Chapter 8  Producing Quality Goods and Services

① Explain the nature of production.

② Outline how the conversion process transforms raw materials, labor, and other resources into finished products or services.

③ Describe how research and development lead to new products and services.

④ Discuss the components involved in planning the production process.

⑤ Explain how purchasing, inventory control, scheduling, and quality control affect production.

⑥ Summarize how technology can make American firms more productive and competitive in the global marketplace.
What Is Production?

• **Operations management**
  • All activities managers engage in to produce goods and services

• **Operations manager**
  • A person who manages systems that convert resources into goods and services
  • Managers concern themselves with the control of operations to ensure that the organization’s goals are achieved

• **Planning**
  • Planning takes place before anything is produced and during the production process
How American Manufacturers Compete in the Global Marketplace

• The U.S. was the most productive country after World War II
• Competitors in European and Asian countries eventually recovered and began to compete with the U.S. firms
• Productivity has increased due to
  • Innovation
  • Highly skilled workers
  • Previously work outsourced to foreign nations returning to the U.S.

• The most successful U.S. firms have focused on:
  • Motivating employees to improve productivity
  • Reducing costs by carefully selecting suppliers
  • Using computer-aided and flexible manufacturing systems
  • Improving control procedures to lower manufacturing costs
  • Building foreign manufacturing facilities where labor costs are lower
  • Using green manufacturing to conserve natural resources
Careers in Operations Management

• **Operations managers must appreciate the manufacturing process**
  • Mass production: a process that lowers the cost required to produce a large number of identical or similar products over a long period of time
  • Analytical process: a process that breaks raw materials into different component parts
  • Synthetic process: a process that combines raw materials or components to create a finished product

• **Successful operations managers must:**
  • Be able to motivate and lead people
  • Understand how technology can make a manufacturer more productive and efficient
  • Appreciate the control processes that lower production costs and improve product quality
  • Understand the relationship between the customer, the marketing of a product, and the production of a product
The Conversion Process

• The purpose of manufacturing is to provide utility to customers
  • Utility: the ability of a good or service to satisfy a human need
  • Four types of utility: form, place, time, and possession
  • Form utility: utility created by people converting raw materials, finances, and information into finished products
The conversion process converts ideas and resources into useful goods and services. The ability to create ideas and to produce products and services is a crucial step in the economic development of any nation.
The Conversion Process (cont’d)

• Manufacturing Using a Conversion Process
  • Focus
    • The resource or resources that make up the major or most important input; financial, material, information, people
  • Magnitude of change
    • The degree to which the resources are physically changed
  • Number of production processes
    • The number of production processes employed varies from one or a few for small firms to many for larger firms
The Conversion Process (cont’d)

• The Increasing Importance of Services
  • Service economy
    • An economy in which more effort is devoted to the production of services than to the production of goods
    • The production of services varies from the production of goods
      • Services are consumed immediately and cannot be stored
      • Services are provided when and where the customer desires
      • Services are usually labor intensive
      • Services are intangible, making it difficult to evaluate customer satisfaction
Service Industries

**FIGURE 8-2**

The growth of service firms has increased so dramatically that we now live in what is referred to as a service economy.

Percent of American workers employed by service industries

<table>
<thead>
<tr>
<th>Year</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1985</td>
<td>76%</td>
</tr>
<tr>
<td>1995</td>
<td>80%</td>
</tr>
<tr>
<td>2005</td>
<td>83%</td>
</tr>
<tr>
<td>2010</td>
<td>86%</td>
</tr>
<tr>
<td>2012 (January)</td>
<td>87%</td>
</tr>
</tbody>
</table>

Where Do New Products and Services Come From?

• **Research and Development**
  • A set of activities intended to identify new ideas that have the potential to result in new goods and services

• **Basic research**
  • Uncovering new knowledge; scientific advancement without regard for its potential use

• **Applied research**
  • Discovering new knowledge with some potential use

• **Development and implementation**
  • Activities undertaken to put new or existing knowledge to use in producing goods and services
Where Do New Products and Services Come From? (cont’d)

• **Product extension and refinement**
  - **Product life cycle**
    - The rise and fall pattern of sales associated with the introduction and acceptance of a product in the market place
  - **Product refinement**
    - Improving a product’s performance characteristics to increase its utility to consumers
  - **Product extension**
    - Improving and adding additional performance features that extend the want-satisfying capability of the product and its life cycle in the market
How Do Managers Plan for Production?

