Operations and Productivity

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PowerPoint presentation to accompany Heizer et al.:

- **Operations Management, Twelfth Edition, Global Edition**
- **Principles of Operations Management, Tenth Edition, Global Edition**

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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

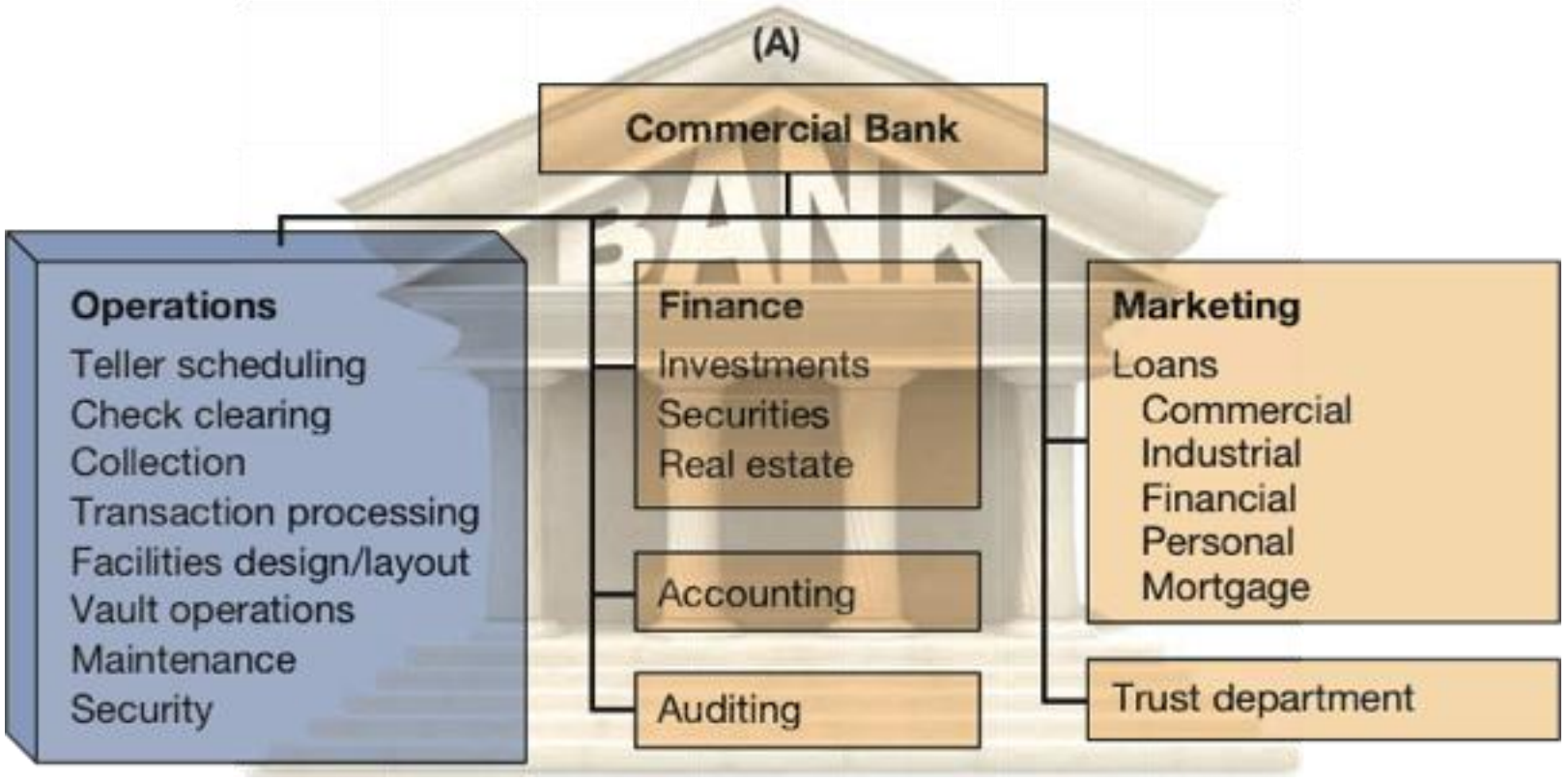
Part of it is **Production Management**

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.

