Outline

- Global Company Profile: Hard Rock Cafe
- What Is Operations Management?
- Organizing to Produce Goods and Services
- Why Study OM?
- What Operations Managers Do
  - How This Book Is Organized
Outline - Continued

☑ The Heritage of Operations Management

☑ Operations in the Service Sector
  ☑ Differences between Goods and Services
  ☑ Growth of Services
  ☑ Service Pay

☑ Exciting New Trends in Operations Management
**Outline - Continued**

- **The Productivity Challenge**
  - Productivity Measurement
  - Productivity Variables
  - Productivity and the Service Sector
- **Ethics and Social Responsibility**
Learning Objectives

When you complete this chapter you should be able to:

1. Define operations management
2. Explain the distinction between goods and services
3. Explain the difference between production and productivity
Learning Objectives

When you complete this chapter you should be able to:

4. Compute single-factor productivity
5. Compute multifactor productivity
6. Identify the critical variables in enhancing productivity
The Hard Rock Cafe

- First opened in 1971
- Now – 121 restaurants in over 40 countries
- Rock music memorabilia
- Creates value in the form of good food and entertainment
- 3,500+ custom meals per day in Orlando
- How does an item get on the menu?
- Role of the Operations Manager
What Is Operations Management?

Production is the creation of goods and services.

Operations management (OM) is the set of activities that creates value in the form of goods and services by transforming inputs into outputs.
Organizing to Produce Goods and Services

☑ Essential functions:

☑ Marketing – generates demand

☑ Production/operations – creates the product

☑ Finance/accounting – tracks how well the organization is doing, pays bills, collects the money
Figure 1.1(A)
Organizational Charts

Manufacturing

Operations
- Facilities
  - Construction; maintenance
- Production and inventory control
  - Scheduling; materials control
- Quality assurance and control
- Supply chain management
- Manufacturing
  - Tooling; fabrication; assembly
- Design
  - Product development and design
  - Detailed product specifications
- Industrial engineering
  - Efficient use of machines, space, and personnel
- Process analysis
  - Development and installation of production tools and equipment

Finance/accounting
- Disbursements/credits
- Receivables
- Payables
- General ledger
- Funds Management
- Money market
- International exchange
- Capital requirements
- Stock issue
- Bond issue
- and recall

Marketing
- Sales promotion
- Advertising
- Sales
- Market research

Figure 1.1(C)
Why Study OM?

✓ **OM is one of three major functions (marketing, finance, and operations) of any organization**

✓ **We want (and need) to know how goods and services are produced**

✓ **We want to understand what operations managers do**

✓ **OM is such a costly part of an organization**
### Options for Increasing Contribution

<table>
<thead>
<tr>
<th></th>
<th>Marketing Option Current</th>
<th>Increase Sales Revenue 50%</th>
<th>Finance/Accounting Option Reduce Finance Costs 50%</th>
<th>OM Option Reduce Production Costs 20%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales</td>
<td>$100,000</td>
<td>$150,000</td>
<td>$100,000</td>
<td>$100,000</td>
</tr>
<tr>
<td>Cost of Goods</td>
<td>– 80,000</td>
<td>– 120,000</td>
<td>– 80,000</td>
<td>– 64,000</td>
</tr>
<tr>
<td>Gross Margin</td>
<td>20,000</td>
<td>30,000</td>
<td>20,000</td>
<td>36,000</td>
</tr>
<tr>
<td>Finance Costs</td>
<td>– 6,000</td>
<td>– 6,000</td>
<td>– 3,000</td>
<td>– 6,000</td>
</tr>
<tr>
<td>Subtotal</td>
<td>14,000</td>
<td>24,000</td>
<td>17,000</td>
<td>30,000</td>
</tr>
<tr>
<td>Taxes at 25%</td>
<td>– 3,500</td>
<td>– 6,000</td>
<td>– 4,250</td>
<td>– 7,500</td>
</tr>
<tr>
<td>Contribution</td>
<td>$10,500</td>
<td>$18,000</td>
<td>$12,750</td>
<td>$22,500</td>
</tr>
</tbody>
</table>
What Operations Managers Do