• Design planning
  • The development of a plan for converting an idea into an actual product or service

• Product line
  • A group of similar products that differ only in relatively minor characteristics

• Product design
  • Creating a set of specifications from which a product can be produced

• Capacity
  • The amount of products or services that an organization can produce in a given time
  • Required capacity must meet product demand
How Do Managers Plan for Production? (cont’d)

**FIGURE 8-3**

Once research and development identifies an idea that meets customer needs, three additional steps are used to convert the idea to an actual good or service.

1. **Research and development identifies an idea for a new good or service.**
2. **Design planning develops a plan to convert the idea into a new good or service.**
3. **Facilities planning identifies a site where the good or service can be produced.**
4. **Operational planning decides on the amount of goods or services that will be produced within a specific time period.**
How Do Managers Plan for Production? (cont’d)

• Design planning (cont’d)
  • Use of technology
    • The degree of automation and technology must be determined based on the tradeoff between high initial investment costs with lower operating costs (for automation) and low initial with high operating costs (for human labor)
  • Labor-intensive technology: a process in which people must do most of the work
  • Capital-intensive technology: a process in which machines and equipment do most of the work
How Do Managers Plan for Production? (cont’d)

• **Facilities planning**
  • The process of determining where products or services are to be produced
  • Factors influencing the decision either to use an existing facility or to construct a new facility
    • Does the existing facility have the capacity to handle the increased demand for production?
    • Is the cost of refurbishing or expanding the existing facility less than constructing a new facility?
How Do Managers Plan for Production? (cont’d)

• **Facilities planning** (cont’d)
  • **Factors influencing the location decision for a production facility**
    • Locations of major customers
    • Availability of skilled and unskilled labor
    • Quality of life for employees and management
    • Cost of land and construction
    • Taxes, environmental regulations, zoning laws
    • Financial incentives from local and state governments
    • Special requirements for resources
How Do Managers Plan for Production? (cont’d)

• **Human resources**
  - Human resources manager and operations manager must work together
  - The appropriate skills must be identified
  - Employees with the right skills must be recruited
  - Or training programs must be developed
Planning for Production (cont’d)

• **Plant layout**
  - The process layout is used when small batches of different products are created or worked on in a different operating sequence
Planning for Production (cont’d)

• **Plant layout**
  • The product layout (assembly line) is used when all products undergo the same operations in the same sequence.
Planning for Production (cont’d)

- **Plant layout**
  - The fixed position layout is used in producing a product that is too large to move.
Planning for Production (cont’d)
Operational Planning

- **Four steps in operational planning**
  - **Step 1: Selecting a planning horizon**
    - The period during which a plan will be in effect; commonly one year
  - **Step 2: Estimating market demand**
    - The quantity that customers will purchase at the going price
    - Demand is estimated for the planning horizon
  - **Step 3: Comparing market demand with capacity**
    - If market demand and the facility’s capacity are not equal, adjustments may be necessary
  - **Step 4: Adjusting products or services to meet demand**
    - Increase capacity to meet demand
    - Ignore excess demand
    - Eliminate excess capacity
Four Aspects of Operations Control

Implementing the operations control system in any business requires the effective use of purchasing, inventory control, scheduling, and quality control.
Operations Control

• **Purchasing**
  • All the activities involved in obtaining required materials, components, supplies, and parts from other firms
  • Objective: to ensure that the required materials are available when needed, in the proper amounts, and at minimum cost
  • Factors affecting the choice of suppliers
    • Price
    • Quality
    • Reliability
    • Credit terms
    • Shipping costs
Operations Control (cont’d)

• **Inventory control**
  • The process of managing inventories in such a way as to minimize inventory costs, including both holding costs and potential stock-out costs

• **Types of inventory**
  • Raw materials: materials that will become part of the product during the production process
  • Work-in-process: partially completed products
  • Finished-goods: completed goods

• **Costs of inventory**
  • Holding costs: the investment and storage costs of inventory
  • Stock-out costs: the costs of not having inventory available when needed
Operations Control (cont’d)

• **Inventory control methods**
  
  • **Materials requirements planning (MRP)**
    • A computerized system that integrates production planning and inventory control
  
  • **Manufacturing resource planning (MRP II)**
    • Extends planning to the entire organization by providing a single common set of facts to be used by all managers to make decisions
  
  • **Enterprise resource planning (ERP)**
    • A sophisticated software system that can monitor inventory and production and also quality, sales, and supplier information
  
  • **Just-in-time inventory system**
    • A system that ensures that materials or supplies arrive at the facility just when they are needed so that storage and holding costs are minimized
Operations Control (cont’d)

