

# Operations and Productivity

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PowerPoint presentation to accompany  
Heizer, Render, Munson/Global Edition  
Operations Management, Twelfth Edition  
Principles of Operations Management, Tenth Edition

PowerPoint slides by Jeff Heyl

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## Outline

- ▶ **Global Company Profile:** Hard Rock Cafe
- ▶ What Is Operations Management?
- ▶ Organizing to Produce Goods and Services
- ▶ The Supply Chain
- ▶ Why Study OM?
- ▶ What Operations Managers Do

# Outline - Continued

- ▶ The Heritage of Operations Management
- ▶ Operations for Goods and Services
- ▶ The Productivity Challenge
- ▶ Current Challenges in Operations Management
- ▶ Ethics, Social Responsibility, and Sustainability



## Operations Management at Hard Rock Cafe

- ▶ First opened in 1971
  - ▶ Now – 150 restaurants in over 53 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

# Learning Objectives

**When you complete this chapter you should be able to:**

- 1.1 Define** operations management
- 1.2 Explain** the distinction between goods and services
- 1.3 Explain** the difference between production and productivity

# Learning Objectives

**When you complete this chapter you should be able to:**

- 1.4 Compute** single-factor productivity
- 1.5 Compute** multifactor productivity
- 1.6 Identify** the critical variables in enhancing productivity

# What Is Operations Management?

**Production** is the creation of goods and services

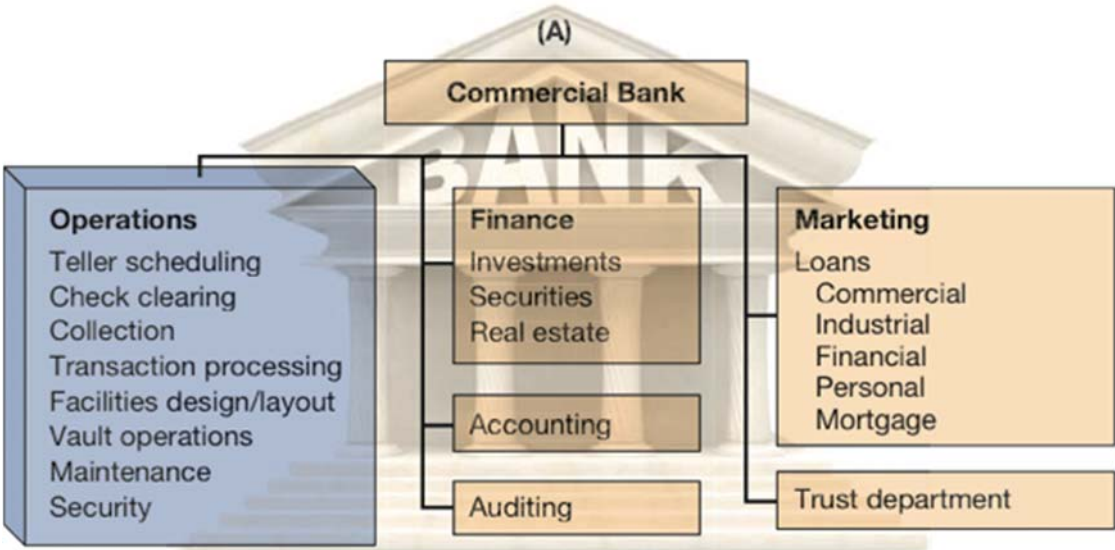
**Operations management (OM)** is the set of activities that create value in the form of goods and services by transforming inputs into outputs

## Organizing to Produce Goods and Services

- ▶ Essential functions:
  1. **Marketing** – generates demand
  2. **Production/operations** – creates the product
  3. **Finance/accounting** – tracks how well the organization is doing, pays bills, collects the money