Basic Management Functions

- Planning
- Organizing
- Staffing
- Leading
- Controlling
## Ten Critical Decisions

### Ten Decision Areas

<table>
<thead>
<tr>
<th>Decision Area</th>
<th>Chapter(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ Design of goods and services</td>
<td>5</td>
</tr>
<tr>
<td>✓ Managing quality</td>
<td>6, Supplement 6</td>
</tr>
<tr>
<td>✓ Process and capacity design</td>
<td>7, Supplement 7</td>
</tr>
<tr>
<td>✓ Location strategy</td>
<td>8</td>
</tr>
<tr>
<td>✓ Layout strategy</td>
<td>9</td>
</tr>
<tr>
<td>✓ Human resources and job design</td>
<td>10, Supplement 10</td>
</tr>
<tr>
<td>✓ Supply chain management</td>
<td>11, Supplement 11</td>
</tr>
<tr>
<td>✓ Inventory management</td>
<td>12, 14, 16</td>
</tr>
<tr>
<td>✓ Scheduling</td>
<td>13, 15</td>
</tr>
<tr>
<td>✓ Maintenance</td>
<td>17</td>
</tr>
</tbody>
</table>

Table 1.2
The Critical Decisions

- **Design of goods and services**
  - **What good or service should we offer?**
  - **How should we design these products and services?**

- **Managing quality**
  - **How do we define quality?**
  - **Who is responsible for quality?**

Table 1.2 (cont.)
The Critical Decisions

✔️ Process and capacity design
  ✔️ What process and what capacity will these products require?
  ✔️ What equipment and technology is necessary for these processes?

✔️ Location strategy
  ✔️ Where should we put the facility?
  ✔️ On what criteria should we base the location decision?

Table 1.2 (cont.)
The Critical Decisions

☑ **Layout strategy**
  ☑ *How should we arrange the facility?*
  ☑ *How large must the facility be to meet our plan?*

☑ **Human resources and job design**
  ☑ *How do we provide a reasonable work environment?*
  ☑ *How much can we expect our employees to produce?*

Table 1.2 (cont.)
The Critical Decisions

☑ Supply chain management

☑ Should we make or buy this component?
☑ Who are our suppliers and who can integrate into our e-commerce program?

☑ Inventory, material requirements planning, and JIT

☑ How much inventory of each item should we have?
☑ When do we re-order?

Table 1.2 (cont.)
The Critical Decisions

☑ Intermediate and short-term scheduling

☑ Are we better off keeping people on the payroll during slowdowns?
☑ Which jobs do we perform next?

☑ Maintenance

☑ Who is responsible for maintenance?
☑ When do we do maintenance?
Where are the OM Jobs?

**PLANT MANAGER**
Division of Fortune 1000 company seeks plant manager for plant located in the upper Hudson Valley area. This plant manufactures loading dock equipment for commercial markets. The candidate must be experienced in plant management including expertise in production planning, purchasing, and inventory management. Good written and oral communication skills are a must along with excellent understanding of and application skills in managing people.

**Quality Manager**
Several openings exist in our small measurement. The work involves (1) a package processing facilities in the Northeast, Florida, and Southern California for quality managers, and spreadsheets, (2) process audits to identify areas for improvement, and require extensive use of statistical tools to monitor all aspects of changes. Positions involve night hours, service timeliness and workload and weekends. Send resume.

**Operations Analyst**
Expanding national coffee shop; top 10 "Best Places to Work" wants junior level systems analyst to join our excellent store improvement team. Business or I.E. degree, work methods, labor standards, ergonomics, cost accounting knowledge a plus. This is a hands on job and excellent opportunity for team player with good people skills. West Coast location. Some travel required.

