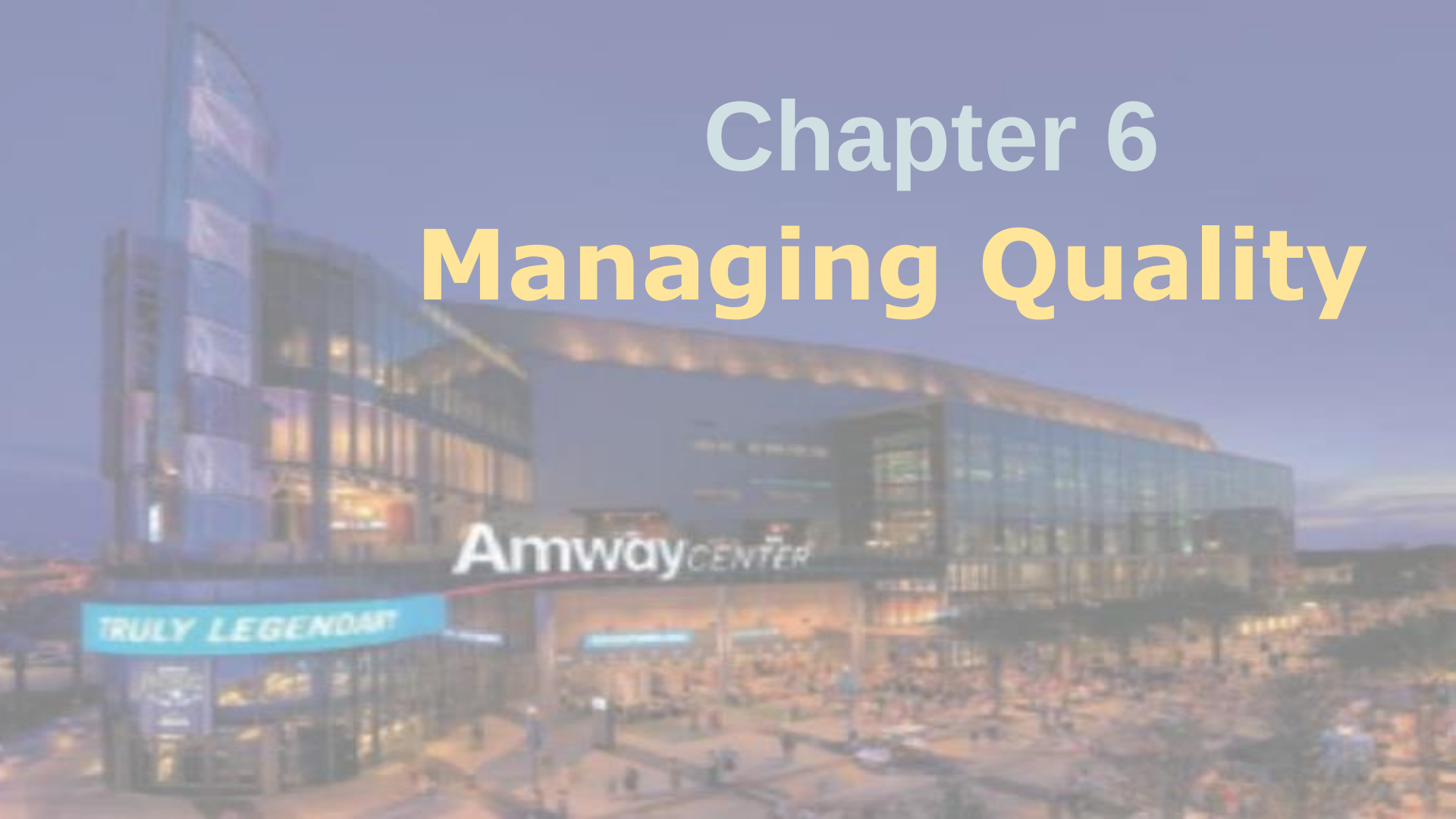

Chapter 6
Managing Quality

Learning Objectives

At the end of this lesson, you should be able to:

1. **Define** quality and TQM
2. **Describe** the ISO international quality standards
3. **Explain** what Six Sigma is
4. **Explain** how benchmarking is used in TQM
5. **Explain** quality robust products and Taguchi concepts
6. **Appreciate and aware of** the seven tools of TQM

Managing Quality Provides a Competitive Advantage

Arnold Palmer Hospital

- Deliver over 12,000 babies annually
- Virtually every type of quality tool is employed
  - Continuous improvement
  - Employee empowerment
  - Benchmarking
  - Just-in-time
  - Quality tools

Quality and Strategy

- Managing quality helps build successful **differentiation, low cost, and response** strategies - Quality is Key Success Factor
  - Bose Corporation ***differentiates*** its stereo speaker amongst best in world
  - Nucor produce Quality steel at ***low cost*** be developing efficient processes producing consistent quality
  - Dell Computers ***responds*** to customer orders through quality system, with little rework, fast throughput

Quality and Strategy

Companies with highest quality were 5 times more productive (units produced per labour hour) of poor quality companies

