SOME REAL-LIFE SCENARIOS IN OM

♦ Man of us have witnessed the agony and the suffering (and even deaths) that many senior citizens have had to endure in order to collect their retirement or pension pay from the various commercial banks. This is an episode that repeats every month or every three months, especially in large urban centers. The government organizations and the banks involved in this service process unfortunately have done nothing so far to improve the situation and increase the quality of this rather routine service (now at least they are talking about it.)

♦ You mail a letter by Express Post (APS) to an address in İstanbul. The recipient gets it after 4 days; whereas a package sent to İstanbul via Varan Kargo is in the hands of the addressee in 6 hours. QUALITY OF SERVICE?

♦ You buy a shirt from an expensive store and pay lots of money; the buttons come off after the shirt is worn three times. The manufacturer has to really make a special(!) effort to achieve this terrible quality.

♦ A THY plane takes off 40 minutes late from an airport because some Japanese tourists on board forget to identify their baggage before boarding the plane. The plane flies from İstanbul to Ankara in 50 minutes. 40 minutes delay for a 50 minute flight!! HOW DO WE EXPLAIN THIS IN TERMS OF EFFICIENCY, PRODUCTIVITY, AND PROFITABILITY?

♦ Why do many people prefer McDonald’s despite the fact that it is much more expensive than comparable food served elsewhere? The same is true for Varan and Ulusoy bus companies.

♦ When you go to some government office (say, the Tax Bureau) you spend so much time and effort and cover so much ground (the elevators never seem to work either) that you feel terribly exhausted after a very routine task. Is the whole process designed to maximize pain to citizens?

♦ During registration periods at many universities, poor students have to report to so many different offices and people, and have to wait so long in several lines. Not only the students but also instructors and administrators have to go through the same unpleasant experience. Indeed, we are a society of endless waiting lines! IS THIS SOMETHING ORDAINED BY GOD OR WHAT??
Outline
♦ Global company profile: Hard Rock Cafe
♦ What is Operations Management?
♦ The heritage of Operations Management
♦ Why study OM?
♦ What Operations Managers do
  ♦ How this book is organized
  ♦ Organizing to produce goods and services
  ♦ Where are the OM jobs?
♦ Exciting new trends in Operations Management

Outline - Continued
♦ Operations in the service sector
  ♦ Differences between goods and services
  ♦ Growth of services
  ♦ Service pay
♦ The Productivity challenge
  ♦ Productivity measurement
  ♦ Productivity variables
  ♦ Productivity and the Service Sector
♦ The challenge of social responsibility

Learning Objectives
When you complete this chapter, you should be able to:
♦ Identify or Define:
  ♦ Production and productivity
  ♦ Operations Management (OM)
  ♦ What operations managers do
  ♦ Services

Learning Objectives - continued
When you complete this chapter, you should be able to:
♦ Describe or Explain:
  ♦ A brief history of operations management
  ♦ Career opportunities in operations management
  ♦ The future of the discipline
  ♦ Measuring productivity

Hard Rock Cafe
♦ First opened in 1971 in Orlando, Florida
♦ Now – 110 restaurants in over 40 countries
♦ Rock music memorabilia
♦ Creates value in the form of good food and entertainment
♦ 3,500+ custom meals per day
♦ 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 is the set of activities that creates value in the form of goods and services by transforming inputs into outputs
OM Involves Managing Transformations

 OM Involves Managing Transformations

Input ➔ Transformation Process (Value Adding) ➔ Output

- People
- Plants
- Parts
- Processes
- Planning and Control

Transformation is enabled by The 5 Ps of OM:

- Physical and chemical—manufacturing (shoes, PC's, planes, paint, detergents)
- Locational—transportation (rail, sea, air, road)
- Exchange—retailing (all kinds of stores, offices)
- Storage—warehousing (normal and cold storage)
- Physiological—health care (hospitals, clinics)
- Informational—telecommunications (schools, Reuter Services, Internet and BBS's, news media, TV services, EMU, METU)

Operations as the Technical Core

Operations ➔ Finance, Personnel ➔ Marketing, Workers ➔ Purchasing, Suppliers ➔ Capital Markets, Stockholders

The Heritage of Operations Management

Division of labor (Adam Smith 1776 and Charles Babbage 1852)
Standardized parts (Whitney 1800)
Scientific Management (Taylor 1881)
Coordinated (moving) assembly line (Ford, Sorenson/Avery 1913)
Gantt charts (Gantt 1916)
Economic Lot Size Formula (Harris 1915)
Motion study (Frank and Lillian Gilbreth 1922)
Quality control (Shewhart 1924; Deming 1950)
Computer (Atanasoff & Berry 1938; Iowa State U.)
CPMP/PERT (DuPont 1957; U.S. Navy 1956)