**Supply Chain Manager and Planner**
Responsibilities entail negotiating contracts and establishing long-term relationships with suppliers. We will rely on the selected candidate to maintain accuracy in the purchasing system, invoices, and product returns. A bachelor’s degree and up to 2 years related experience are required. Working knowledge of MRP, ability to use feedback to master scheduling and suppliers and consolidate orders for best price and delivery are necessary. Proficiency in all PC Windows applications, particularly Excel and Word, is essential. Knowledge of Oracle business system I is a plus. Effective verbal and written communication skills are essential.

**Process Improvement Consultants**
An expanding consulting firm is seeking consultants to design and implement lean production and cycle time reduction plans in both service and manufacturing processes. Our firm is currently working with an international bank to improve its back office operations, as well as with several manufacturing firms. A business degree required; APICS certification a plus.
Where are the OM Jobs?

- Technology/methods
- Facilities/space utilization
- Strategic issues
- Response time
- People/team development
- Customer service
- Quality
- Cost reduction
- Inventory reduction
- Productivity improvement
Significant Events in OM

Cost Focus

Early Concepts
1776–1880
Labor Specialization
(Smith, Babbage)
Standardized Parts (Whitney)

Scientific Management Era
1880–1910
Gantt Charts (Gantt)
Motion & Time Studies
(Gilbreth)
Process Analysis (Taylor)
Queuing Theory (Erlang)

Mass Production Era
1910–1980
Moving Assembly Line
(Ford/Sorensen)
Statistical Sampling
(Shewhart)
Economic Order
Quantity (Harris)
Linear Programming
PERT/CPM (DuPont)
Material Requirements Planning

Lean Production Era
1980–1995
Just-in-Time
Computer-Aided Design
Electronic Data Interchange
Total Quality Management
Baldrige Award
Empowerment
Kanbans

Customization Focus

Mass Customization Era
1995–2010
Globalization
Internet/E-Commerce
Enterprise Resource Planning
Learning Organization
International Quality Standards
Finite Scheduling
Supply Chain Management
Mass Customization
Build-to-Order

Figure 1.3
The Heritage of OM

- **Division of labor** (Adam Smith 1776; Charles Babbage 1852)
- **Standardized parts** (Whitney 1800)
- **Scientific Management** (Taylor 1881)
- **Coordinated assembly line** (Ford/Sorenson 1913)
- **Gantt charts** (Gantt 1916)
- **Motion study** (Frank and Lillian Gilbreth 1922)
- **Quality control** (Shewhart 1924; Deming 1950)
The Heritage of OM

- Computer (Atanasoff 1938)
- CPM/PERT (DuPont 1957)
- Material requirements planning (Orlicky 1960)
- Computer aided design (CAD 1970)
- Flexible manufacturing system (FMS 1975)
- Baldrige Quality Awards (1980)
- Computer integrated manufacturing (1990)
- Globalization (1992)
- Internet (1995)
Eli Whitney

- **Born** 1765; **died** 1825
- **In 1798, received government contract to make 10,000 muskets**
- **Showed that machine tools could make standardized parts to exact specifications**
  - **Musket parts could be used in any musket**
Frederick W. Taylor

- Born 1856; died 1915
- Known as ‘father of scientific management’
- In 1881, as chief engineer for Midvale Steel, studied how tasks were done
  - Began first motion and time studies
- Created efficiency principles
Taylor’s Principles

Management Should Take More Responsibility for:

- Matching employees to right job
- Providing the proper training
- Providing proper work methods and tools
- Establishing legitimate incentives for work to be accomplished
Frank & Lillian Gilbreth

- Frank (1868-1924); Lillian (1878-1972)
- Husband-and-wife engineering team
- Further developed work measurement methods
- Applied efficiency methods to their home and 12 children!
Henry Ford

☑ Born 1863; died 1947

☑ In 1903, created Ford Motor Company

☑ In 1913, first used moving assembly line to make Model T
  ✓ Unfinished product moved by conveyor past work station