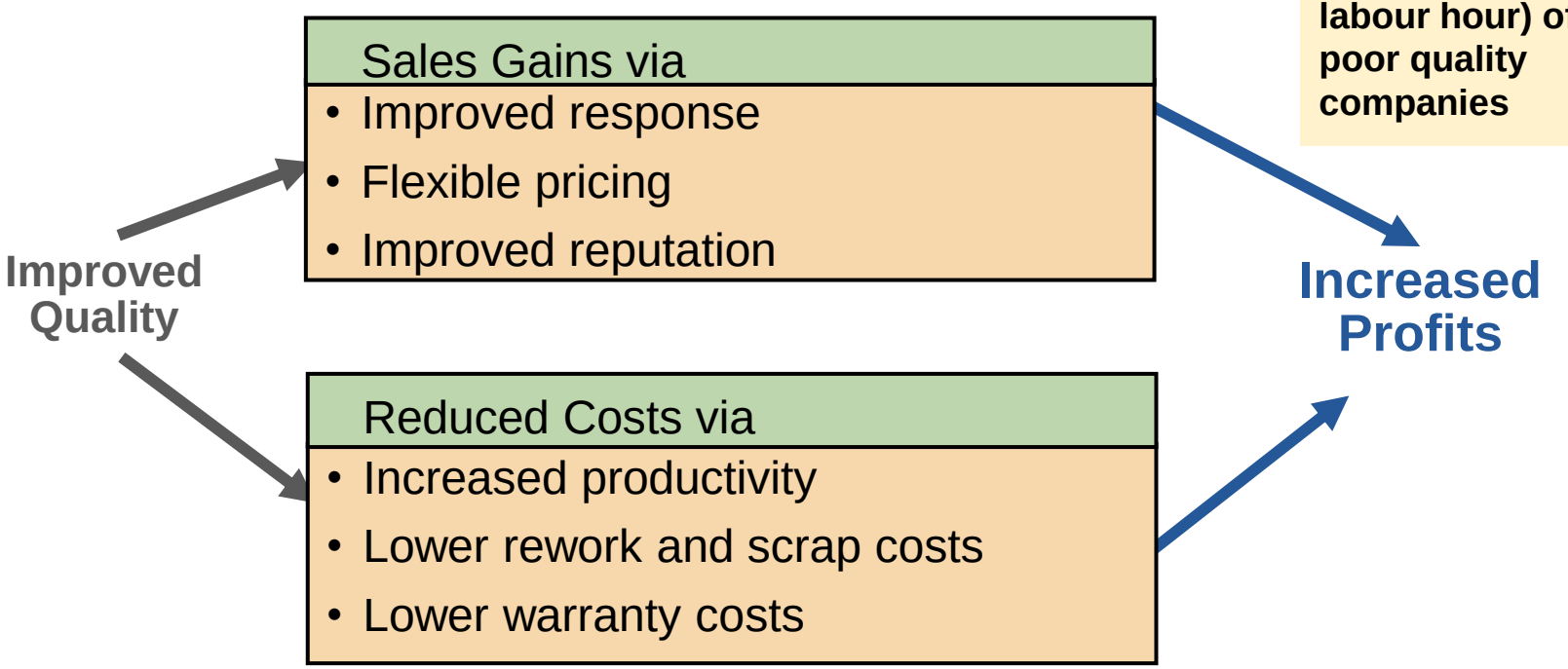

Figure 6.1 **Two Ways Quality Improves Profitability**

Quality and Strategy

Building a quality organization is a demanding task

The Flow of Activities towards Total Quality Management

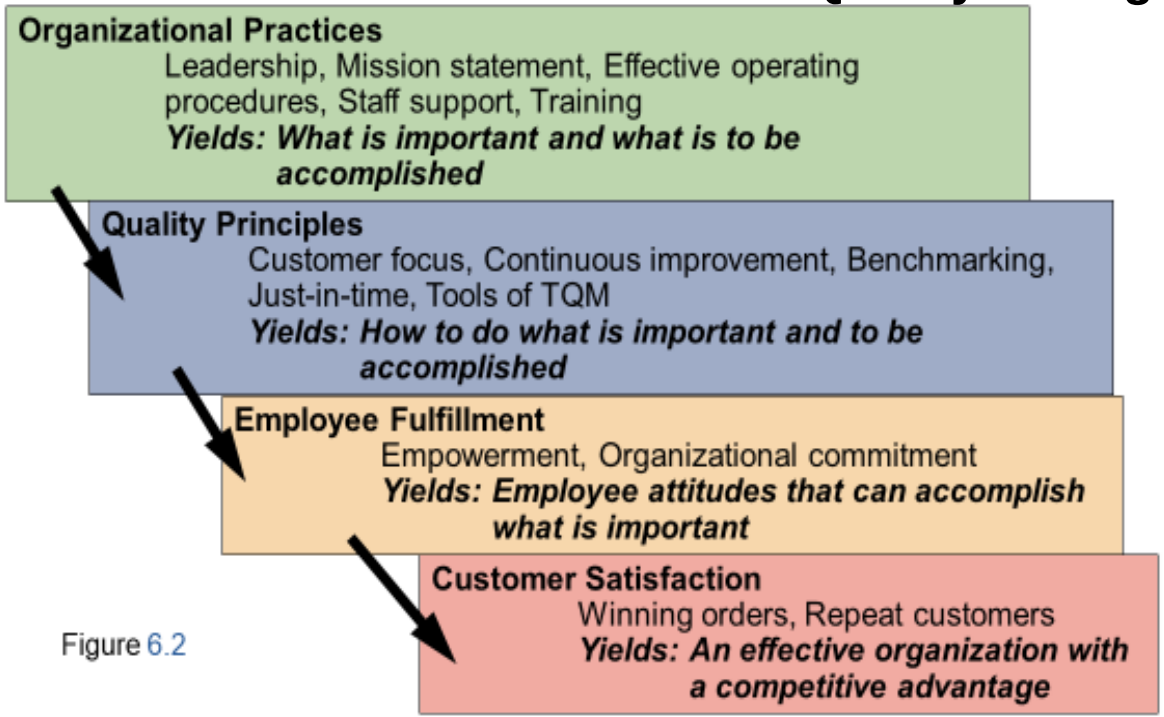

Figure 6.2

Defining Quality

What is Quality?

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

American Society for Quality

What is the objective for operations manager in Quality?