The Heritage of Operations Management - continued

Material requirements planning (Orlicky 1960)
Computer aided design (CAD 1970)
Flexible manufacturing system (FMS 1975)
JIT, TQC, TQM, factory automation, KANBAN, Poka-Yoke - 1980's
Computer integrated manufacturing (CIM) (1990)
EFQM and Baldridge Quality Awards (1981)
Globalization (1993)
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 time & motion studies
- Created efficiency principles

Taylor: 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 & 12 children!
  - (Book & Movie: “Cheaper by the Dozen,” book: “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 & 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 (ergonomics, fatigue studies)
♦ Industrial engineering
♦ Operations Research (Management science)
♦ Biological science
♦ Physical sciences
♦ Information science

What is Industrial Engineering?

Industrial engineering is concerned with the design, installation, and improvement of integrated systems of people, material, information, equipment and energy. It draws upon specialized knowledge and skills in the mathematical, physical and social sciences, together with the principles and methods of engineering analysis and design to specify, predict and evaluate the results to be obtained from such systems.

IIE Web Site -- http://www.iienet.org

What is Operations Research?

OR/MS Professionals aim to provide rational bases for decision making by seeking to understand and structure complex situations and to use this understanding to predict system behavior and improve system performance. Much of this work is done using analytical and numerical techniques to develop and manipulate mathematical and computer models of organizational systems composed of people, machines, and procedures. ...

IIE Web Site -- http://www.iienet.org

What is Operations Research?

OR/MS draws upon ideas from engineering, management, mathematics, and psychology to contribute to a wide variety of application domains; the field is closely related to several other fields in the "decision sciences" -- applied mathematics, computer science, economics, and industrial engineering.

INFORMS Web Site -- http://www.informs.org

Significant Events in OM

♦ Division of labor (Smith, 1776)
♦ Standardized parts (Whitney, 1800)
♦ Scientific management (Taylor, 1881)
♦ Moving assembly line (Ford 1913)
♦ Gantt charts (Gantt, 1916)
♦ Motion study (the Gilbreths, 1922)
♦ Quality control (Shewhart, 1924)
Significant Events - Continued

♦ CPM/PERT (Dupont, 1957)
♦ MRP (Orlicky, 1960)
♦ Computer-aided design (CAD)
♦ Flexible manufacturing systems (FMS)
♦ Computer integrated manufacturing (CIM)

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 know what operations managers do
♦ OM is such a costly part of an organization

Options for Increasing Contribution

<table>
<thead>
<tr>
<th>Marketing Option</th>
<th>Finance &amp; Accounting Option</th>
<th>OM Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales $100,000</td>
<td>Finance Costs: 50%</td>
<td>Production Costs: 20%</td>
</tr>
<tr>
<td>Cost of Goods Sold $80,000</td>
<td>$100,000</td>
<td>$40,000</td>
</tr>
<tr>
<td>Gross Margin $20,000</td>
<td>$30,000</td>
<td>$20,000</td>
</tr>
<tr>
<td>Finance Costs $5,000</td>
<td>$3,000</td>
<td>$2,000</td>
</tr>
<tr>
<td>Transformation $14,000</td>
<td>$24,000</td>
<td>$30,000</td>
</tr>
<tr>
<td>Taxes @ 25% $3,500</td>
<td>$6,000</td>
<td>$7,500</td>
</tr>
<tr>
<td>Contribution $10,500</td>
<td>$18,000</td>
<td>$22,500</td>
</tr>
</tbody>
</table>

Increase in Contribution 71%  21%  114%

What Operations Managers Do

♦ Plan
♦ Organize
♦ Staff
♦ Lead
♦ Control

Ten Critical Decisions

♦ Service, product design ......... Ch. 5
♦ Quality management ......... Ch. 6, 6S
♦ Process, capacity design ......... Ch. 7, 7S
♦ Location ......... Ch. 8
♦ Layout design ......... Ch. 9
♦ Human resources, job design ......... Ch. 10, 10S
♦ Supply-chain management ......... Ch. 11
♦ Inventory management ......... Ch. 12, 12S, 14
♦ Scheduling ......... Ch. 13, 15, 16
♦ Maintenance ......... Ch. 17

The Critical Decisions

♦ Service and product design
  ♦ What product or service should we offer?
  ♦ How should we design these products and services?
♦ Quality management
  ♦ Who is responsible for quality?
  ♦ How do we define quality?
The Critical Decisions - Continued

- **Process and capacity design**
  - What processes will these products require and in what order?
  - What equipment and technology is necessary for these processes?