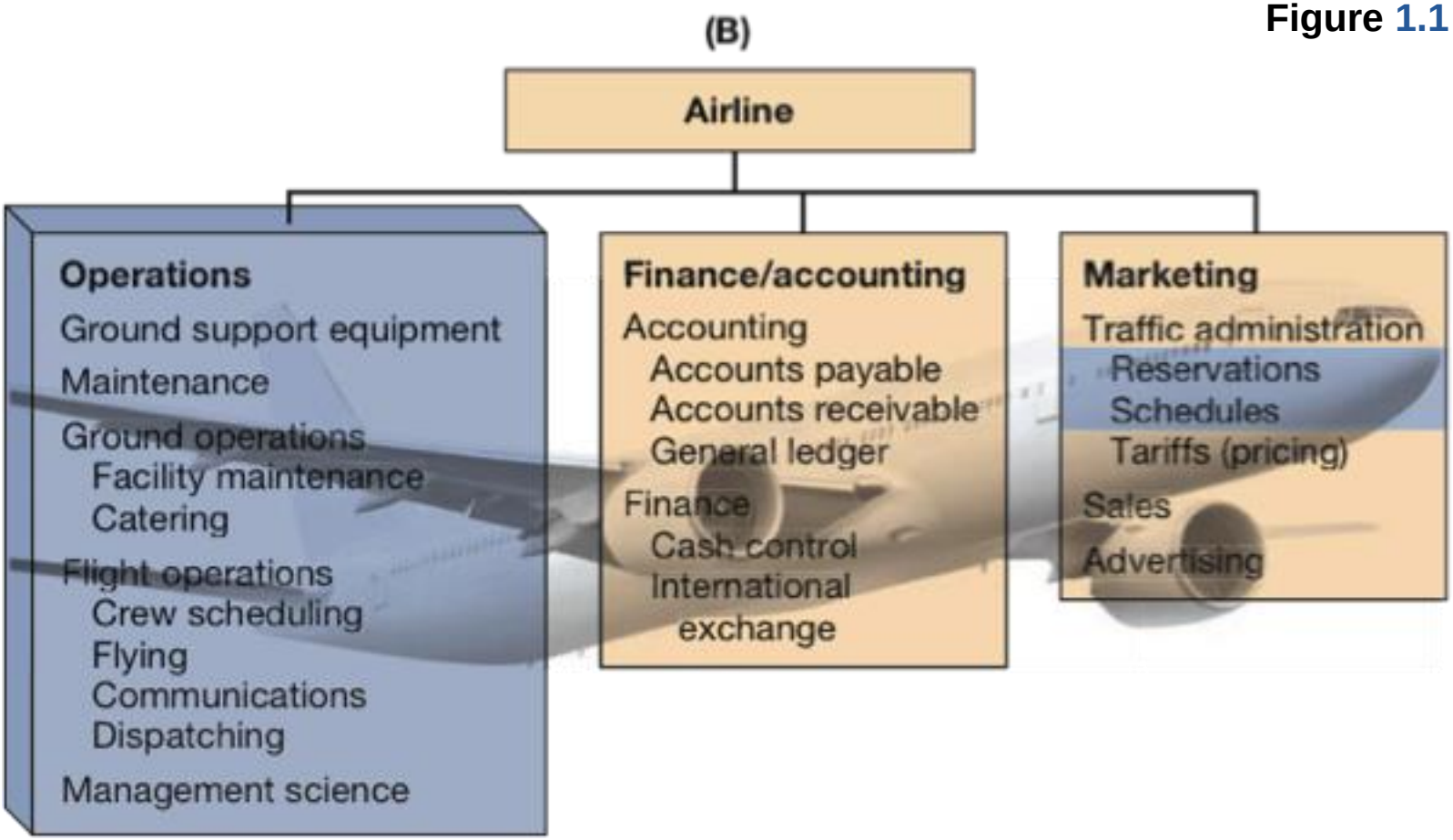
Organizational Charts

Figure 1.1



Organizational Charts

Figure 1.1



Organizational Charts

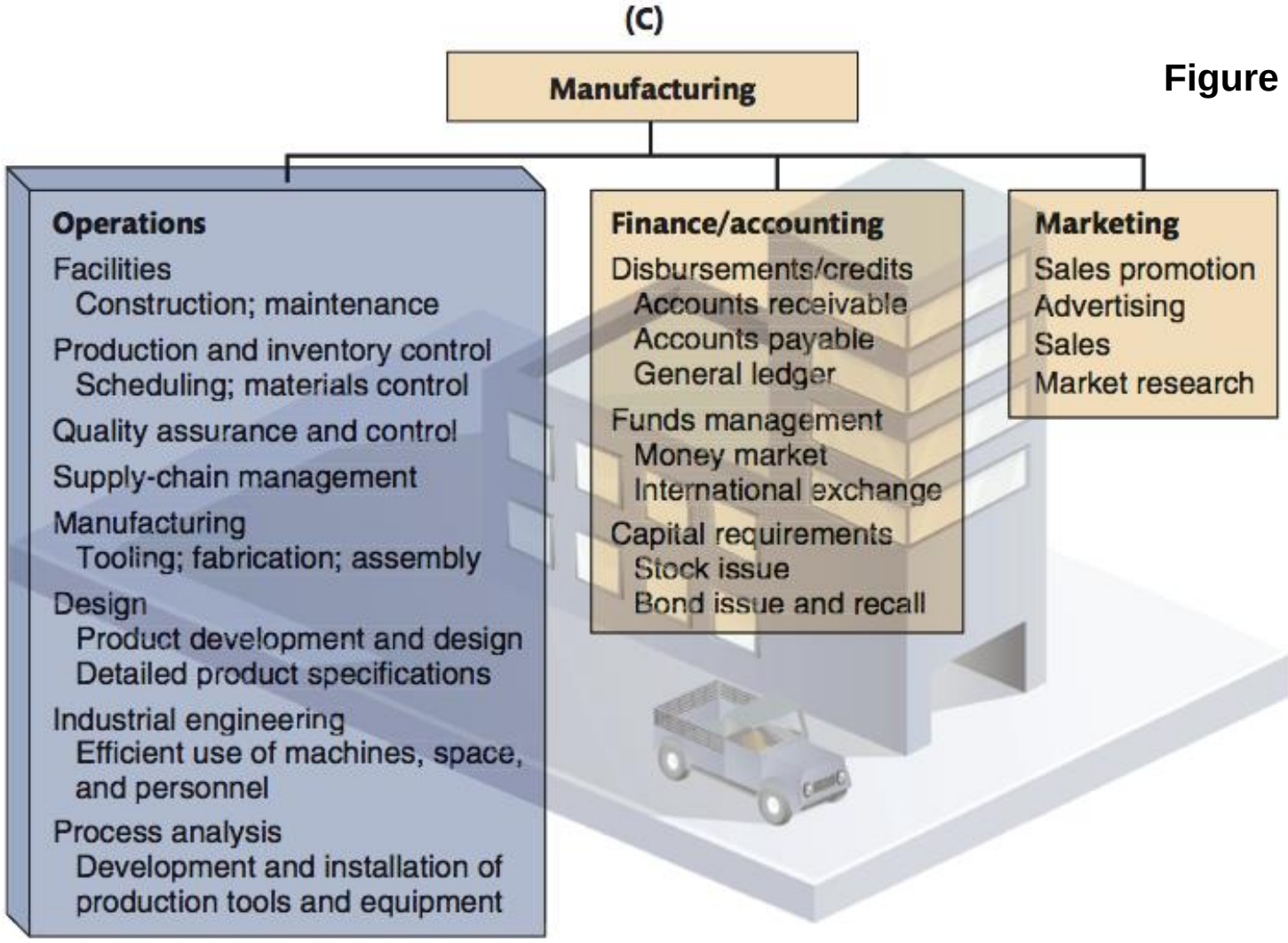


Figure 1.1

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

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

What Operations Managers Do

Basic Management Functions

- Planning
- Organizing
- Staffing
- Leading
- Controlling

Decisions

TABLE 1.2

STRATEGIC (LONG TERM)-> PRODUCTION SYSTEMS DESIGN	TACTICAL/OPERATIONAL (MID-/SHORT- TERM) -> PRODUCTION PLANNING
Design of goods and services	*Supply-chain management*