- **An operations manager's objective is to build a total quality management system that identifies and satisfies customer needs**

Different Quality Perspectives

- User-based: fit for use, ‘lie in eyes of customers’, marketing based quality
- Product-based: specific and measurable attributes of the product
- Manufacturing-based: conformance to standards, making it right the first time

Address all 3 categories

1. **Quality identified through market research - user-based**
2. **Characteristics identified in 1. Translated into product characteristic and specifications**
3. **Quality must be built and produced during manufacturing / service realization**

Impact of Quality

1. Company reputation
   - Perception of new products
   - Employment practices
   - Supplier relations
2. Product liability
   - Reduce risk
3. Global implications
   - Improved ability to compete

Malcolm Baldrige National Quality Award

- Established in 1988 by the U.S. government
- Designed to promote TQM practices
- Recent winners include

  Lockheed Martin Missiles and Fire Control, MESA Products Inc., North Mississippi Health Services, City of Irving, Concordia Publishing House, Henry Ford Health System, MEDRAD, Nestlé Purina PetCare Co., Montgomery County Public Schools

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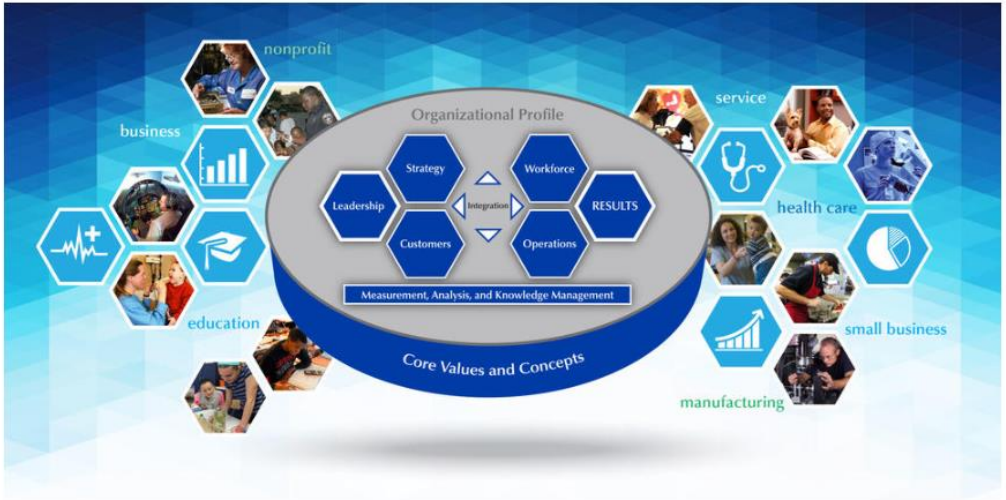

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For more than 30 years, the Baldrige Excellence Framework® has empowered organizations to accomplish their missions, improve results, and become more competitive. The Baldrige Excellence Framework includes the Criteria for Performance Excellence, core values and concepts, and guidelines for evaluating your processes and results.

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Baldrige Criteria

Applicants are evaluated on:

CATEGORIES	POINTS
Leadership	120
Strategic Planning	85
Customer Focus	85
Measurement, Analysis, and Knowledge Management	90
Workforce Focus	85
Operations Focus	85
Results	450

Deming Prize

The Deming Prize is one of the highest awards on TQM (Total Quality Management) in the world. It was established in 1951 in commemoration of the late Dr. William Edwards Deming who contributed greatly to Japan's proliferation of statistical quality control after the World War II. His teachings helped Japan build its foundation by which the level of Japan's product quality has been recognized as the highest in the world.

− INFORMATION

Deming Prize Evaluation Criteria

Evaluation Criteria (From FY 2018)

Evaluation criteria consists of "A. Establishment of business objectives and strategies and top management's leadership", "B. Suitable utilization and implementation of TQM" and "C. Effects of TQM" as in the below chart. Organization that meets the qualifying standards will pass the examination.

A. Establishment of business objectives and strategies and top management's leadership	Points	Passing points
I Establishment of proactive customer-oriented business objectives and strategies II Role of top management and its fulfillment	100	70 or above

B. Suitable utilization and implementation of TQM	Points	Passing points
III Suitable utilization and implementation of TQM for the realization of business objectives and strategies	100	70 or above
1. Organizational deployment of business objectives and strategies	(15)	
2. Creation of new values based on understanding of customer and social needs and innovation of technology and business model	(15)	
3. Management and improvement of quality of products and services and/or work process	(15)	
4. Establishment and operation of cross-functional management systems such as quality, quantity, delivery, cost, safety, environment, etc. across the supply chain	(15)	
5. Collection and analysis of information and accumulation and utilization of knowledge	(15)	
6. Development and active utilization of human resource and organizational capability	(15)	
7. Initiatives for social responsibility of the organization	(10)	

C. Effects of TQM	Points	Passing points
IV Effects obtained regarding business objectives and strategies through utilization and implementation of TQM V Outstanding TQM activities and acquisition of organizational capabilities	100	70 or above

ISO 9000 International Quality Standards

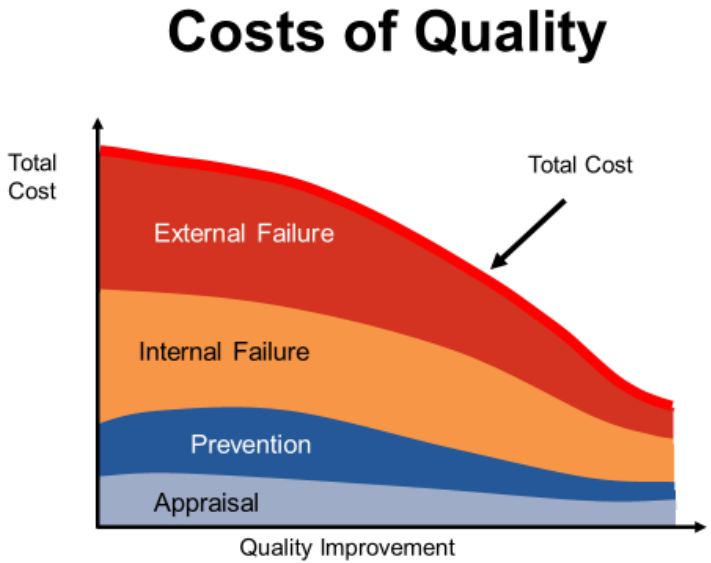
- International recognition
- Require quality management **procedures**, detailed documentation, **work instructions**, and **quality record**keeping
- Over one million certifications in 178 countries

Management principles

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 systems approach to management**
8. **Mutually beneficial supplier relationships**