• **Scheduling**
  • The process of ensuring that materials and other resources are at the right place at the right time
    • Routing of materials: the sequence of work stations that the materials will follow
    • Timing of materials: when the materials will arrive at each work station and how long they will stay there
    • Follow-up: monitoring by managers to ensure timely work flows

• **For complex products, many operations managers prefer:**
  • Gantt chart—graphic scheduling device that displays the tasks to be performed and the time required for each
  • PERT (Program Evaluation and Review Technique)—a scheduling technique that identifies the major activities necessary to complete a project and sequences them based on the time required to perform each one
Scheduling: A Gantt Chart

• This chart details the job of building three dozen electric golf carts

A PERT diagram identifies the activities necessary to complete a given project and arranges the activities based on the total time required for each to become an event. The activities on the critical path determine the minimum time required.

- Design the book (6)
- Obtain design sample (1)
- Obtain cost estimates (3)
- Prepare cover (1)
- Obtain and approve cover proof (3)
- Mark manuscript for typesetting (2)
- Set type (4)
- Make up pages (5)
- Print and bind (6)
- Prepare pages for printing (5)

Activity
Critical path ( ) Number of weeks to complete activity

FINISH
Operations Control (cont’d)

• Quality control
  • The process of ensuring that goods and services are produced in accordance with specifications
  • Objective: to see that the organization lives up to the standards it has set for itself

• Statistical process control (SPC)
  • A system that uses sampling to obtain data that are plotted on control charts and graphs to identify and pinpoint problems in the production process

• Statistical quality control (SQC)
  • A set of techniques used to monitor all aspects of the production process to ensure that both work in progress and finished products meet the firm’s quality standards

• Inspection
  • The examination of the quality of work in process
Operations Control (cont’d)

• **Quality control** (cont’d)
  
  • **Improving quality through employee participation**
    • Quality circle: a team of employees who meet on company time to solve problems of product quality
    • Total Quality Management (TQM)
    • Six Sigma: relies on statistical data and improved methods to eliminate defects for products and services
  
  • **World quality standards**: International Organization for Standardization (ISO)
    • ISO 9000: certification for meeting quality control standards in procedures in design, production processes, product testing
    • ISO 14000: certification for incorporating environmental concerns into operations and product standards
Improving Productivity with Technology

• **Productivity**
  • The average level of output per worker per hour

• **Productivity trends**
  • Recently the U.S. rate of productivity growth compares favorably with other nations

• **Causes of U.S. productivity small increase**
  • Economic crisis; reduction in investment in new equipment and technology
  • Growth of the service sector without a corresponding increase in the rate of productivity growth
  • Increased government regulation
Improving Productivity with Technology (cont’d)

• **Improving productivity growth rates**
  • Eliminate or modify government policies hindering productivity growth
  • Increase employee motivation and participation
  • Increase cooperation between labor and management
  • More investment by business in facilities, equipment, technology and automation, and employee training
Improving Productivity with Technology (cont’d)

• **The impact of computers and robotics on productivity**
  • **Automation**
    • The total or near total use of machines to do work
  • **Robotics**
    • The use of programmable machines to perform a variety of tasks by manipulating materials and tools
    • Robots work quickly, accurately, and steadily
    • Robots are effective in tedious, repetitious, and hazardous tasks
Improving Productivity with Technology (cont’d)

• The impact of computers and robotics on productivity (cont’d)
  • Computer manufacturing systems
    • Computer-aided design (CAD)
      • The use of computers to aid in the development of products
    • Computer-aided manufacturing (CAM)
      • The use of computers to plan and control manufacturing processes
    • Computer-integrated manufacturing (CIM)
      • a computer system that helps design products and controls the machinery in the manufacturing process
Improving Productivity with Technology (cont’d)

• The impact of computers and robotics on productivity (cont’d)
  • Continuous process
    • A manufacturing process in which a firm produces the same product(s) over a long period of time
  • Flexible manufacturing systems (FMS)
    • A single production system that combines electronic machines and computer-integrated manufacturing
Improving Productivity with Technology (cont’d)

• The impact of computers and robotics on productivity (cont’d)

  • Intermittent process
    • A manufacturing process in which a firm’s manufacturing machines and equipment are changed to produce different products

  • Technological displacement
    • Automation cuts manufacturing time, reduces error, and simplifies retooling procedures
    • Many robots work with humans to make jobs safer and easier
    • Automation will bring change to many jobs; many workers will have to retrain or seek jobs in other sectors of the economy