Managing quality	*Forecasting*
Process and capacity strategy	*Inventory management*
Location strategy	*Material Requirements Planning*
Layout strategy	*Aggregate Planning*
Human resources and job design	*Scheduling*
Climate change, environment, sustainability	*Project Management*
	Maintenance

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.)

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

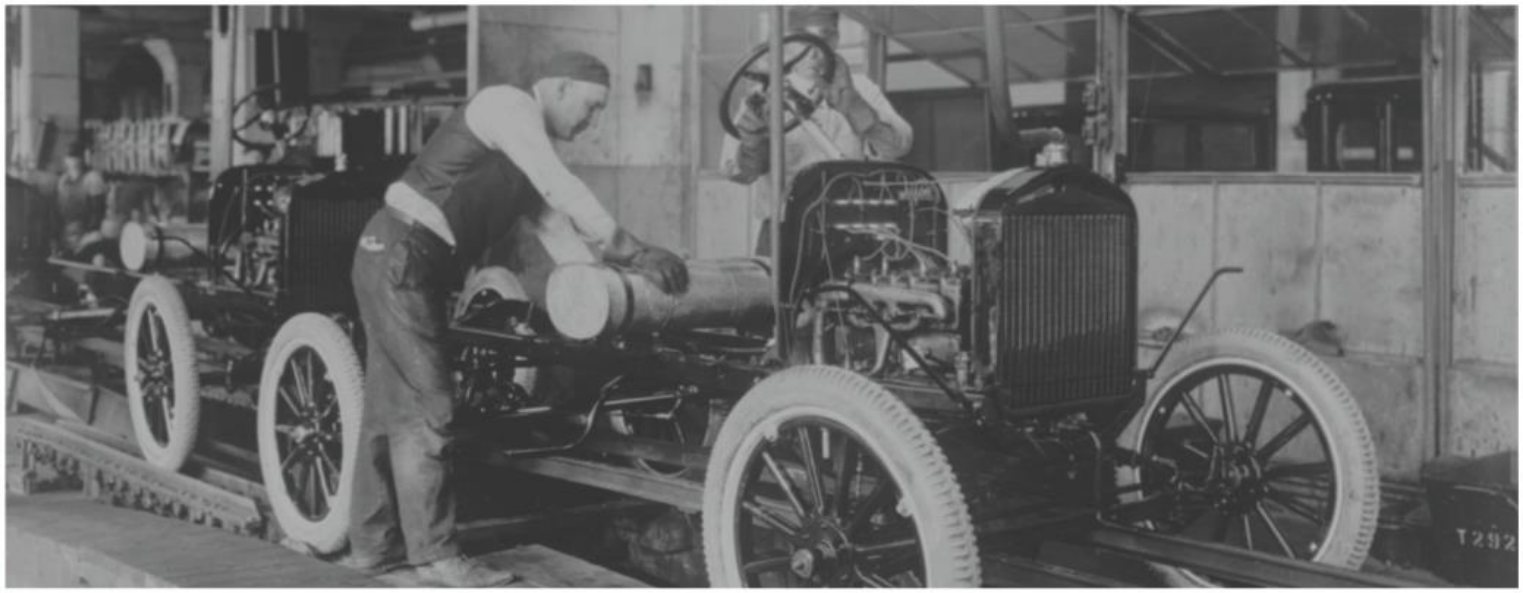
Opportunities

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



Everett Collection/Newscom

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 (MRP)