Costs of Quality

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



Quality Gurus

TABLE 6.1 Leaders in the Field of Quality Management

LEADER	PHILOSOPHY/CONTRIBUTION
W. Edwards Deming	Deming insisted management accept responsibility for building good systems. The employee cannot produce products that on average exceed the quality of what the process is capable of producing. His 14 points for implementing quality improvement are presented in this chapter.
Joseph M. Juran	A pioneer in teaching the Japanese how to improve quality, Juran believed strongly in top-management commitment, support, and involvement in the quality effort. He was also a believer in teams that continually seek to raise quality standards. Juran varies from Deming somewhat in focusing on the customer and defining quality as fitness for use, not necessarily the written specifications.
Armand Feigenbaum	His 1961 book *Total Quality Control* laid out 40 steps to quality improvement processes. He viewed quality not as a set of tools but as a total field that integrated the processes of a company. His work in how people learn from each other's successes led to the field of cross-functional teamwork.
Philip B. Crosby	*Quality Is Free* was Crosby's attention-getting book published in 1979. Crosby believed that in the traditional trade-off between the cost of improving quality and the cost of poor quality, the cost of poor quality is understated. The cost of poor quality should include all of the things that are involved in not doing the job right the first time. Crosby coined the term *zero defects* and stated, "There is absolutely no reason for having errors or defects in any product or service."

Source: Based on *Quality Is Free* by Philip B. Crosby (New York, McGraw-Hill, 1979) p. 96.

Ethics and Quality Management

- Operations managers must deliver healthy, safe, quality products and services
- Poor quality risks **injuries, lawsuits, recalls**, and regulation

- Ethical conduct must dictate response to problems - product recall, public announcement - not hiding safety issues/defects
- All stakeholders must be considered - all involved - suppliers, workers, customers, distributors, govt agencies, others

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

TABLE 6.2 **Deming's 14 Points for Implementing Quality Improvement**

1. Create consistency of purpose.
2. Lead to promote change.
3. Build quality into the product; stop depending on inspections to catch problems.
4. Build long-term relationships based on performance instead of awarding business on the basis of price.
5. Continuously improve product, quality, and service.
6. Start training.
7. Emphasize leadership.
8. Drive out fear.
9. Break down barriers between departments.
10. Stop haranguing workers.
11. Support, help, and improve.
12. Remove barriers to pride in work.
13. Institute a vigorous program of education and self-improvement.
14. Put everybody in the company to work on the transformation.

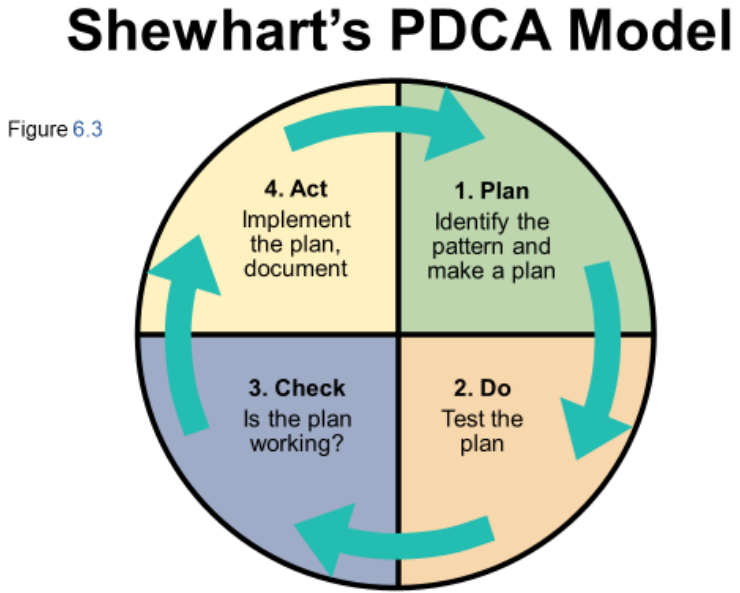
Source: Deming, W. Edwards. *Out of the Crisis*, pp. 61–62, © 2000 W. Edwards Deming Institute, published by The MIT Press. Reprinted by permission.

Seven Concepts in TQM

1. Continuous improvement
2. Six Sigma
3. Employee empowerment
4. Benchmarking
5. Just-in-time (JIT)
6. Taguchi concepts
7. Knowledge of TQM tools

Continuous Improvement

- Never-ending process of continual improvement
- Covers people, equipment, materials, procedures
- Every operation can be improved



Continuous Improvement

- Japanese use *Kaizen* - process of unending improvement
- TQM and zero defects also used to describe continuous improvement

Six Sigma

- Two meanings
  - *Statistical* definition of a process that is 99.9997% capable, 3.4 defects per million opportunities (DPMO) - when shift 1.5sigma
  - A *program* designed to reduce defects, lower costs, save time, and improve customer satisfaction
- A comprehensive system for achieving and sustaining business success

