### Chapter Learning Objectives

**After studying this chapter you should be able to:**

1. Describe and explain the nature of operations management.

2. Identify and discuss the components involved in designing effective operations systems.

3. Discuss organizational technologies and their role in operations management.

4. Identify and discuss the components involved in implementing operations systems through supply chain management.

5. Explain the meaning and importance of managing quality and total quality management.

6. Explain the meaning and importance of managing productivity, productivity trends, and ways to improve productivity.
The Nature of Operations Management

• Operations Management
  – The total set of managerial activities used by an organization to transform resource inputs into products, services, or both.

• Importance of Excellence in Operations
  – Is necessary for competitiveness and overall organization performance.
  – Creates value and utility through the production of products and services.
Types of Operations

• Manufacturing and Production Operations
  – A form of business that combines and transforms resource inputs into tangible outcomes that are then sold to others.

• Service Organization
  – An organization that transforms resources into an intangible output and creates time and place utility for its customers.
Operations and Organizational Strategy

• Role of Operations in Organizational Strategy
  – Operations management has a direct impact on competitiveness, quality, productivity, and effectiveness.
  – Operations management and organizational strategy have reciprocal effects on each other.
  – Strategic goals cannot be met if there are deficiencies and insufficiencies in operations resources.
Designing Operations Systems

• Determining Product-Service Mix
  – Involves deciding how many and what kinds of products to offer in the marketplace.

• Capacity Decisions
  – Involve choosing the amount of products, services, or both that can be produced by an organization.
  – High-risk decisions are due to uncertainty about future product demand and the significant costs of additional, possibly excess, capacity.
• Facilities Decisions

– *Facilities*—the physical locations where products or services are created, stored, and distributed.

– *Location*—the physical positioning or geographic site of facilities.

– *Layout*—the physical configuration of facilities, the arrangement of equipment within facilities, or both.
## Types of Layouts

<table>
<thead>
<tr>
<th>Type of Layout</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product layout</td>
<td>Facilities arranged around the product; used when large quantities of a single product are needed.</td>
</tr>
<tr>
<td>Process layout</td>
<td>Facilities arranged around the process; used in facilities that create or process a variety of products.</td>
</tr>
<tr>
<td>Fixed position layout</td>
<td>Facilities arranged around a single work area; used for the manufacture of large and complex products.</td>
</tr>
<tr>
<td>Cellular layout</td>
<td>A configuration of facilities used when families of products can follow similar paths.</td>
</tr>
</tbody>
</table>
Manufacturing Technology

• Technology
  – The set of processes and systems used by organizations to convert resources into products or services.

• Automation
  – The process of designing work so that it can be completely or almost completely performed by machines.
FIGURE 15.2 A Simple Automatic Control Mechanism

Thermostat tests air (sensor) → Feedback

Detects high temperature (information) → Turns off furnace (control)

Detects low temperature (information) → Turns on furnace (control)

Feedback
• Computer-assisted Manufacturing (CAM)
  – Technology that relies on computers to design or manufacture products.

• Computer-aided Design (CAD)
  – The use of computers to design and complete products and to simulate performance so that prototypes need not be constructed.

• Flexible Manufacturing Systems (FMS)
  – The use of robotic systems and computers to coordinate and integrate automated production and material handling facilities.
• Robotics
  – The science and technology of the construction, maintenance, and use of robots.
    • Robot—any artificial device that can perform functions ordinarily thought to be appropriate for human beings.

• Service Technology
  – Services are rapidly moving toward automated systems and procedures (e.g., automated teller machines).
Implementing Operations Systems through Supply Chain Management

• Supply Chain Management
  – The process of managing operations control, resource and inventory acquisition and purchasing, and thus improving overall efficiency and effectiveness.

• Operations Management as Control
  – Coordinating operations management with other functions helps insure the system focuses on the elements crucial to goal attainment.
Implementing Operations Systems through Supply Chain Management (cont’d)

• Purchasing Management
  – Controlling the buying of the materials and resources is at the heart of effective supply chain management.

• Inventory Management (Materials Control)
  – Managing the organization’s raw materials, work-in-process, finished goods, and products in-transit.
  – Just-in-time (JIT) method
    • An inventory system than has necessary materials arriving as soon as they are needed (just in time) so that the production process is not interrupted.
<table>
<thead>
<tr>
<th>Inventory Type</th>
<th>Purpose</th>
<th>Source of Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw materials</td>
<td>Provide the materials needed to make the product</td>
<td>Purchasing models and systems</td>
</tr>
<tr>
<td>Work in process</td>
<td>Enable overall production to be divided into stages of manageable size</td>
<td>Shop floor control systems</td>
</tr>
<tr>
<td>Finished goods</td>
<td>Provide ready supply of products on customer demand and enable long, efficient production runs</td>
<td>High-level production scheduling systems in conjunction with marketing</td>
</tr>
<tr>
<td>In transit</td>
<td>Distribute products to customers</td>
<td>Transportation and distribution control systems</td>
</tr>
</tbody>
</table>

Table 15.1 Inventory Types, Purposes, and Sources of Control
Managing Total Quality

• Quality
  – The totality of features and characteristics of a product or service that bear on its ability to satisfy stated or implied needs.
  – Is both a relative and absolute concept.
  – Is relevant to both products and services.
Managing Total Quality (cont’d)

• The Importance of Quality
  – Malcolm Baldrige Award
    • Named after a former Secretary of Commerce, this prestigious award is given to firms that achieve major quality improvements.