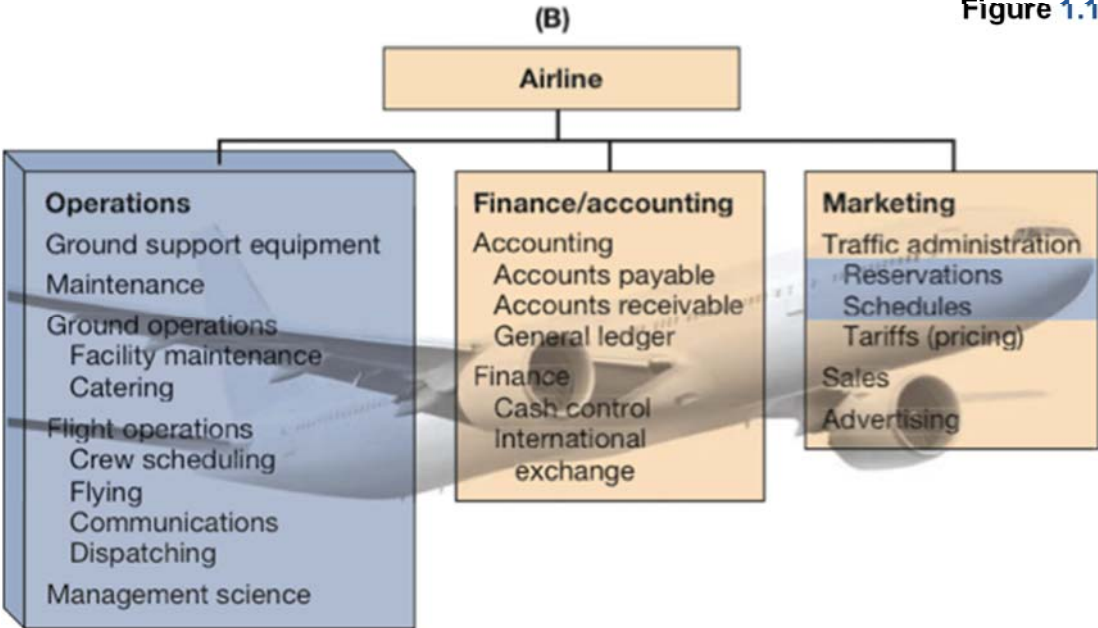
# Organizational Charts

Figure 1.1

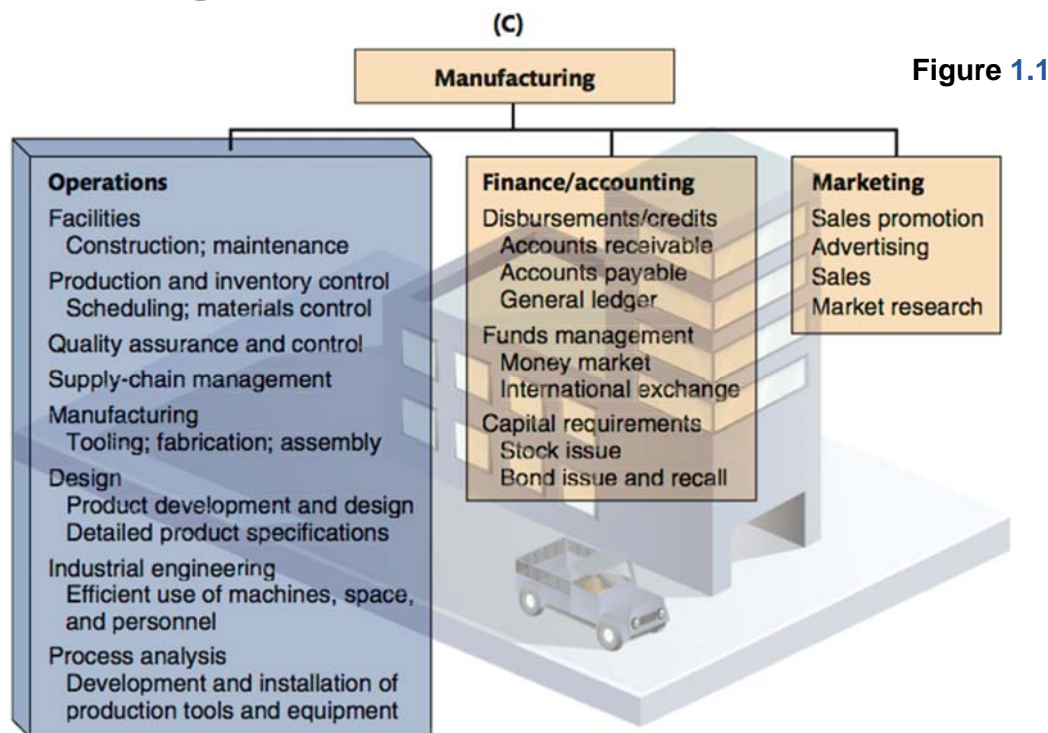


# Organizational Charts

Figure 1.1



# Organizational Charts



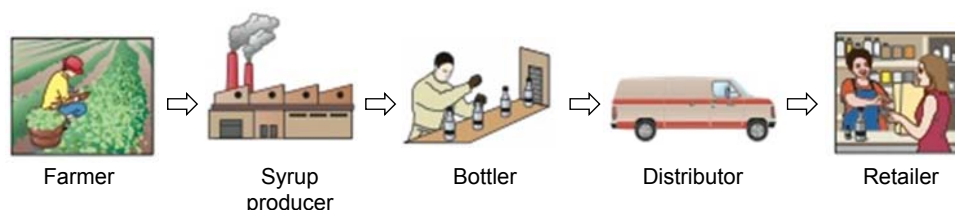
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## The Supply Chain