Six Sigma

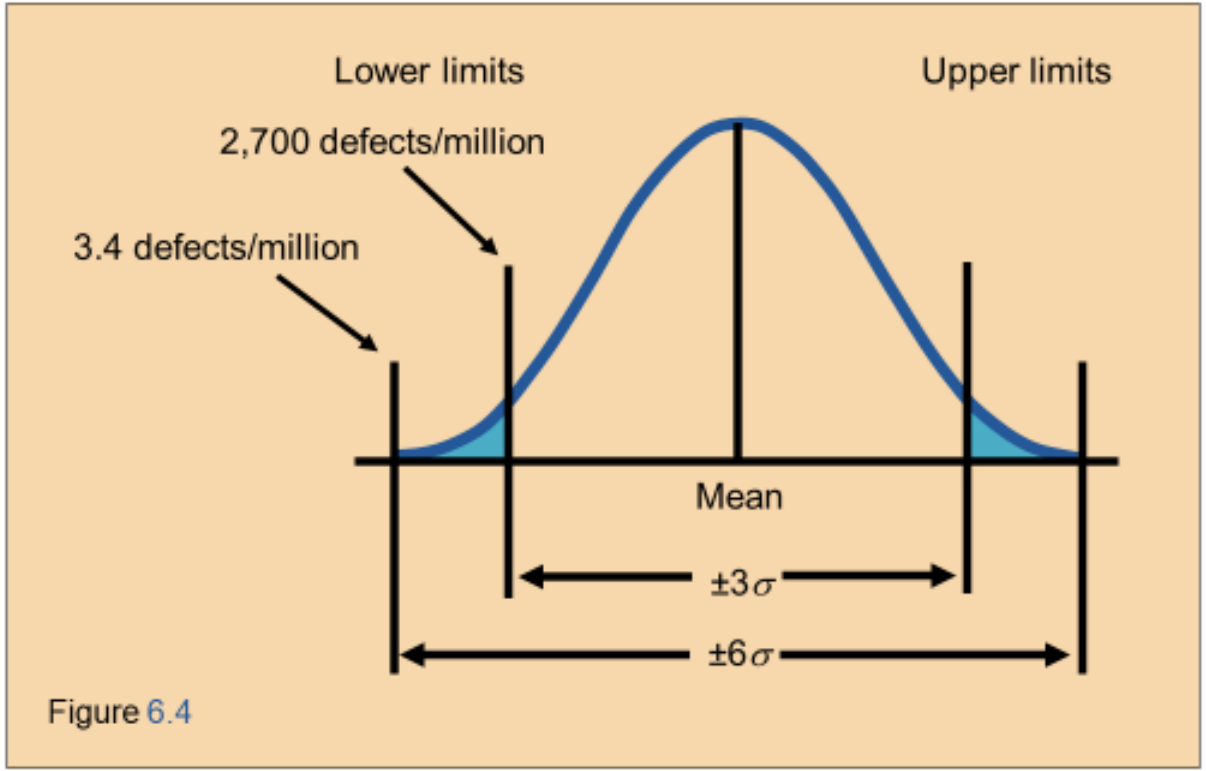


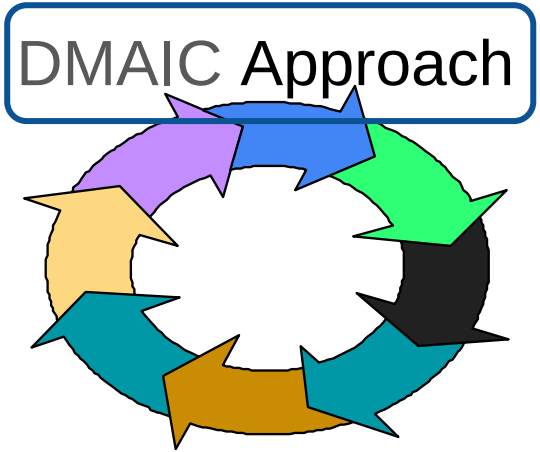
Figure 6.4

Six Sigma Program

- Originally developed by Motorola, adopted and enhanced by Honeywell and GE
- Highly structured approach to process improvement
  - A strategy
  - A discipline – DMAIC
  - A set of 7 tools

Six Sigma

1. ***Defines*** the project's purpose, scope, and outputs, identifies the required process information keeping in mind the customer's definition of quality
2. ***Measures*** the process and collects data
3. ***Analyzes*** the data ensuring repeatability and reproducibility
4. ***Improves*** by modifying or redesigning existing processes and procedures
5. ***Controls*** the new process to make sure performance levels are maintained



Implementing Six Sigma

- Emphasize defects per million opportunities as a standard metric
- Provide extensive training
- Focus on corporate sponsor support (Champions)
- Crea
(Blac
- Set stretch objectives

This cannot be accomplished without a major commitment from top level management

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

Quality Circles

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

Benchmarking

What is benchmarking?

Compare with the best --- best company, best processes, for improvement

Selecting best practices to use as a standard for performance

STEPS FOR BENCHMARKING

1. Determine what to benchmark
2. Form a benchmark team
3. Identify benchmarking partners
4. Collect and analyze benchmarking information
5. Take action to match or exceed the benchmark

Example Benchmarking : Best Practices for Resolving Customer Complaints

Table 6.3

BEST PRACTICE	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

Internal Benchmarking

- When the organization is large enough
- Data more accessible
- Can and should be established in a variety of areas

Just-in-Time (JIT)

Relationship to quality:

- JIT cuts the cost of quality
- JIT improves quality
- Better quality means less inventory and better, easier-to-employ JIT system

- ‘Pull’ system of production scheduling including supply management
  - Production only when signaled
- Allows reduced inventory levels
  - Inventory costs money and hides process and material problems
- Encourages improved process and product quality

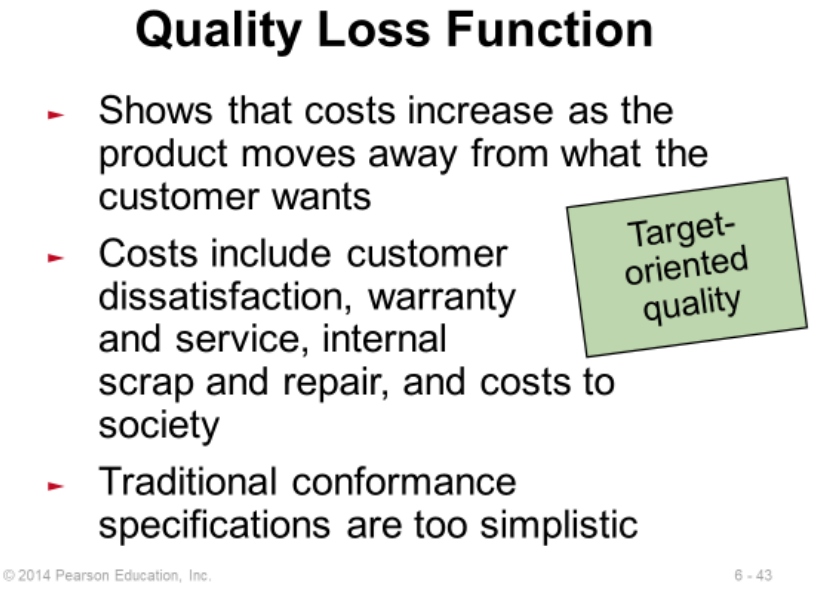
Taguchi Concepts

- Engineering and **experimental design methods** to improve product and process design
  - Identify key component and process variables affecting product variation