- **Location**
  - Where should we put the facility
  - On what criteria should we base this location decision?

- **Layout design**
  - How should we arrange the facility?
  - How large a facility is required?

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

- **Supply chain management**
  - Should we make or buy this item?
  - Who are our good suppliers and how many should we have?

- **Inventory, material requirements planning, JIT “just-in-time” inventory,**
  - How much inventory of each item should we have?
  - When do we re-order?

- **Intermediate, short term, and project scheduling**
  - Is subcontracting production a good idea?
  - Are we better off keeping people on the payroll during slowdowns?

- **Maintenance**
  - Who is responsible for maintenance?

Organizational Functions

- **Marketing**
  - Gets customers

- **Operations**
  - Creates product or service

- **Finance/Accounting**
  - Obtains funds
  - Tracks money

Functions - Bank

- Commercial Bank
  - Marketing
  - Operations
  - Finance/Accounting
    - Teller Scheduling
    - Check Clearing
    - Transactions Processing
    - Security
Functions - Airline

- Marketing
- Operations
- Finance/Accounting
  - Flight Operations
  - Ground Operations
  - Facility Maintenance
  - Catering

Functions - Manufacturer

- Marketing
- Operations
- Finance/Accounting
  - Manufacturing
  - Production Inv. Control
  - Quality Control
  - Purchasing

Organizational Charts - Commercial Bank

- Operations
  - Teller Scheduling
  - Check Clearing
  - Transactions processing
  - Facilities design/layout
  - Vault operations
  - Maintenance
  - Security

- Marketing
  - Loans
    - Commercial
    - Industrial
  - Financial
  - Personal
  - Mortgage

- Accounting
  - Trust Department

Organizational Charts - Airline

- Operations
  - Ground support equipment
  - Maintenance
  - Facility maintenance
  - Catering
  - Flight Operations
  - Crew scheduling
  - Flying
  - Communications
  - Dispatching
  - Management science

- Marketing
  - Traffic administration
  - Reservations
  - Schedules
  - Tariffs (pricing)
  - Sales
  - Advertising

Organizational Charts - Manufacturing

- Operations
  - Facilities:
    - Construction/maintenance
    - Production & inventory control
    - Scheduling: materials 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 issues
  - Bond issues and recall

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
Where Are the OM Jobs?

PLANT MANAGER

Director of Purchasing

New Challenges in OM

From

To

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

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

Quality Manager

Process Improvement/Continual Improvement

Supply Chain Manager and Planner

Changing Challenges for the Operations Manager (Details)

Past Causes Future

Local or national focus Low-cost, reliable worldwide communication and transportation networks Global Focus
Batch large shipments Cost of capital puts pressure on reducing investment in Just-in-time shipments
Low bid purchasing Quality emphasis requires that suppliers be engaged in product improvement Supply-chain partners
Lengthy product development Shorter life cycles, rapid international communication, computer-aided design, and international collaboration Rapid product development, alliances, collaborative designs

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 & consumed at same time
♦ Often unique
♦ High customer interaction
♦ Inconsistent product definition
♦ Often knowledge-based (education, medical, legal)
♦ Frequently dispersed (local office, housecall, etc)
**Goods Versus Services**

**Goods**
- Can be resold
- Can be inventoried
- Some aspects of quality measurable
- Selling is distinct from production

**Service**
- Reselling unusual
- Difficult/impossible to inventory
- Quality difficult to measure
- Selling is part of service

---

**Goods Versus Services - Continued**

**Goods**
- Product is transportable
- Site of facility important for cost
- Often easy to automate
- Revenue generated primarily from tangible product

**Service**
- Provider, not product, is transportable
- Site of facility important for customer contact
- Often difficult to automate
- Revenue generated primarily from intangible service.

---

**Goods Contain Services & Services Contain Goods**

- Automobile
- Computer
- Installed Carpeting
- Fast-food Meal
- Restaurant Meal
- Auto Repair
- Hospital Care
- Advertising Agency
- Investment Management
- Consulting Service
- Counseling

---

**Development of the Service Economy**

- U.S. Employment, % Share
- Services as a Percent of GDP
- U.S. Exports of Services

---

**The U.S. Economic System Transforms Inputs to Outputs**

**Inputs**
- Land, Labor, Capital, Management

**Process**
- The economic system transforms inputs to outputs at about an annual 2.5% increase in productivity (capital 38% of 2.5%), labor (10% of 2.5%), management (52% of 2.5%)

**Outputs**
- Goods and Services

---

**Whirlpool**

- Productivity improved increased
- Costs were pared (gradually decreased)
- Wages

---
**Productivity**

- Measure of process improvement
- How well resources are used
- Represents output relative to input
  \[
  \text{Productivity} = \frac{\text{Units produced}}{\text{Input used}}
  \]
- Productivity increases improve standard of living
- From 1889 to 1973, U.S. productivity increased at a 2.5% annual rate

**Productivity Variables**

\[
\text{Productivity} = \frac{\text{Output}}{\text{Inputs}} = \frac{\text{Labor + material + energy + capital + miscellaneous}}{\text{Output}}
\]

This is called “multifactor productivity.”