- ▶ A global network of organizations and activities that supply a firm with goods and services
- ▶ Members of the supply chain collaborate to achieve high levels of customer satisfaction, efficiency and competitive advantage

Figure 1.2



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# Why Study OM?

1. OM is one of three major functions of any organization; we want to study *how people organize themselves for productive enterprise*
2. We want (*and need*) to know *how goods and services are produced*
3. We want to understand *what operations managers do*
4. OM *is such a costly part of an organization*

## Options for Increasing Contribution

**TABLE 1.1**

|               | CURRENT        | MARKETING OPTION<br>INCREASE SALES REVENUE 50% | FINANCE/<br>ACCOUNTING OPTION<br>REDUCE FINANCE COSTS 50% | OM OPTION<br>REDUCE PRODUCTION COSTS 20% |
|---------------|----------------|--|---|--|
| Sales         | \$100,000      | \$150,000                                      | \$100,000   | \$100,000                                |
| Cost of goods | <u>-80,000</u> | <u>-120,000</u>                                | <u>-80,000</u>  | <u>-64,000</u>                           |
| Gross margin  | 20,000         | 30,000   | 20,000  | 36,000                                   |
| Finance costs | <u>-6,000</u>  | <u>-6,000</u>                                  | <u>-3,000</u>   | <u>-6,000</u>                            |
| Subtotal      | 14,000         | 24,000   | 17,000  | 30,000                                   |
| Taxes at 25%  | <u>-3,500</u>  | <u>-6,000</u>                                  | <u>-4,200</u>   | <u>-7,500</u>                            |
| Contribution  | \$ 10,500      | \$ 18,000                                      | \$ 12,750   | \$ 22,500                                |

# What Operations Managers Do

## Basic Management Functions

- ▶ Planning
- ▶ Organizing
- ▶ Staffing
- ▶ Leading
- ▶ Controlling



## Ten Strategic Decisions

**TABLE 1.2**

| <b>DECISION</b>                          | <b>CHAPTER(S)</b> |
|--|-------------------|
| 1. <i>Design of goods and services</i>   | 5, Supplement 5   |
| 2. <i>Managing quality</i>               | 6, Supplement 6   |
| 3. <i>Process and capacity strategy</i>  | 7, Supplement 7   |
| 4. <i>Location strategy</i>              | 8                 |
| 5. <i>Layout strategy</i>                | 9                 |
| 6. <i>Human resources and job design</i> | 10                |
| 7. <i>Supply-chain management</i>        | 11, Supplement 11 |
| 8. <i>Inventory management</i>           | 12, 14, 16        |
| 9. <i>Scheduling</i>                     | 13, 15            |
| 10. <i>Maintenance</i>                   | 17                |

# The Strategic Decisions

## 1. Design of goods and services

- ▶ Defines what is required of operations
- ▶ Product design determines quality, sustainability and human resources

## 2. Managing quality

- ▶ Determine the customer's quality expectations
- ▶ Establish policies and procedures to identify and achieve that quality

Table 1.2 (cont.)

# The Strategic Decisions

## 3. Process and capacity design

- ▶ How is a good or service produced?
- ▶ Commits management to specific technology, quality, resources, and investment

## 4. Location strategy

- ▶ Nearness to customers, suppliers, and talent
- ▶ Considering costs, infrastructure, logistics, and government

Table 1.2 (cont.)

# The Strategic Decisions

## 5. Layout strategy

- ▶ Integrate capacity needs, personnel levels, technology, and inventory
- ▶ Determine the efficient flow of materials, people, and information

## 6. Human resources and job design

- ▶ Recruit, motivate, and retain personnel with the required talent and skills
- ▶ Integral and expensive part of the total system design

Table 1.2 (cont.)

# The Strategic Decisions

## 7. Supply chain management

- ▶ Integrate supply chain into the firm's strategy
- ▶ Determine what is to be purchased, from whom, and under what conditions

## 8. Inventory management

- ▶ Inventory ordering and holding decisions
- ▶ Optimize considering customer satisfaction, supplier capability, and production schedules

Table 1.2 (cont.)

