Introduction to Operations Management

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

- Organization
- Finance
- Operations
- Marketing
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Value-Added

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

- **Inputs**: Land, Labor, Capital
- **Outputs**: Goods, Services

Transformation/Conversion process

Control

Feedback

Feedback

Value added

Figure 1.2

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Steel production, Automobile fabrication, Home remodeling, Retail sales, Auto Repair, Appliance repair, Maid Service, Manual car wash, Teaching, Lawn mowing

High percentage goods, Low percentage service

Goods-service Continuum

Figure 1.3

Food Processor

<table>
<thead>
<tr>
<th>Inputs</th>
<th>Processing</th>
<th>Outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw Vegetables</td>
<td>Cleaning</td>
<td>Canned vegetables</td>
</tr>
<tr>
<td>Metal Sheets</td>
<td>Making cans</td>
<td></td>
</tr>
<tr>
<td>Water</td>
<td>Cutting</td>
<td></td>
</tr>
<tr>
<td>Energy</td>
<td>Cooking</td>
<td></td>
</tr>
<tr>
<td>Labor</td>
<td>Packing</td>
<td></td>
</tr>
<tr>
<td>Building</td>
<td>Labelling</td>
<td></td>
</tr>
<tr>
<td>Equipment</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 1.2
Table 1.2

<table>
<thead>
<tr>
<th>Inputs</th>
<th>Processing</th>
<th>Outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doctors, nurses</td>
<td>Examination</td>
<td>Healthy patients</td>
</tr>
<tr>
<td>Hospital</td>
<td>Surgery</td>
<td></td>
</tr>
<tr>
<td>Medical Supplies</td>
<td>Monitoring</td>
<td></td>
</tr>
<tr>
<td>Equipment</td>
<td>Medication</td>
<td></td>
</tr>
<tr>
<td>Laboratories</td>
<td>Therapy</td>
<td></td>
</tr>
</tbody>
</table>

Manufacturing or Service?

- Tangible
- Act

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

1. Customer contact
2. Uniformity of input
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 quality problems</td>
<td>High</td>
<td>Low</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 . . .
• The operations function
  • Consists of all activities directly related to producing goods or providing services

### Types of Operations

<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>

### U.S. Manufacturing vs. Service Employment

![Graph showing U.S. Manufacturing vs. Service Employment](chart.png)
### 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></td>
</tr>
<tr>
<td>Layout</td>
<td></td>
</tr>
<tr>
<td>Projects</td>
<td></td>
</tr>
<tr>
<td>Scheduling</td>
<td></td>
</tr>
</tbody>
</table>

**Controlling/Improving**

- Inventory
- Quality
- Costs
- Productivity

**Staffing**

- Hiring/laying off
- Use of Overtime

**Directing**

- Incentive plans
- Issuance of work orders
- Job assignments

### Key Decisions of Operations Managers

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

### Decision Making

**System Design**

- capacity
- location
- arrangement of departments
- product and service planning
- acquisition and placement of equipment
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Decision Making

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

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Decision Making

- Models
- Quantitative approaches
- Analysis of trade-offs
- Systems approach

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Models

A model is an abstraction of reality.

- Physical
- Schematic
- Mathematical

Tradeoffs

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

Quantitative Approaches

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

Systems Approach

“The whole is greater than the sum of the parts.”

Suboptimization
Pareto Phenomenon

- A few factors account for a high percentage of the occurrence of some event(s).
- 80/20 Rule - 80% of problems are caused by 20% of the activities.

How do we identify the vital few?

Business Operations Overlap

Operations

Marketing

Finance

Operations Interfaces

Industrial Engineering

Maintenance

Public Relations

Personnel

MIS

Accounting

Purchasing

Distribution

Legal
Historical Evolution of Operations Management

Table 1.7

- Industrial revolution (1770’s)
- Scientific management (1911)
  - Mass production
  - Interchangeable parts
  - Division of labor
- Human relations movement (1920-60)
- Decision models (1915, 1960-70’s)
- Influence of Japanese manufacturers

Trends in Business

- Major trends
  - The Internet, e-commerce, e-business
  - Management technology
  - Globalization
  - Management of supply chains
  - Agility

Simple Product Supply Chain

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>$1.00</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><strong>Total Value-Added</strong></td>
<td><strong>$1.29</strong></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

### Value/Dimensions

VD2

Performance = speed x quality x flexibility
<table>
<thead>
<tr>
<th>Value/Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>VD1</td>
</tr>
<tr>
<td>Trek bike example</td>
</tr>
</tbody>
</table>