Quality Focus

Lean Production Era
1980–1995
Just-in-Time (JIT)
Computer-Aided Design (CAD)
Electronic Data Interchange (EDI)
Total Quality Management (TQM)
Baldrige Award
Empowerment
Kanbans

Customization Focus

Mass Customization Era
1995–2005
Internet/E-Commerce
Enterprise Resource Planning
International Quality Standards (ISO)
Finite Scheduling
Supply Chain Management
Mass Customization
Build-to-Order
Radio Frequency Identification (RFID)

Globalization Focus

Globalization Era
2005–2020
Global Supply Chains
Growth of Transnational Organizations
Instant Communications
Sustainability
Ethics in a Global Workforce
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)

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:

1. Matching employees to right job
2. Providing the proper training
3. Providing proper work methods and tools
4. Establishing legitimate incentives for work to be accomplished

Frank and 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!
- Book and Movie: “Cheaper by the Dozen,” “Bells on Their Toes”

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

- Industrial engineering
- Statistics
- Management
- Economics
- Physical sciences
- Information technology

Operations for Goods (Products) 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

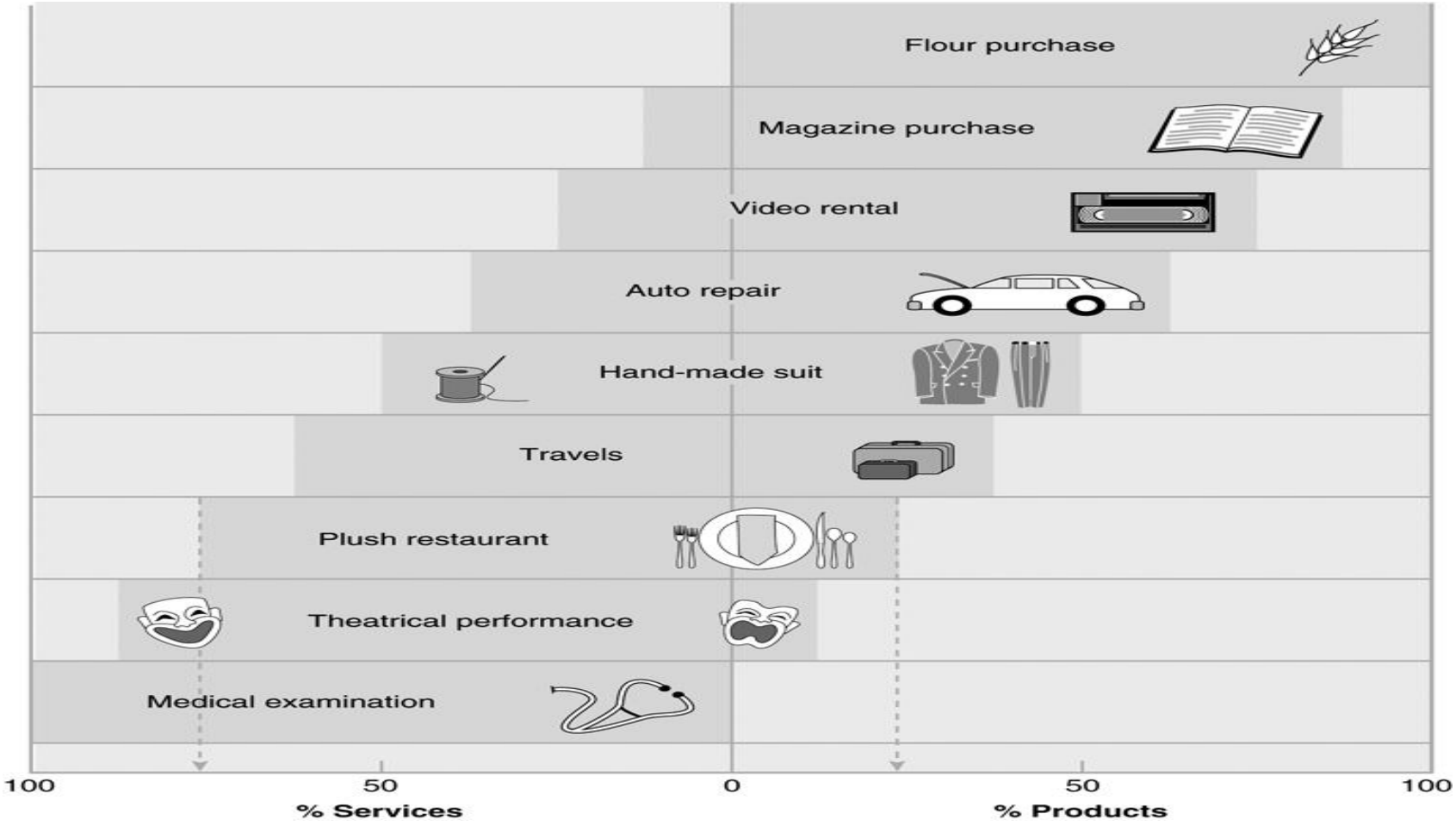
- Manufacturers produce tangible product, services often intangible
- Operations activities often very similar
- Distinction not always clear
- Few pure services

