Introduction to Operations Management

The management of systems or processes that create goods and/or provide services.

Value-Added

The difference between the cost of inputs and the value or price of outputs.

Goods-Service Continuum

Figure 1.8

<table>
<thead>
<tr>
<th>Steel production</th>
<th>Home remodeling</th>
<th>Retail sales</th>
<th>Auto Repair</th>
<th>Maid Service</th>
<th>Teaching</th>
<th>Laser mowing</th>
</tr>
</thead>
<tbody>
<tr>
<td>High percentage goods</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low percentage service</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Tangible product

Service action
Production of Goods vs. Delivery of Services

- Production of goods – tangible output
- Delivery of services – an act
- Service job categories
  - Government
  - Wholesale/retail
  - Financial services
  - Healthcare
  - Personal services
  - Business services
  - Education

Key Differences Product vs. Service

1. Customer contact: high or low?
2. Uniformity of input: uniform or variable?
3. Labor content of jobs
4. Uniformity of output
5. Measurement of productivity
6. Production and delivery
7. Quality assurance
8. Amount of inventory

Manufacturing vs Service

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Manufacturing</th>
<th>Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output</td>
<td>Tangible</td>
<td>Intangible</td>
</tr>
<tr>
<td>Customer contact</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Uniformity of input</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Labor content</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Uniformity of output</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Measurement of productivity</td>
<td>Easy</td>
<td>Difficult</td>
</tr>
<tr>
<td>Opportunity to correct</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>quality problems</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 1.4

As Productivity increases, # manufacturing jobs decrease?
Does productivity affect standard of living?

Diversity of Operations Management

Table 1.4

<table>
<thead>
<tr>
<th>Operations</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goods Producing</td>
<td>Farming, mining, construction, manufacturing, power generation</td>
</tr>
<tr>
<td>Storage/Transportation</td>
<td>Warehousing, trucking, mail service, moving, taxis, buses, hotels, airlines</td>
</tr>
<tr>
<td>Exchange</td>
<td>Retailing, wholesaling, banking, renting, leasing, library, loans</td>
</tr>
<tr>
<td>Entertainment</td>
<td>Films, radio and television, concerts, recording</td>
</tr>
<tr>
<td>Communication</td>
<td>Newspapers, radio and television newscasts, telephone, satellites</td>
</tr>
</tbody>
</table>

Scope of Operations Management

- Operations Management includes:
  - Forecasting
  - Capacity planning
  - Scheduling
  - Managing inventories
  - Assuring quality
  - Motivating employees
  - Deciding where to locate facilities
  - And more . . .
### Responsibilities of Operations Management

Table 1.6

<table>
<thead>
<tr>
<th>Planning</th>
<th>Organizing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity</td>
<td>Degree of centralization</td>
</tr>
<tr>
<td>Location</td>
<td>Process selection</td>
</tr>
<tr>
<td>Products &amp; services</td>
<td></td>
</tr>
<tr>
<td>Make or buy</td>
<td>Staffing</td>
</tr>
<tr>
<td>Layout</td>
<td>- Hiring/laying off</td>
</tr>
<tr>
<td>Projects</td>
<td>- Use of Overtime</td>
</tr>
<tr>
<td>Scheduling</td>
<td>Directing</td>
</tr>
<tr>
<td>Controlling/Improving</td>
<td>- Incentive plans</td>
</tr>
<tr>
<td>Inventory</td>
<td>- Issuance of work orders</td>
</tr>
<tr>
<td>Quality</td>
<td>- Job assignments</td>
</tr>
<tr>
<td>Costs</td>
<td></td>
</tr>
<tr>
<td>Productivity</td>
<td></td>
</tr>
</tbody>
</table>

### Key Decisions of Operations Managers

- What resources/what amounts
- When Needed/scheduled/ordered
- Where Work to be done
- How Designed
- Who To do the work

### Decision Making

**System operation**
- personnel
- inventory
- scheduling
- project management
- quality assurance

**System Design**
- Forecasting
- Capacity
- Process selection
- Work System layout
- location
- arrangement of departments
- product and service planning
- acquisition and placement of equipment

### Models

A model is an abstraction of reality (e.g. a miniature airplane used in wind tunnel testing). Types of models include:
- Physical
- Schematic
- Mathematical

**Tradeoffs:** cost vs. reality

What are the pros and cons of models?