- Taguchi Concepts
  - **Quality robustness**
  - **Quality loss function**
  - **Target-oriented quality**

Quality Robustness

- Ability to **produce products uniformly** in adverse manufacturing and environmental conditions
  - Remove the *effects* of adverse conditions
  - Small variations in materials and process do not destroy product quality



Quality Loss Function

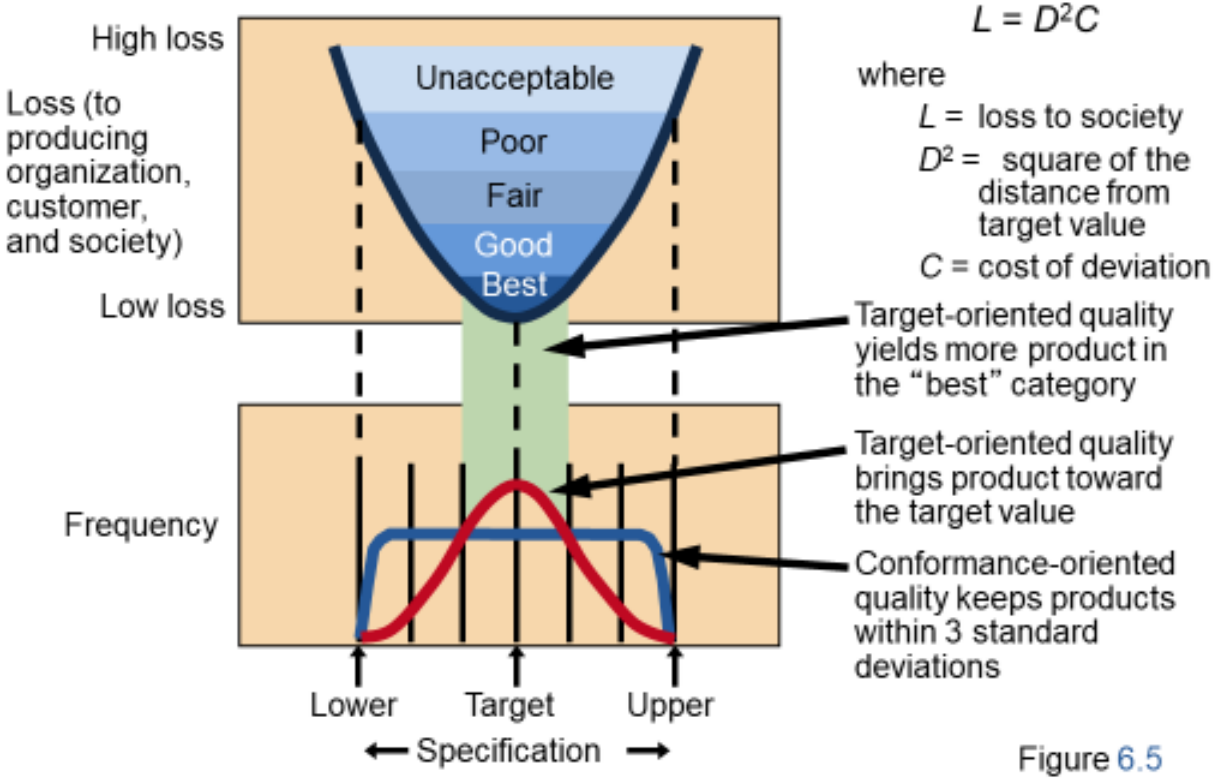


Figure 6.5

TQM Tools

- Tools for Generating Ideas
  - Check Sheet
  - Scatter Diagram
  - Cause-and-Effect Diagram
- Tools to Organize the Data
  - Pareto Chart
  - Flowchart (Process Diagram)

TQM Tools

- Tools for Identifying Problems
  - Histogram
  - Statistical Process Control Chart

Seven Tools of TQM

(a) Check Sheet: An organized method of recording data

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

Figure 6.6

Seven Tools of TQM

(b) Scatter Diagram: A graph of the value of one variable vs. another variable

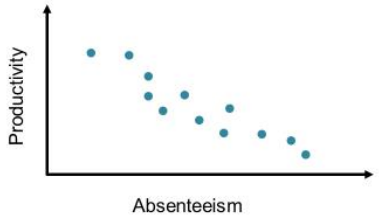


Figure 6.6

Seven Tools of TQM

(c) Cause-and-Effect Diagram: A tool that identifies process elements (causes) that might effect an outcome

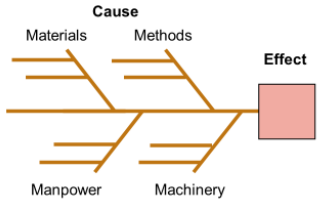
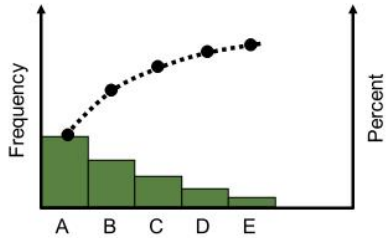


Figure 6.6

Seven Tools of TQM

(d) Pareto Chart: A graph to identify and plot problems or defects in descending order of frequency