Differences Between Goods and Services

TABLE 1.3

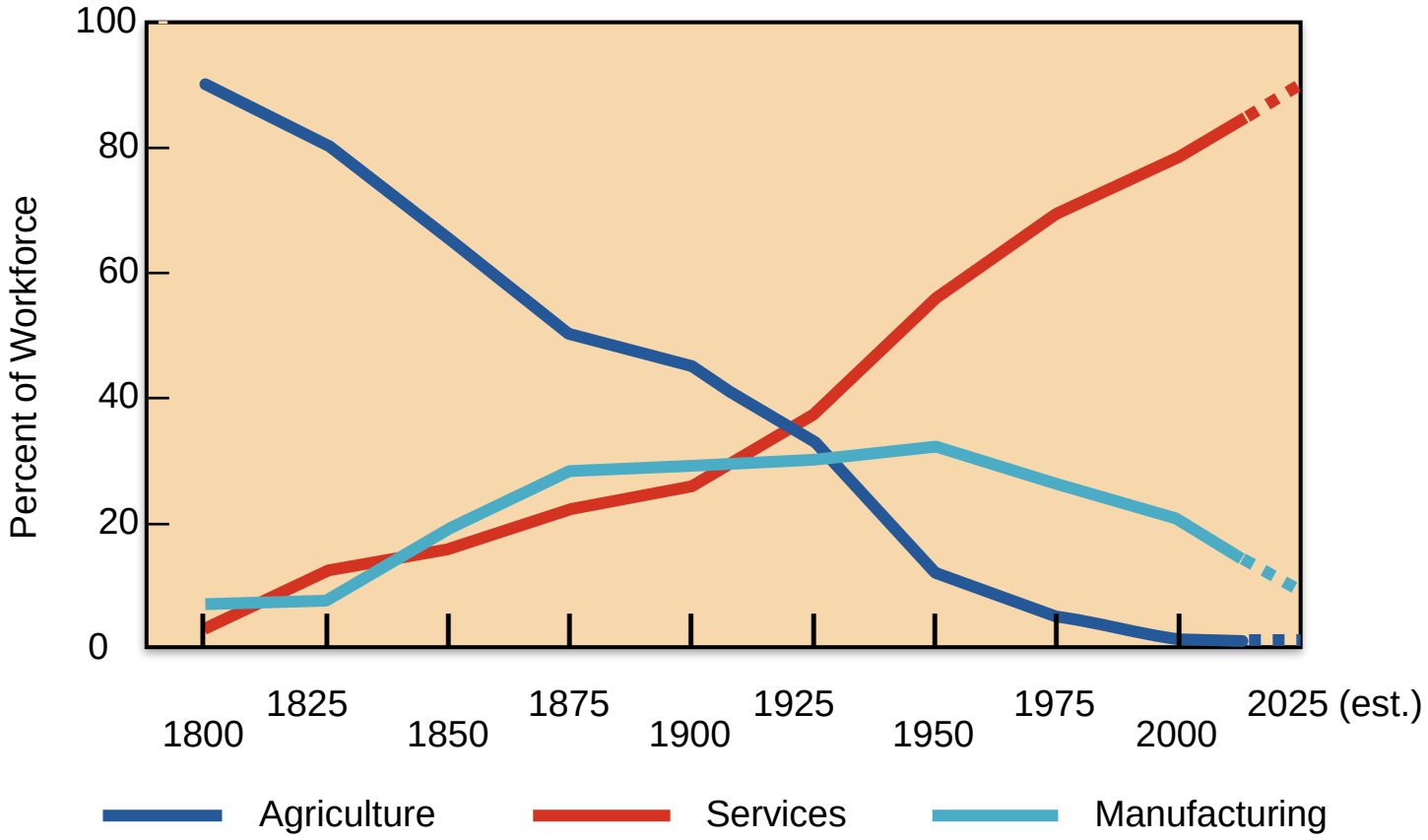
CHARACTERISTICS OF SERVICES	CHARACTERISTICS OF GOODS
Intangible: Ride in an airline seat	Tangible: The seat itself
Produced and consumed simultaneously: Beauty salon produces a haircut that is consumed as it is produced	Product can usually be kept in inventory (beauty care products)
Unique: Your investments 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