☑ Paid workers very well for 1911 ($5/day!)
W. Edwards Deming

- Born 1900; died 1993
- Engineer and physicist
- Credited with teaching Japan quality control methods in post-WW2
- Used statistics to analyze process
- His methods involve workers in decisions
Contributions From

- Human factors
- Industrial engineering
- Management science
- Biological science
- Physical sciences
- Information technology
New Challenges in OM

From

- Local or national focus
- Batch shipments
- Low bid purchasing
- Lengthy product development
- Standard products
- Job specialization

To

- Global focus
- Just-in-time
- Supply chain partnering
- Rapid product development, alliances
- Mass customization
- Empowered employees, teams
Characteristics of Goods

- **Tangible product**
- **Consistent product definition**
- **Production usually separate from consumption**
- **Can be inventoried**
- **Low customer interaction**
Characteristics of Service

- Intangible product
- Produced and consumed at same time
- Often unique
- High customer interaction
- Inconsistent product definition
- Often knowledge-based
- Frequently dispersed
Industry and Services as Percentage of GDP

<table>
<thead>
<tr>
<th>Country</th>
<th>Services</th>
<th>Manufacturing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>70</td>
<td>70</td>
</tr>
<tr>
<td>Canada</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>China</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Czech Rep</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>France</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Germany</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>10</td>
<td>90</td>
</tr>
<tr>
<td>Japan</td>
<td>30</td>
<td>60</td>
</tr>
<tr>
<td>Mexico</td>
<td>20</td>
<td>80</td>
</tr>
<tr>
<td>Russian Fed</td>
<td>10</td>
<td>70</td>
</tr>
<tr>
<td>South Africa</td>
<td>20</td>
<td>60</td>
</tr>
<tr>
<td>Spain</td>
<td>10</td>
<td>80</td>
</tr>
<tr>
<td>UK</td>
<td>20</td>
<td>70</td>
</tr>
<tr>
<td>US</td>
<td>10</td>
<td>90</td>
</tr>
</tbody>
</table>
### Goods Versus Services

<table>
<thead>
<tr>
<th>Attributes of Goods</th>
<th>Attributes of Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Tangible Product)</td>
<td>(Intangible Product)</td>
</tr>
<tr>
<td>Can be resold</td>
<td>Reselling unusual</td>
</tr>
<tr>
<td>Can be inventoried</td>
<td>Difficult to inventory</td>
</tr>
<tr>
<td>Some aspects of quality measurable</td>
<td>Quality difficult to measure</td>
</tr>
<tr>
<td>Selling is distinct from production</td>
<td>Selling is part of service</td>
</tr>
<tr>
<td>Product is transportable</td>
<td>Provider, not product, is often transportable</td>
</tr>
<tr>
<td>Site of facility important for cost</td>
<td>Site of facility important for customer contact</td>
</tr>
<tr>
<td>Often easy to automate</td>
<td>Often difficult to automate</td>
</tr>
<tr>
<td>Revenue generated primarily from tangible product</td>
<td>Revenue generated primarily from the intangible service</td>
</tr>
</tbody>
</table>

**Table 1.3**
Goods and Services

- Automobile
- Computer
- Installed carpeting
- Fast-food meal
- Restaurant meal/auto repair
- Hospital care
- Advertising agency/investment management
- Consulting service/teaching
- Counseling

Percent of Product that is a Good

Percent of Product that is a Service

Figure 1.4
Manufacturing and Service Employment

Employment (millions)


Manufacturing

Service

Figure 1.5 (A)
Manufacturing Employment and Production

![Chart showing manufacturing employment and industrial production over time. The chart plots employment (left scale) and industrial production (right scale) from 1950 to 2010, with estimates for 2010. The index for 1997 is set at 100.](image)

Figure 1.5 (B)
Development of the Service Economy

United States
Canada
France
Italy
Britain
Japan
W. Germany

1970 ● 2008 (est)