Figure

Seven Tools of TQM

(e) Flowchart (Process Diagram): A chart that describes the steps in a process

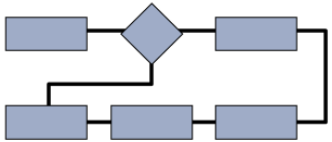


Figure 6.6

Seven Tools of TQM

(f) Histogram: A distribution showing the frequency of occurrences of a variable

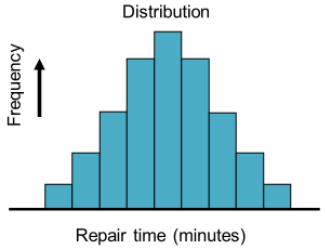
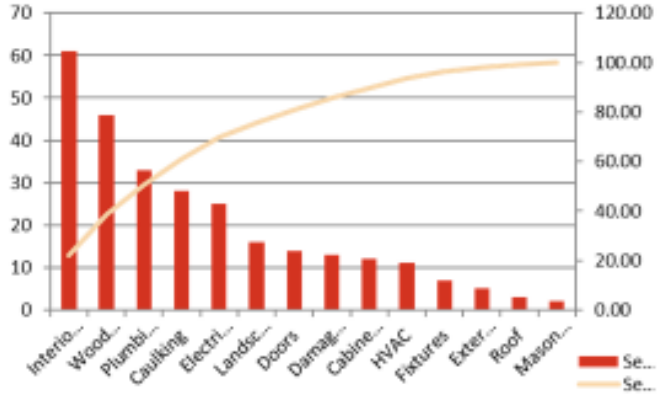


Figure 6.6

PARETO DIAGRAM EXAMPLE

Pareto Exercise

Type of defect	Occurences	%	Cum %
Interio Paint	61	22.10	22.10
Woodwork	46	16.67	38.77
Plumbing	33	11.96	50.72
Caulking	28	10.14	60.87
Electrical	25	9.06	69.93
Landscape	16	5.80	75.72
Doors	14	5.07	80.80
DamagedWall	13	4.71	85.51
Cabinetry	12	4.35	89.86
HVAC	11	3.99	93.84
Fixtures	7	2.54	96.38
Exter paint	5	1.81	98.19
Roof	3	1.09	99.28
Masonry	2	0.72	100.00
Total	276	100.00	



Seven Tools of TQM

(g) Statistical Process Control Chart: A chart with time on the horizontal axis to plot values of a statistic

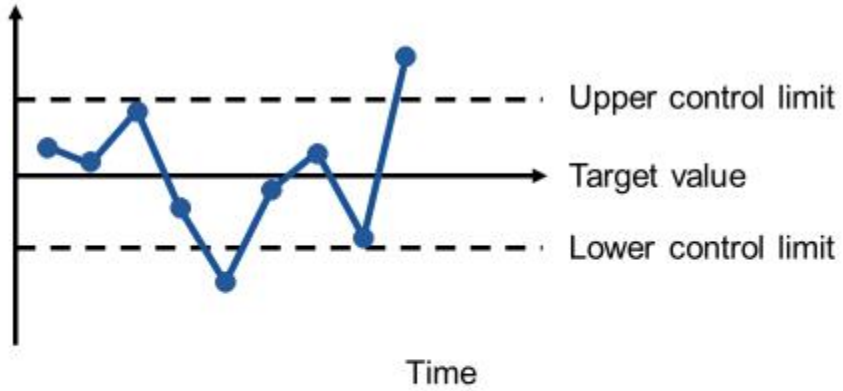


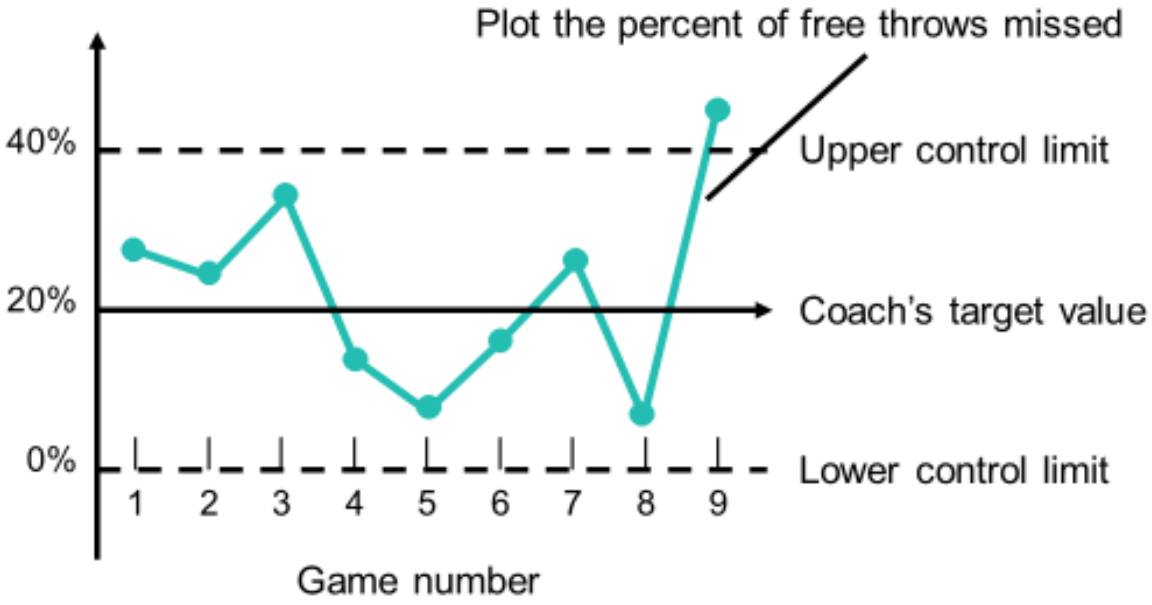
Figure 6.6

Statistical Process Control (SPC)

- Uses statistics and control charts to tell when to take corrective action
- Drives process improvement
- Four key steps
  - Measure the process
  - When a change is indicated, find the assignable cause
  - Eliminate or incorporate the cause
  - Restart the revised process

Control Charts

Figure 6.8



Inspection

- Involves **examining items** to see if an item is **good or defective (OK or NG)**
- Detect a defective product
  - Does not correct deficiencies in process or product
  - It is expensive
- Issues
  - **When to inspect**
  - **Where** in process to inspect
  - **What, Who**, and **How** to inspect

When and Where to Inspect

1. At the supplier’s plant while the supplier is producing
2. At your facility upon receipt of goods from your supplier
3. Before costly or irreversible processes
4. During the step-by-step production process
5. When production or service is complete
6. Before delivery to your customer
7. At the point of customer contact