From Goods to Services



U.S. Agriculture, Manufacturing, and Service Employment

Figure 1.5



Organizations in Each Sector

TABLE 1.4

SECTOR	EXAMPLE	PERCENT OF ALL JOBS	
Service Sector			
Education, Medical, Other	San Diego State University, Arnold Palmer Hospital	15.3	
Trade (retail, wholesale), Transportation	Walgreen's, Walmart, Nordstrom, Alaska Airlines	15.8	
Information, Publishers, Broadcast	IBM, Bloomberg, Pearson, ESPN	1.9	
Professional, Legal, Business Services, Associations	Snelling and Snelling, Waste Management, Inc., American Medical Association, Ernst & Young	13.6	85.2
Finance, Insurance, Real Estate	Citicorp, American Express, Prudential, Aetna	9.6	
Food, Lodging, Entertainment	Olive Garden, Motel 6, Walt Disney	10.4	
Public Administration	U.S., State of Alabama, Cook County	15.6	
Manufacturing Sector	General Electric, Ford, U.S. Steel, Intel		8.6
Construction Sector	Bechtel, McDermott		4.3
Agriculture	King Ranch		1.4
Mining Sector	Homestake Mining		.5
Grand Total			100.0

Service Pay

- Perception that services are low-paying
- 42% of service workers receive above average wages
- 14 of 33 service industries pay below average
- Retail trade pays only 61% of national average
- Overall average wage is 96% of the average

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

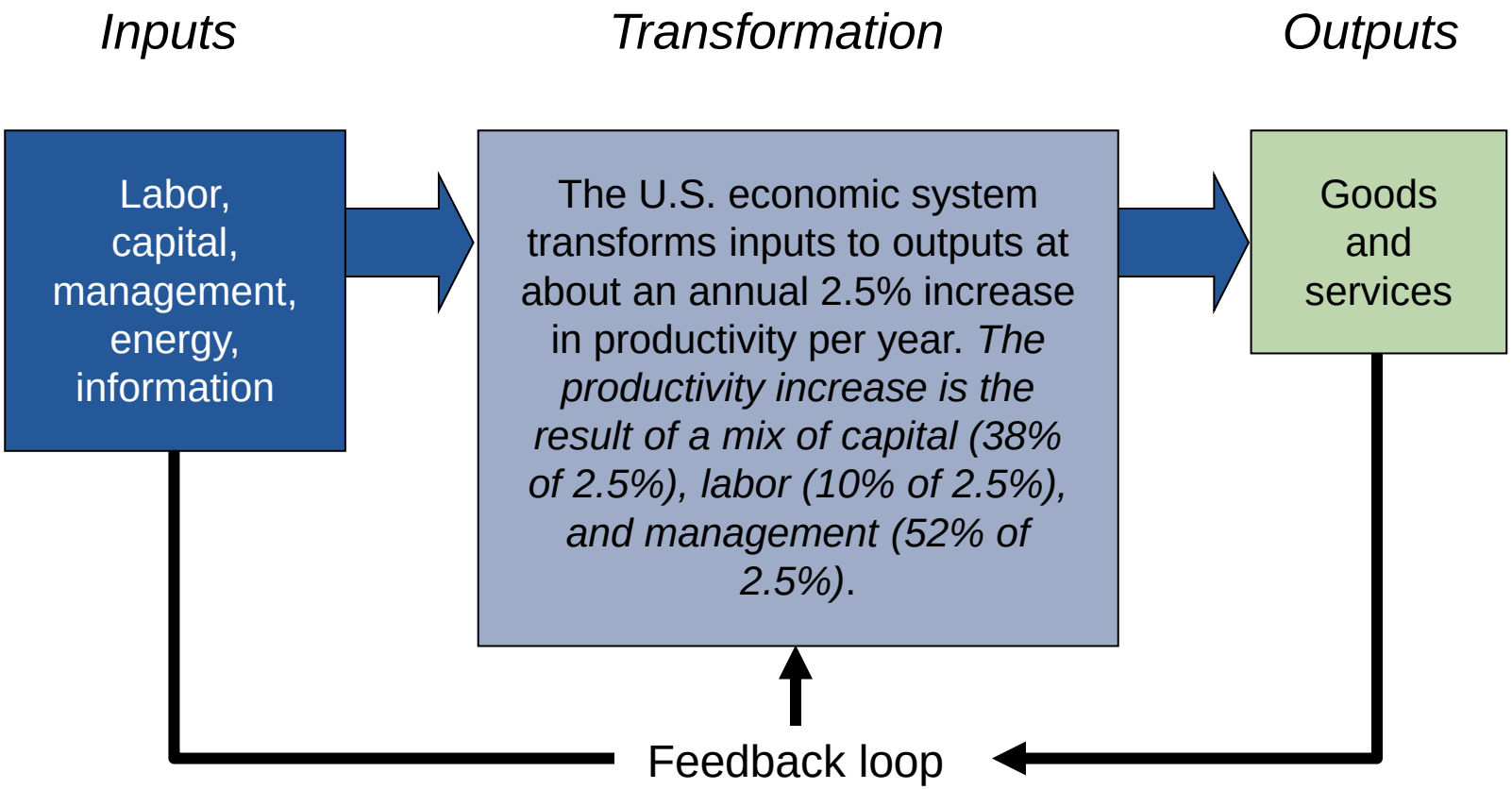


Figure 1.6

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 ti… Some improveme…

Stop requirin… on credit card… under $25

Change the s… scoop

New espress… per shot

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.