Figure 1.5 (C)
## Organizations in Each Sector

<table>
<thead>
<tr>
<th>Service Sector</th>
<th>Example</th>
<th>% of all Jobs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education, Legal, Medical, and other</td>
<td>Notre Dame University, San Diego Zoo, Arnold Palmer Hospital</td>
<td>25.5</td>
</tr>
<tr>
<td>Trade (retail, wholesale)</td>
<td>Walgreen’s, Wal-Mart, Nordstrom’s</td>
<td>15.1</td>
</tr>
<tr>
<td>Utilities, Transportation</td>
<td>Pacific Gas &amp; Electric, American Airlines, Santa Fe R.R., Roadway Express</td>
<td>5.2</td>
</tr>
</tbody>
</table>

Table 1.4
## Organizations in Each Sector

<table>
<thead>
<tr>
<th>Service Sector</th>
<th>Example</th>
<th>% of all Jobs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professional and Business Services</td>
<td>Snelling and Snelling, Waste Management, Pitney-Bowes</td>
<td>10.1</td>
</tr>
<tr>
<td>Finance, Information, Real Estate</td>
<td>Citicorp, American Express, Prudential, Aetna, Trammel Crow, EDS, IBM</td>
<td>9.6</td>
</tr>
<tr>
<td>Food, Lodging, Entertainment</td>
<td>Olive Garden, Hard Rock Cafe, Motel 6, Hilton Hotels, Walt Disney, Paramount Pictures</td>
<td>8.5</td>
</tr>
<tr>
<td>Public Administration</td>
<td>U.S., State of Alabama, Cook County</td>
<td>4.6</td>
</tr>
</tbody>
</table>

Table 1.4
## Organizations in Each Sector

<table>
<thead>
<tr>
<th>Sector</th>
<th>Example</th>
<th>% of all Jobs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturing</td>
<td>General Electric, Ford, U.S. Steel, Intel</td>
<td>11.5</td>
</tr>
<tr>
<td>Construction</td>
<td>Bechtel, McDermott</td>
<td>7.9</td>
</tr>
<tr>
<td>Agriculture</td>
<td>King Ranch</td>
<td>1.6</td>
</tr>
<tr>
<td>Mining</td>
<td>Homestake Mining</td>
<td>0.4</td>
</tr>
<tr>
<td>Service</td>
<td></td>
<td>78.6%</td>
</tr>
<tr>
<td>Manufacturing</td>
<td></td>
<td>21.4%</td>
</tr>
</tbody>
</table>

Table 1.4
# New Trends in OM

## Past
- **Local or national focus**

## Causes
- **Reliable worldwide communication and transportation networks**
- **Short product life cycles and cost of capital put pressure on reducing inventory**
- **Supply chain competition requires that suppliers be engaged in a focus on the end customer**

## Future
- **Global focus, moving production offshore**
- **Just-in-time performance**
- **Supply chain partners, collaboration, alliances, outsourcing**

---

*Figure 1.6*
# New Trends in OM

## Past

- **Lengthy product development**

## Causes

- **Shorter life cycles,**
  - **Internet,**
  - **rapid international communication,**
  - **computer-aided design,**
  - **and international collaboration**

## Future

- **Rapid product development,**
  - **alliances,**
  - **collaborative designs**

- **Affluence and worldwide markets,**
  - **increasingly flexible production processes**

## Future

- **Mass customization with added emphasis on quality**

- **Changing socioculture milieu,**
  - **increasingly a knowledge and information society**

## Future

- **Empowered employees,**
  - **teams,**
  - **and lean production**

---

**Figure 1.6**
New Trends in OM

Past

Low-cost focus

Causes

Environmental issues, ISO 14000, increasing disposal costs

Future

Environmentally sensitive production, green manufacturing, recycled materials, remanufacturing

Ethics not at forefront

Businesses operate more openly; public and global review of ethics; opposition to child labor, bribery, pollution

High ethical standards and social responsibility expected

Figure 1.6
New Trends in OM

- Global focus
- Just-in-time performance
- Supply chain partnering
- Rapid product development
- Mass customization
- Empowered employees
- Environmentally sensitive production
- Ethics
Productivity Challenge

Productivity is the ratio of outputs (goods and services) divided by the inputs (resources such as labor and capital).