**Single Factor Productivity**

- labor \[ \frac{\text{output}}{\text{labor hours}} \]
- material \[ \frac{\text{output}}{\text{amount of material}} \]
- energy
- capital
- miscellaneous

**Illustration (single factor)**

- Assume units produced = 2000
  - labor-hours used = 500 hrs.
- Productivity = 2000 units/500 hours = 4 units/hour
- If units produced increases to 2500, then productivity = 5 units/hour which means a productivity increase of 25%.

**Illustration (multifactor)**

- Refer to example 2 on page 15 of textbook.

**Measurement Problems**

- Quality may change while the quantity of inputs and outputs remains constant
- External elements may cause an increase or decrease in productivity (Think of TRNC where energy is a problem -- frequent blackouts..)
- Precise units of measure may be lacking (not all cars require the same inputs. VW versus Porche)
Productivity Variables

- **Labor** - contributes about 10% of the annual increase
- **Capital** - contributes about 32% 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 (transportation, sanitation, health services, etc.)
- Maintaining and enhancing skills in the midst of rapidly changing technology and knowledge

Jobs in the U.S

<table>
<thead>
<tr>
<th>Industry</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education, Health, etc.</td>
<td>14%</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>9%</td>
</tr>
<tr>
<td>Retail Trade</td>
<td>8%</td>
</tr>
<tr>
<td>State &amp; Local Gov’t</td>
<td>5%</td>
</tr>
<tr>
<td>Finance, Insurance</td>
<td>6%</td>
</tr>
<tr>
<td>Wholesale Trade</td>
<td>6%</td>
</tr>
<tr>
<td>Transport, Public Util.</td>
<td>4%</td>
</tr>
<tr>
<td>Construction</td>
<td>3%</td>
</tr>
<tr>
<td>Federal Government</td>
<td>2%</td>
</tr>
<tr>
<td>Mining</td>
<td>1%</td>
</tr>
</tbody>
</table>

Productivity Growth 1971-1992

<table>
<thead>
<tr>
<th>Region</th>
<th>Growth Rate of Labor Productivity (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S.</td>
<td>2.5</td>
</tr>
<tr>
<td>U.K.</td>
<td>3.5</td>
</tr>
<tr>
<td>W Germany</td>
<td>3.0</td>
</tr>
<tr>
<td>France</td>
<td>2.6</td>
</tr>
<tr>
<td>Japan</td>
<td>3.4</td>
</tr>
</tbody>
</table>

Comparison of Productivity United States, Japan, Germany

<table>
<thead>
<tr>
<th>Country</th>
<th>Labor Productivity Growth 1971-1992</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>W Germany</td>
</tr>
</tbody>
</table>
**Investment and Productivity in Selected Nations**

<table>
<thead>
<tr>
<th>Nation</th>
<th>Nonresidential fixed investment to GNP (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S.</td>
<td>10</td>
</tr>
<tr>
<td>U.K.</td>
<td>8</td>
</tr>
<tr>
<td>Canada</td>
<td>6</td>
</tr>
<tr>
<td>Italy</td>
<td>4</td>
</tr>
<tr>
<td>Belgium</td>
<td>3</td>
</tr>
<tr>
<td>France</td>
<td>2</td>
</tr>
<tr>
<td>Netherlands</td>
<td>1</td>
</tr>
<tr>
<td>Japan</td>
<td>0</td>
</tr>
<tr>
<td>Best fit</td>
<td>0.012</td>
</tr>
</tbody>
</table>

**A SAD PICTURE**

- **GDP per Hour**
  - Japan: 10,000
  - Italy: 8,000
  - France: 6,000
  - Netherlands: 4,000
  - Belgium: 2,000
  - U.S.: 1,000
  - U.K.: 400

**Service Productivity**

- Typically labor intensive
- Frequently individually processed
- Often an intellectual task performed by professionals
- Often difficult to mechanize
- Often difficult to evaluate for quality

**Some Bestseller Books on Operations Management**


**Some Landmark Articles on Operations Management**