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

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

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

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 — 8 titles/day

Payroll cost = $640/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 — 8 titles/day

Payroll cost = $640/day — Overhead = $400/day

New System:

14 titles/day — Overhead = $800/day

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

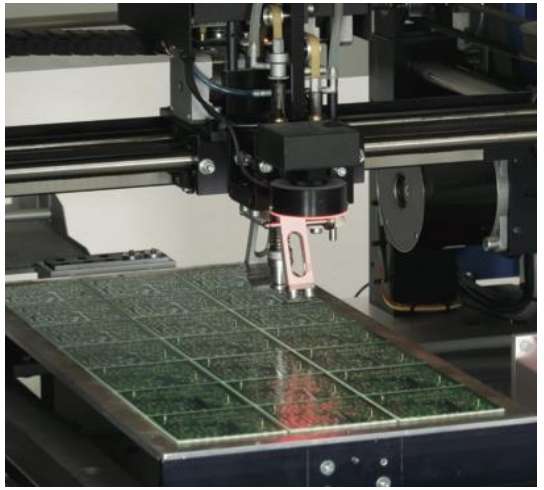
$$\text{New multifactor productivity} = \frac{14 \text{ titles/day}}{\$640 + 800} = .0097 \text{ titles/dollar}$$

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



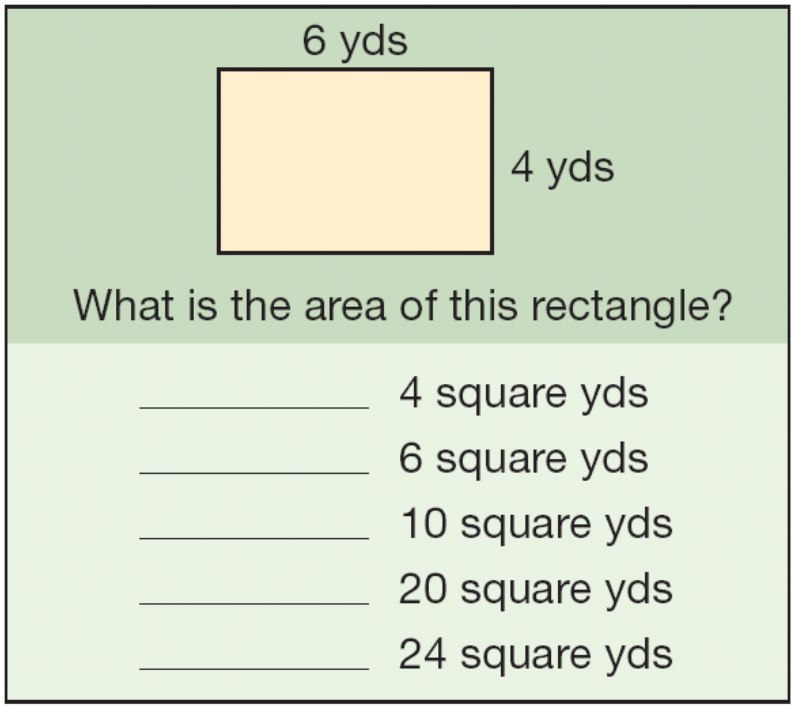
Key Variables for Improved Labor Productivity

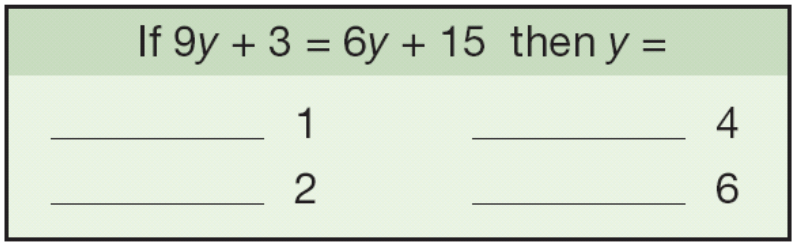
1. Basic education appropriate for the labor force
2. Diet of the labor force
3. Social overhead that makes labor available

   - Challenge is in maintaining and enhancing skills in the midst of rapidly changing technology and knowledge

Labor Skills

About half of the 17-year-olds in the U.S. cannot correctly answer questions of this type





