3 standard deviations

⑩ American Method

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8. TQM in Services

TQM in Services

- ☑ 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

Service Quality

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

Determinants of Service Quality

- ☑ Reliability
- ☑ Responsiveness
- ☑ Competence
- ☑ Access
- ☑ Courtesy
- ☑ Communication
- ☑ Credibility
- ☑ Security
- ☑ Understanding/ knowing the customer
- ☑ Tangibles

Service Industry Inspections (example)

Organization	What is Inspected	Standard
Jones Law Office	Receptionist performance	• Is phone answered by the second ring
	Billing	• Accurate, timely, and correct format
	Attorney	• Promptness in returning calls

Service Industry Inspection (example)

Organization	What is Inspected	Standard
Hard Rock Cafe	Busboy	• Serves water and bread within 1 minute
	Busboy	• Clears all entrée items and crumbs prior to dessert
	Waiter	• Knows and suggest specials and desserts

Service Industry Inspection (example)

Organization	What is Inspected	Standard
Hard Rock Hotel	Reception desk	• Use customer's name
	Doorman	• Greet guest in less then 30 seconds
	Room	• All lights working, spotless bathroom
	Minibar	• Restocked and charges accurately posted to bill

Service Industry Inspection (example)

Organization	What is Inspected	Standard
Arnold Palmer Hospital	Billing	• Accurate, timely, and correct format
	Pharmacy	• Prescription accuracy, inventory accuracy
	Lab	• Audit for lab-test accuracy
	Nurses	• Charts immediately updated • Data entered correctly and completely
	Admissions	

Service Industry Inspection (example)

Organization	What is Inspected	Standard
Nordstrom's Department Store	Display areas	• Attractive, well-organized, stocked, good lighting
	Stockrooms	• Rotation of goods, organized, clean
	Salesclerks	• Neat, courteous, very knowledgeable

Service Specs at UPS

Hair can't grow below shirt collar

Turn in **sales leads**

No smoking in front of customers

No beards

Use **DIAD** to log everything from driver's miles per gallon to tracking data on parcels

Key ring held on the pinky finger

"All Good Kids Love Milk": the five seeing habits of drivers: Aim high in steering, Get the big picture, Keep your eyes moving, Leave yourself an out, Make sure they see you

Sideburns can't grow below the bottom of the ear

Undershirts must be either white or brown

Shirts can't be unbuttoned below the first button

Toot horn when arriving at business or residence

Present parcels for five stops ahead

Load boxes neatly and evenly like a stack of bricks

Walk briskly. No running allowed

Sport **clean uniform** every day

Black or brown **polishable shoes,** nonslip soles

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Optional

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9. International Quality Standards

International Quality Standards

- ☑ Industrial Standard Z8101-1981 (Japan)
  - ☑ Specification for TQM
- ☑ ISO 9000 series (Europe/EC)
  - ☑ Common quality standards for products sold in Europe (even if made in U.S.)
  - ☑ 2000 update places greater emphasis on leadership and customer satisfaction
- ☑ ISO 14000 series (Europe/EC)

ISO 14000

Environmental Standard

Core Elements:

- ☑ Environmental management
- ☑ Auditing
- ☑ Performance evaluation
- ☑ Labeling
- ☑ Life-cycle assessment

ISO 9000

- **Procedures and policies for international quality certification:**
- **ISO 9000: 2008**
  - *Quality Management Systems—Fundamentals and Vocabulary*
  - defines fundamental terms and definitions used in ISO 9000 family
- **ISO 9001: 2008**
  - *Quality Management Systems—Requirements*
  - standard to assess ability to achieve customer satisfaction

ISO 9000

- **ISO 9004: 2008**
  - Quality Management Systems—Guidelines for Performance Improvements
  - Guidance to a company for continual improvement of its quality-management system

ISO 9000

Certification, Implications, and Registrars

- ISO 9001:2008—only standard that carries third-party *certification*
- Many overseas companies will not do business with a supplier unless it has ISO 9000 certification
- ISO 9000 accreditation
- ISO registrars

Quality Awards

Malcom Baldrige National Quality Award

- ☑ Established in 1988 by the U.S. government
- ☑ Designed to promote TQM practices
- ☑ Sample Set of winners
- ☑ The Bama Companies, Kenneth W. Monfort College of Business, Caterpillar Financial Services, Baptist Hospital, Clarke American Checks, Los Alamos National Bank
- ☑ Link

Baldridge Criteria

Applicants are evaluated on:

Categories	Points
Leadership	120
Strategic Planning	85
Customer & Market Focus	85
Information & Analysis	90
Human Resource Focus	85
Process Management	85
Organizational Results	450

Other Awards for Quality

National individual awards:

- Armand V. Feigenbaum Medal
- Deming Medal
- E. Jack Lancaster Medal
- Edwards Medal
- Shewhart Medal
- Ishikawa Medal

International awards:

- European Quality Award
- Canadian Quality Award
- Australian Business Excellence Award
- Deming Prize from Japan

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10. Quality and Ethics

Quality and Ethics

- ☑ 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

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11. Video References

Video References

W. Edwards Deming

⑩(These one is one of the most important videos ever produced ! ! !)

14 Points of W. Edwards Deming

Video Reference

Quality at Honda

Quality at BMW

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Tutorial

TQM

End