# The Strategic Decisions

## 9. Scheduling

- ▶ Determine and implement intermediate- and short-term schedules
- ▶ Utilize personnel and facilities while meeting customer demands

## 10. Maintenance

- ▶ Consider facility capacity, production demands, and personnel
- ▶ Maintain a reliable and stable process

Table 1.2 (cont.)

## 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

# Opportunities

Operations Management Positions

SEARCH JOBS

Date Job Title

|      |  |
|------|--|
| 1/15 | <b>Plant Manager</b><br>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 application of skills in managing people.   |
| 2/23 | <b>Operations Analyst</b><br>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 a team player with good people skills. West Coast location. Some travel required.  |
| 3/18 | <b>Quality Manager</b><br>Several openings exist in our small package processing facilities in the Northeast, Florida, and Southern California for quality managers. These highly visible positions require extensive use of statistical tools to monitor all aspects of service, timeliness, and workload measurement. The work involves (1) a combination of hands-on applications and detailed analysis using databases and spreadsheets, (2) processing of audits to identify areas for improvement and (3) management of implementation of changes. Positions involve night hours and weekends.   |
| 4/6  | <b>Supply-Chain Manager and Planner</b><br>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. Effective verbal and written communication skills are essential. |
| 5/14 | <b>Process Improvement Consultants</b><br>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.   |

Figure 1.3

## Certifications

- ▶ APICS, the Association for Operations Management
- ▶ American Society for Quality (ASQ)
- ▶ Institute for Supply Management (ISM)
- ▶ Project Management Institute (PMI)
- ▶ Council of Supply Chain Management Professionals
- ▶ Charter Institute of Procurement and Supply (CIPS)

# Significant Events in OM



| Cost Focus  | Quality Focus   | Customization Focus   | Globalization Focus   |
|---|---|---|---|
| <b>Early Concepts</b><br>1776–1880<br>Labor Specialization (Smith, Babbage)<br>Standardized Parts (Whitney)   | <b>Mass Production Era</b><br>1910–1980<br>Moving Assembly Line (Ford/Sorensen)<br>Statistical Sampling (Shewhart)  | <b>Lean Production Era</b><br>1980–1995<br>Just-in-Time (JIT)<br>Computer-Aided Design (CAD)<br>Electronic Data Interchange (EDI) | <b>Mass Customization Era</b><br>1995–2005<br>Internet/E-Commerce<br>Enterprise Resource Planning<br>International Quality Standards (ISO)  |
| <b>Scientific Management Era</b><br>1880–1910<br>Gantt Charts (Gantt)<br>Motion & Time Studies (Gilbreth)<br>Process Analysis (Taylor)<br>Queuing Theory (Erlang) | Economic Order Quantity (Harris)<br>Linear Programming<br>PERT/CPM (DuPont)<br>Material Requirements Planning (MRP) | Total Quality Management (TQM)<br>Baldrige Award<br>Empowerment<br>Kanbans  | <b>Globalization Era</b><br>2005–2020<br>Global Supply Chains<br>Growth of Transnational Organizations<br>Instant Communications<br>Sustainability<br>Ethics in a Global Workforce<br>Logistics |

Figure 1.4

## 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, Navy 1958)
- ▶ 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)

## Operations for Goods and Services

**Services** – Economic activities that typically produce an intangible product (such as education, entertainment, lodging, government, financial, and health services)

# Operations for Goods and Services

- ▶ Manufacturers produce tangible product, services often intangible
- ▶ Operations activities often very similar
- ▶ Distinction not always clear
- ▶ Few pure services

## Differences Between Goods and Services

**TABLE 1.3**

| CHARACTERISTICS OF SERVICES  | CHARACTERISTICS OF GOODS  |
|--|---|
| Intangible: Ride in an airline seat  | Tangible: The seat itself   |
| Produced and consumed simultaneously: Beauty salon produces a haircut that is consumed as it is produced | Product can usually be kept in inventory (beauty care products)                         |
| Unique: Your investments and medical care are unique   | Similar products produced (iPods)   |
| High customer interaction: Often what the customer is paying for (consulting, education)                 | Limited customer involvement in production  |
| Inconsistent product definition: Auto Insurance changes with age and type of car                         | Product standardized (iPhone)   |
| Often knowledge based: Legal, education, and medical services are hard to automate                       | Standard tangible product tends to make automation feasible                             |
| Services dispersed: Service may occur at retail store, local office, house call, or via internet.        | Product typically produced at a fixed facility  |
| Quality may be hard to evaluate: Consulting, education, and medical services                             | Many aspects of quality for tangible products are easy to evaluate (strength of a bolt) |
| Reselling is unusual: Musical concert or medical care  | Product often has some residual value   |