Inspection

- Many problems
  - Worker fatigue
  - Measurement error
  - Process variability

- Cannot inspect quality into a product
- Robust design, empowered employees, and sound processes are better solutions

Source Inspection

- Also known as source control
- The next step in the process is your customer
- Ensure perfect product to your customer

Source Inspection

- Poka-yoke is the concept of foolproof devices or techniques designed to pass only acceptable product
- Checklists ensure consistency and completeness

Service Industry Inspection

TABLE 6.4 **Examples of Inspection in Services**

ORGANIZATION	WHAT IS INSPECTED	STANDARD
Jones Law Office	Receptionist performance	Phone answered by the second ring
	Billing	Accurate, timely, and correct format
	Attorney	Promptness in returning calls
Hard Rock Hotel	Reception desk	Use customer's name
	Doorman	Greet guest in less than 30 seconds
	Room	All lights working, spotless bathroom
	Minibar	Restocked and charges accurately posted to bill

Service Industry Inspection

TABLE 6.4 Examples of Inspection in Services

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
	Admissions	Data entered correctly and completely
Olive Garden Restaurant	Busboy	Serves water and bread within 1 minute
	Busboy	Clears all entrée items and crumbs prior to dessert
	Waiter	Knows and suggest specials, desserts

Service Industry Inspection

TABLE 6.4 **Examples of Inspection in Services**

ORGANIZATION	WHAT IS INSPECTED	STANDARD
Nordstrom Department Store	Display areas	Attractive, well-organized, stocked, good lighting
	Stockrooms	Rotation of goods, organized, clean
	Salesclerks	Neat, courteous, very knowledgeable

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:

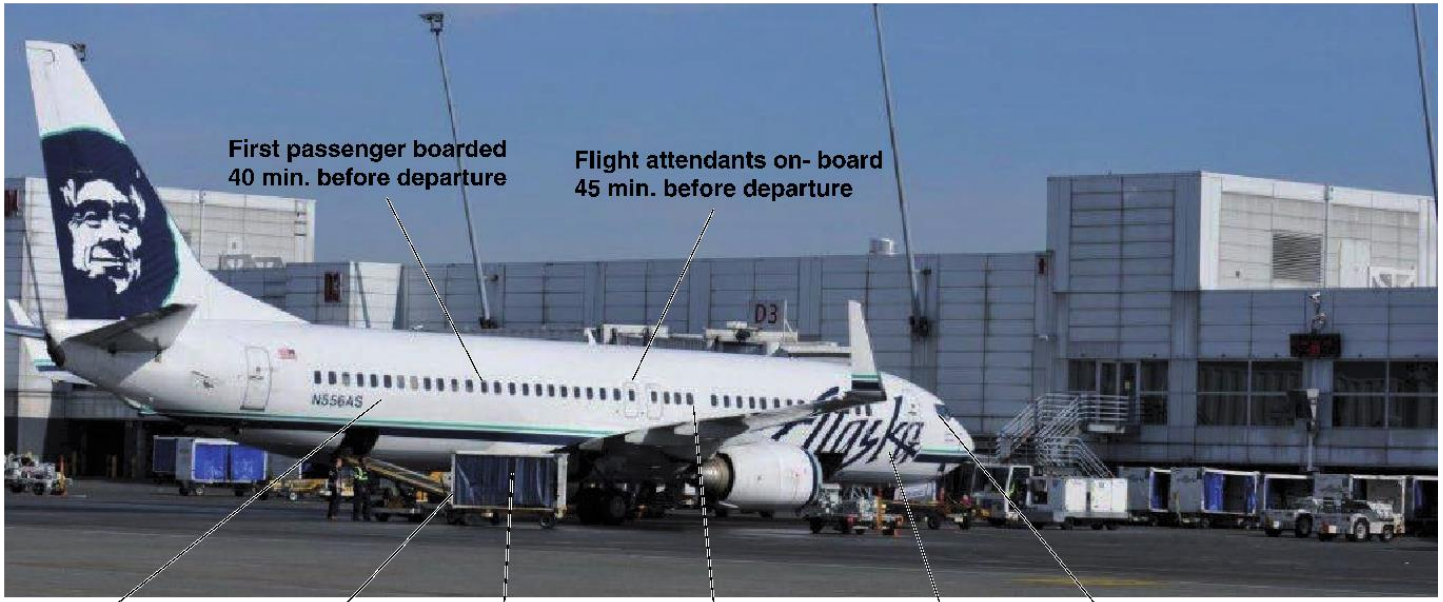
- The tangible component of services is important - design the service tangibles
- The service process is important (9out 10 Determinants of Service Quality)
- The service is judged against the customer’s expectations
- Exceptions will occur

Determinants of Service Quality

Reliability involves consistency of performance and dependability. It means that the firm performs the service right the first time and that the firm honors its promises.
Responsiveness concerns the willingness or readiness of employees to provide service. It involves timeliness of service.
Competence means possession of the required skills and knowledge to perform the service.
Access involves approachability and ease of contact.
Courtesy involves politeness, respect, consideration, and friendliness of contact personnel (including receptionists, telephone operators, etc.).
Communication means keeping customers informed in language they can understand and listening to them. It may mean that the company has to adjust its language for different consumers—increasing the level of sophistication with a well-educated customer and speaking simply and plainly with a novice.
Credibility involves trustworthiness, believability, and honesty. It involves having the customer's best interests at heart.
Security is the freedom from danger, risk, or doubt.
Understanding/knowing the customer involves making the effort to understand the customer's needs.
Tangibles include the physical evidence of the service.

Sources: Adapted from A. Parasuraman, Valarie A. Zeithaml, and Leonard L. Berry, "A Conceptual Model of Service Quality and Its Implications for Future Research," *Journal of Marketing* (1985): 49.

Service Specifications



Service Recovery Strategy

- ❏ Managers should have a plan for when services fail
- ❏ Marriott’s LEARN routine
  - ❏ Listen
  - ❏ Empathize
  - ❏ Apologize
  - ❏ React
  - ❏ Notify