### Models Are Beneficial

- Easy to use, less expensive
- Require users to organize
- Systematic approach to problem solving
- Increase understanding of the problem
- Enable “what if” questions
- Specific objectives
- Consistent tool
- Power of mathematics
- Standardized format
Introduction to Operations Management

Quantitative Approaches
- Linear programming
- Queuing Techniques
- Inventory models
- Project models
- Statistical models

Systems Approach
"The whole is greater than the sum of the parts." (e.g. holistic vs. atomistic)

Sub-optimization

Pareto Phenomenon
- A few factors account for a high percentage of the occurrence of some event(s).
  - A pervasive & important concept for establishing priorities
- 80/20 Rule - 80% of output problems are caused by 20% of the input factors.
  
  How do we identify the vital few?

Business Operations Overlap

Operations Interfaces

Operations
- Industrial Engineering
- Maintenance
- Public Relations
- Personnel
- MIS
- Accounting
- Purchasing
- Distribution

Figure 1.5

Homework
- Go to Stevenson web site (you can get there from my home page)
- Go to Chapter 1 resources
- Do first Multiple Choice quiz (5 questions)
- Email it to me (mlewis14@missouriwestern.edu)

Due before class next Wednesday 5 Sep 06
**Activity**

- Break up into small groups (~3 people)
  - Discuss (5 minutes) the following
    - Jobs worked
    - Best job/Worst job (and why)
    - Service or Production?
- Think of a question you have about me
- Pick a representative from the group to “present” results

**Historical Evolution of Operations Management**

**Table 1.7**

- **Industrial revolution (1770’s)**
  - Craft production → standardization & economies of scale
- **Scientific management (1911)**
  - Mass production / Interchangeable parts / Division of labor
  - Gilbreth’s time-motion studies
- **Human relations movement (1920-60)**
  - Worker motivation
- **Decision models (1915, 1960-70’s)**
  - Operations Research, Linear Programming, QC
- **Influence of Japanese manufacturers (Taguchi)**
  - Robust design → quality → social benefit

**Trends in Business**

- **Major trends**
  - The Internet, e-commerce, e-business
  - Management technology
  - Globalization
  - Management of supply chains
  - Agility
    - Lean Production (highly skilled workforce and flexible machines to quickly produce high quantity/quality with little excess inventory)

**Simple Product Supply Chain**

**Figure 1.7**

*Supply Chain: A sequence of activities and organizations involved in producing and delivering a good or service*

**A Supply Chain for Bread**

<table>
<thead>
<tr>
<th>Stage of Production</th>
<th>Value Added</th>
<th>Value of Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farmer produces and harvests wheat</td>
<td>$0.15</td>
<td>$0.15</td>
</tr>
<tr>
<td>Wheat transported to mill</td>
<td>$0.08</td>
<td>$0.23</td>
</tr>
<tr>
<td>Mill produces flour</td>
<td>$0.15</td>
<td>$0.38</td>
</tr>
<tr>
<td>Flour transported to baker</td>
<td>$0.08</td>
<td>$0.46</td>
</tr>
<tr>
<td>Baker produces bread</td>
<td>$0.54</td>
<td>$1.08</td>
</tr>
<tr>
<td>Bread transported to grocery store</td>
<td>$0.08</td>
<td>$1.08</td>
</tr>
<tr>
<td>Grocery store displays and sells bread</td>
<td>$0.21</td>
<td>$1.29</td>
</tr>
<tr>
<td>Total Value Added</td>
<td>$1.29</td>
<td></td>
</tr>
</tbody>
</table>
**Other Important Trends**

- Ethical behavior
- Operations strategy
- Working with fewer resources
- Cost control and productivity
- Quality and process improvement
- Increased regulation and product liability
- Lean production