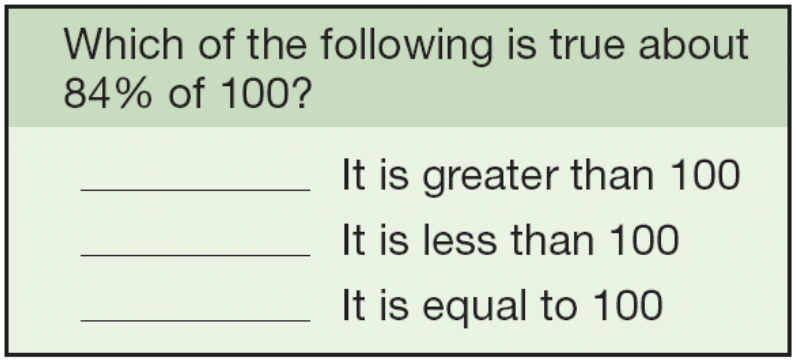
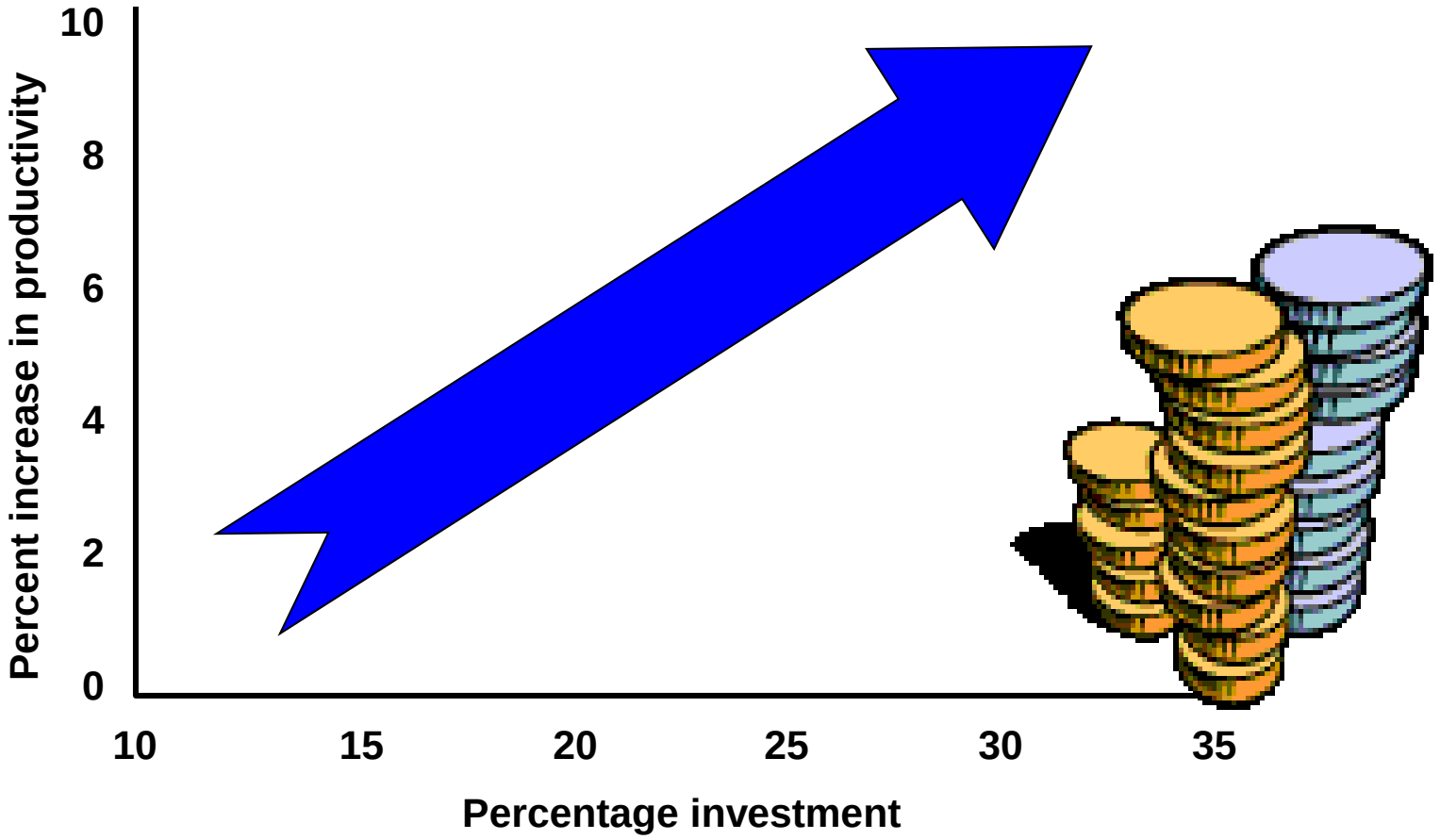


Figure 1.7

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

Technology Innovation by Uber

Innovation:

- Smartphone application
- Peer-to-peer technology
- Concept of mobility as a service
- Putting cab seekers directly in touch with nearby cab providers

Results:

- Daily car trips reduced by 3% in Stockholm
- Number of active cars reduced by 5%
- Reduced CO_2 emissions
- Reduced emissions expected to generate economic value of up to $22 million
- 3,000 jobs created in the short-run
- Total value of $100 million per year created for the society

Current Challenges in OM

- Globalization
- Supply-chain partnering
- Climate Change / 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

Ethic

Stakeholders

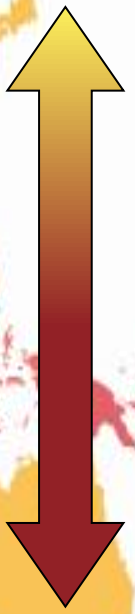
Those with a vested interest in an organization, including customers, distributors, suppliers, owners, lenders, employees, and community members.

Challe
operat

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

Ranking Corruption

Rank	Country	2015 CPI Score (out of 100)
1	Demark	91
2	Finland	90
3	Sweden	89
4	New Zealand	88
5	Netherlands, Norway,	87
7	Switzerland	86
8	Singapore	85
9	Canada	83
10	Germany, UK	81
16	USA	76
18	Japan	75
17	USA	74
30	Taiwan	62
37	South Korea	56
83	China	37
119	Russia	29



Least Corrupt

Most Corrupt

TRANSPARENCY INTERNATIONAL
the global coalition against corruption