The objective is to improve productivity!

Important Note!
Production is a measure of output only and not a measure of efficiency.
The U.S. economic system transforms inputs to outputs at about an annual 2.5% increase in productivity per year. The productivity increase is the result of a mix of capital (38% of 2.5%), labor (10% of 2.5%), and management (52% of 2.5%).
Improving Productivity at Starbucks

A team of 10 analysts continually look for ways to shave time. Some improvements:

- Stop requiring signatures on credit card purchases under $25: Saved 8 seconds per transaction
- Change the size of the ice scoop: Saved 14 seconds per drink
- New espresso machines: Saved 12 seconds per shot
Improving Productivity at Starbucks

A team of 10 analysts continually look for ways to shave time. Some improvements:
- Saved 12 seconds per shot
- New espresso machines saved 14 seconds per drink
- Change the size of the ice scoop saved 8 seconds per transaction
- Stop requiring signatures on credit card purchases under $25

Operations improvements have helped Starbucks increase yearly revenue per outlet by $200,000 to $940,000 in six years.

Productivity has improved by 27%, or about 4.5% per year.
**Productivity**

\[ \text{Productivity} = \frac{\text{Units produced}}{\text{Input used}} \]

- **Measure of process improvement**
- **Represents output relative to input**
- **Only through productivity increases can our standard of living improve**
Productivity Calculations

**Labor Productivity**

Productivity = \( \frac{\text{Units produced}}{\text{Labor-hours used}} \)

\[
= \frac{1,000}{250} = 4 \text{ units/labor-hour}
\]

One resource input \( \Rightarrow \) single-factor productivity
Multi-Factor Productivity

\[
\text{Productivity} = \frac{\text{Output}}{\text{Labor} + \text{Material} + \text{Energy} + \text{Capital} + \text{Miscellaneous}}
\]

- Also known as total factor productivity
- Output and inputs are often expressed in dollars

Multiple resource inputs → multi-factor productivity
Collins Title Productivity

**Old System:**

- Staff of 4 works 8 hrs/day
- 8 titles/day
- Payroll cost = $640/day
- Overhead = $400/day

Old labor productivity = \( \frac{8 \text{ titles/day}}{32 \text{ labor-hrs}} \)
Old System:

Staff of 4 works 8 hrs/day  8 titles/day
Payroll cost = $640/day  Overhead = $400/day

Old labor productivity = \(\frac{8 \text{ titles/day}}{32 \text{ labor-hrs}}\) = .25 titles/labor-hr
Old System:

- Staff of 4 works 8 hrs/day
- Payroll cost = $640/day
- Overhead = $400/day

New System:

- 14 titles/day
- Overhead = $800/day

Old labor productivity = \( \frac{8 \text{ titles/day}}{32 \text{ labor-hrs}} \) = .25 titles/labor-hr

New labor productivity = \( \frac{14 \text{ titles/day}}{32 \text{ labor-hrs}} \)
Collins Title Productivity

**Old System:**
- Staff of 4 works 8 hrs/day
- Payroll cost = $640/day
- 8 titles/day
- Overhead = $400/day

**New System:**
- 14 titles/day
- Overhead = $800/day

\[
\text{Old labor productivity} = \frac{8 \text{ titles/day}}{32 \text{ labor-hrs}} = .25 \text{ titles/labor-hr}
\]

\[
\text{New labor productivity} = \frac{14 \text{ titles/day}}{32 \text{ labor-hrs}} = .4375 \text{ titles/labor-hr}
\]
Collins Title Productivity