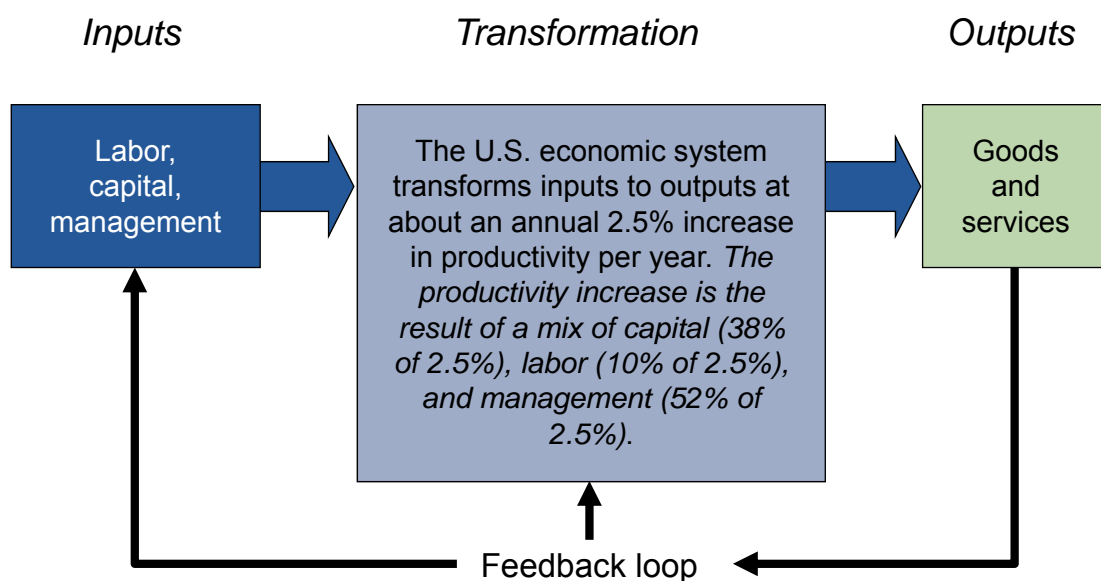
# Productivity Challenge

**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 Economic System



**Figure 1.6**

# 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:**



Stop requiring signatures on credit card purchases under \$25

Change the size of the ice scoop

New espresso machines

Operations improvements have helped Starbucks increase yearly revenue per outlet by \$250,000 to \$1,000,000.

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

per shot

# 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

$$\begin{aligned}\text{Productivity} &= \frac{\text{Units produced}}{\text{Labor-hours used}} \\ &= \frac{1,000}{250} = 4 \text{ units/labor-hour}\end{aligned}$$

*One resource input ⇒ single-factor productivity*

# Multi-Factor Productivity

$$\text{Multifactor} = \frac{\text{Output}}{\text{Labor} + \text{Material} + \text{Energy} + \text{Capital} + \text{Miscellaneous}}$$

- ▶ 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  
Payroll cost = \$640/day

8 titles/day  
Overhead = \$400/day

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

# 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

8 titles/day  
Overhead = \$400/day

## New System:

14 titles/day

Overhead = \$800/day

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

# 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

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

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

## Productivity Improvement

In theoretical terms, there are five potential ways to **improve productivity**:

- 1) Achieve the same output with less input.
- 2) Achieve the more output with the same input.
- 3) Achieve the more output with less input.
- 4) Achieve much more output with more input.
- 5) Achieve less output with much less input.