  – Competition
    • Quality has become one of the most important competitive points in business today.
Managing Total Quality (cont’d)

• The Importance of Quality (cont’d)
  – Productivity
    • Quality enhancement programs decrease the number of defects, reduce resources dedicated to rework, and reduces the need for inspectors as employees become responsible for quality.
  – Costs
    • Improved quality reduces costs from customer returns, warranty, and lawsuits for faulty products, and lost sales to future customers.
Dimensions of Quality

- Performance
- Perceived Quality
- Features
- Aesthetics
- Reliability
- Serviceability
- Conformance
- Durability
<table>
<thead>
<tr>
<th></th>
<th>Eight Dimensions of Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td><strong>Performance.</strong> A product’s primary operating characteristic; examples are automobile acceleration and a television’s picture clarity.</td>
</tr>
<tr>
<td>2.</td>
<td><strong>Features.</strong> Supplements to a product’s basic functioning characteristics, such as power windows on a car.</td>
</tr>
<tr>
<td>3.</td>
<td><strong>Reliability.</strong> A probability of not malfunctioning during a specified period.</td>
</tr>
<tr>
<td>4.</td>
<td><strong>Conformance.</strong> The degree to which a product’s design and operating characteristics meet established standards.</td>
</tr>
<tr>
<td>5.</td>
<td><strong>Durability.</strong> A measure of product life.</td>
</tr>
<tr>
<td>6.</td>
<td><strong>Serviceability.</strong> The speed and ease of repair.</td>
</tr>
<tr>
<td>7.</td>
<td><strong>Aesthetics.</strong> How a product looks, feels, tastes, and smells.</td>
</tr>
<tr>
<td>8.</td>
<td><strong>Perceived quality.</strong> As seen by a customer.</td>
</tr>
</tbody>
</table>
• Total Quality Management (TQM)
  – A strategic commitment by top management to change its whole approach to business and to make quality a guiding factor in everything the organization does.
FIGURE 15.3 Total Quality Management

- Strategic commitment
  - Employee involvement
  - Materials
  - Technology
  - Methods

Quality improvements
TQM Tools and Techniques

• Value-added Analysis
  – A comprehensive evaluation of all work activities, material flows, and paperwork to determine that value was added.

• Benchmarking
  – The process of learning how and what other firms do in an exceptionally high-quality manner.

• Outsourcing
  – Subcontracting operations/services to those who can do them cheaper and/or better.

• Reducing Cycle Time
  – Reducing the time needed by the organization to develop, make, and distribute products or services.
Table 15.3 Guidelines for Increasing the Speed of Operations

1. *Start from scratch.* It’s usually easier than trying to do what the organization does now faster.

2. *Minimize the number of approvals needed to do something.* The fewer people who have to approve something, the faster approval will get done.

3. *Use work teams as a basis for organization.* Teamwork and cooperation work better than individual effort and conflict.

4. *Develop and adhere to a schedule.* A properly designed schedule can greatly increase speed.

5. *Don’t ignore distribution.* Making something faster is only part of the battle.

6. *Integrate speed into the organization’s culture.* If everyone understands the importance of speed, things will naturally get done quicker.
TQM Tools and Techniques

• ISO 9000:2000 and ISO 14000
  – Quality standards created by the International Organization for standardization by which firms can be certified.

• Statistical Quality Control (SQC)
  – A set of statistical techniques that is used to monitor quality; includes acceptance sampling and in-process sampling.

• Six Sigma
  – Involves making corrections until errors disappear
Managing Productivity

• Productivity
  – An economic measure of efficiency that summarizes the value of outputs relative to the value of the resources used to produce them.
Levels of Productivity

• The unit of analysis used to calculate or define:
  • Aggregate productivity—the total level of productivity for a country.
  • Industry productivity—the total productivity of all the firms in an industry.
  • Company productivity—the level of productivity of a single company.
  • Unit productivity—the productivity level of a unit or department.
  • Individual productivity—the productivity attained by a single person.
• Total Factor Productivity

– An overall indicator of how well an organization uses all of its resources (i.e., labor, capital, materials, and energy) to create all of its products and services.

Productivity = \frac{\text{Outputs}}{\text{Inputs}}
• Labor Productivity
  – A partial productivity ratio that uses only one category of resource (labor) to gauge the organization’s productivity in utilizing that resource.

\[
\text{Labor Productivity} = \frac{\text{Outputs}}{\text{Direct Labor}}
\]
Managing Productivity (cont’d)

• The Importance of Productivity
  – Productivity is a primary determinant of an organization’s level of profitability and to survive.
  – Productivity partially determines people’s standard of living within a particular country.

• Productivity Trends
  – The United States has the highest level of productivity in the world, although the gap is closing as other countries become more productive.
  – Manufacturing productivity growth continues to exceed that of the service sector.
FIGURE 15.4 Manufacturing and Service Productivity Growth Trends
Improving Productivity

• Improving Operations
  – Spending more resources on research and development helps identify new products, new uses for existing products, and new methods for making products.
  – Reworking transformation processes and facilities can boost productivity.
Improving Productivity

• Increasing Employee Involvement
  – Increased employee participation can increase quality and productivity.
  
  • Cross-training of employees allows the firm to function with fewer workers.
  
  • Rewards are essential to the success in improving productivity.