**Old System:**

- Staff of 4 works 8 hrs/day
- Payroll cost = $640/day
- Overhead = $400/day
- 8 titles/day

**New System:**

- 14 titles/day
- Overhead = $800/day

**Old multifactor productivity** = \( \frac{8 \text{ titles/day}}{\$640 + 400} \)
Old System:

Staff of 4 works 8 hrs/day 8 titles/day
Payroll cost = $640/day Overhead = $400/day

New System:

14 titles/day Overhead = $800/day

Old multifactor productivity = \( \frac{8 \text{ titles/day}}{\$640 + 400} = .0077 \text{ titles/dollar} \)
Old System:

Staff of 4 works 8 hrs/day
Payroll cost = $640/day
8 titles/day
Overhead = $400/day

New System:

14 titles/day
Overhead = $800/day

Old multifactor productivity = \( \frac{8 \text{ titles/day}}{640 + 400} = 0.0077 \text{ titles/dollar} \)

New multifactor productivity = \( \frac{14 \text{ titles/day}}{640 + 800} \)
**Collins Title Productivity**

**Old System:**

Staff of 4 works 8 hrs/day 8 titles/day
Payroll cost = $640/day Overhead = $400/day

**New System:**

14 titles/day Overhead = $800/day

Old multifactor productivity = \( \frac{8 \text{ titles/day}}{\$640 + 400} \) = .0077 titles/dollar

New multifactor productivity = \( \frac{14 \text{ titles/day}}{\$640 + 800} \) = .0097 titles/dollar
Measurement Problems

- **Quality** may change while the quantity of inputs and outputs remains constant.
- **External elements** may cause an increase or decrease in productivity.
- **Precise units** of measure may be lacking.
Productivity Variables

- **Labor** - contributes about 10% of the annual increase
- **Capital** - contributes about 38% of the annual increase
- **Management** - contributes about 52% of the annual increase
Key Variables for Improved Labor Productivity

- Basic education appropriate for the labor force
- Diet of the labor force
- Social overhead that makes labor available
- Maintaining and enhancing skills in the midst of rapidly changing technology and knowledge
About half of the 17-year-olds in the US cannot correctly answer questions of this type.

### Figure 1.8

<table>
<thead>
<tr>
<th>Question</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>What is the area of this rectangle?</td>
<td>4 square yds&lt;br&gt;6 square yds&lt;br&gt;10 square yds&lt;br&gt;24 square yds</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Equation Solution</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>If $9y + 3 = 6y + 15$ then $y =$</td>
<td>1&lt;br&gt;2&lt;br&gt;6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>True Statement</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Which of the following is true about 84% of 100?</td>
<td>It is greater than 100&lt;br&gt;It is less than 100&lt;br&gt;It is equal to 100</td>
</tr>
</tbody>
</table>
Investment and Productivity

Percent increase in productivity

Percentage investment

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Service Productivity

☑ Typically labor intensive
☑ Frequently focused on unique individual attributes or desires
☑ Often an intellectual task performed by professionals
☑ Often difficult to mechanize
☑ Often difficult to evaluate for quality
Productivity at Taco Bell

Improvements:

- Revised the menu
- Designed meals for easy preparation
- Shifted some preparation to suppliers
- Efficient layout and automation
- Training and employee empowerment
Productivity at Taco Bell

Improvements:

- Revised the menu
- Designed meals for easy preparation
- Shifted some preparation to suppliers
- Efficient layout and automation
- Training and employee empowerment

Results:

- Preparation time cut to 8 seconds
- Management span of control increased from 5 to 30
- In-store labor cut by 15 hours/day
- Stores handle twice the volume with half the labor
- Fast-food low-cost leader
Ethics and Social Responsibility

Challenges facing operations managers:

- Developing and producing safe, quality products
- Maintaining a clean environment
- Providing a safe workplace
- Honoring community commitments