# Measurement Problems

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

# Productivity Variables

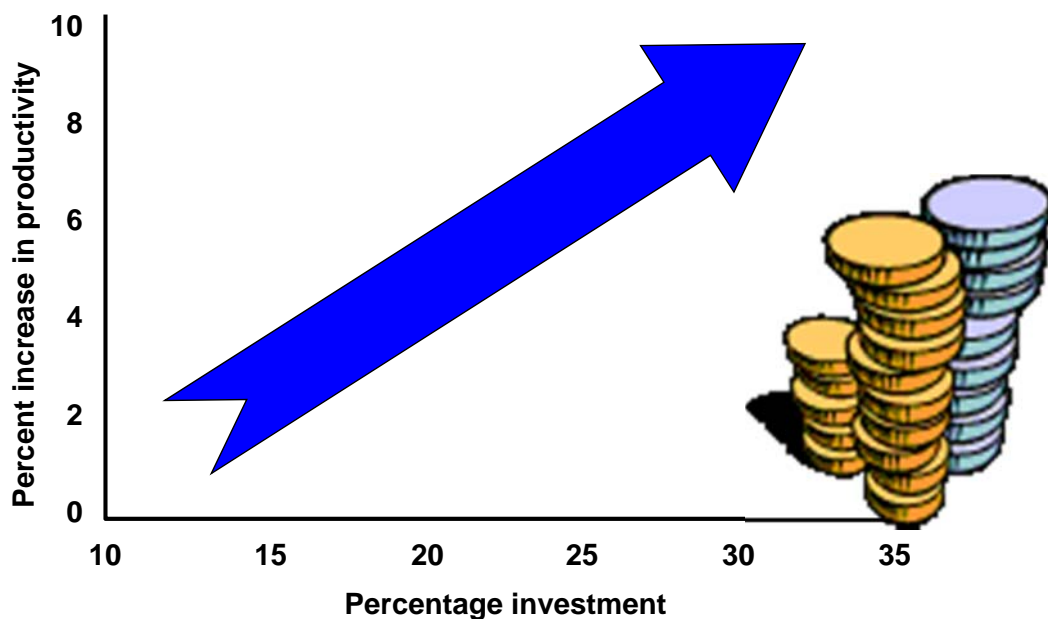
1. **Labor** - contributes about 10% of the annual increase
2. **Capital** - contributes about 38% of the annual increase
3. **Management** - contributes about 52% of the annual increase



# Key Variables for Improved Labor Productivity

1. Basic education appropriate for the labor force
2. Diet of the labor force
3. Social overhead that makes labor available
  - ▶ Challenge is in maintaining and enhancing skills in the midst of rapidly changing technology and knowledge

## Capital



# Management

- ▶ Ensures labor and capital are effectively used to increase productivity
  - ▶ Use of knowledge
  - ▶ Application of technologies
- ▶ **Knowledge societies**
  - ▶ Labor has migrated from manual work to technical and information-processing tasks
- ▶ More effective use of technology, knowledge, and capital

## Productivity in the Service Sector

- ▶ Productivity improvement in services is difficult because:
  1. Typically labor intensive
  2. Frequently focused on unique individual attributes or desires
  3. Often an intellectual task performed by professionals
  4. Often difficult to mechanize and automate
  5. Often difficult to evaluate for quality

# Productivity at Uber

## Improvements:

- ▶ Mobility-as-a-service
- ▶ Low costs and ease of use
- ▶ Peer-to-peer transport services
- ▶ Generates employment
- ▶ Decrease in fuel emission

## Results:

- ▶ Preparation time cut to 8 seconds
- ▶ Management span of control increased from 5 to 30
- ▶ In-store labor cut by 15 hours/day
- ▶ Floor space reduced by more than 50%
- ▶ Stores average 164 seconds/customer from drive-up to pull-out
- ▶ Water- and energy-savings grills conserve 300 million gallons of water and 200 million Kwh of electricity each year
- ▶ Green-inspired cooking method saves 5,800 restaurants \$17 million per year

# Assignment

## Tips for improving productivity at work

### Instructions

1. Team up 4-5 students per group.
2. List the tips for improving productivity at work as many as possible. (10 minutes)
  - utilize automation, train people, etc.
3. Categorize such tips into 3-8 areas. (5 minutes)
4. Prepare your presentation. (5 minutes)
5. Present your work. (3-5 minutes)

## Current Challenges in OM

- ▶ Globalization
- ▶ Supply-chain partnering
- ▶ Sustainability
- ▶ Rapid product development
- ▶ Mass customization
- ▶ Lean operations

# Ethics, Social Responsibility, and Sustainability

## Challenges facing operations managers:

- ▶ Develop and produce safe, high-quality green products
- ▶ Train, retrain, and motivate employees in a safe workplace
- ▶ Honor stakeholder commitments

**Ethics**

### Stakeholders

Those with a vested interest in an organization, including customers, distributors, suppliers, owners, lenders, employees, and community members.

**Challenges facing operations managers:**

- ▶ Develop and produce safe, high-quality green products
- ▶ Train, retrain, and motivate employees in a safe workplace
- ▶ Honor stakeholder commitments