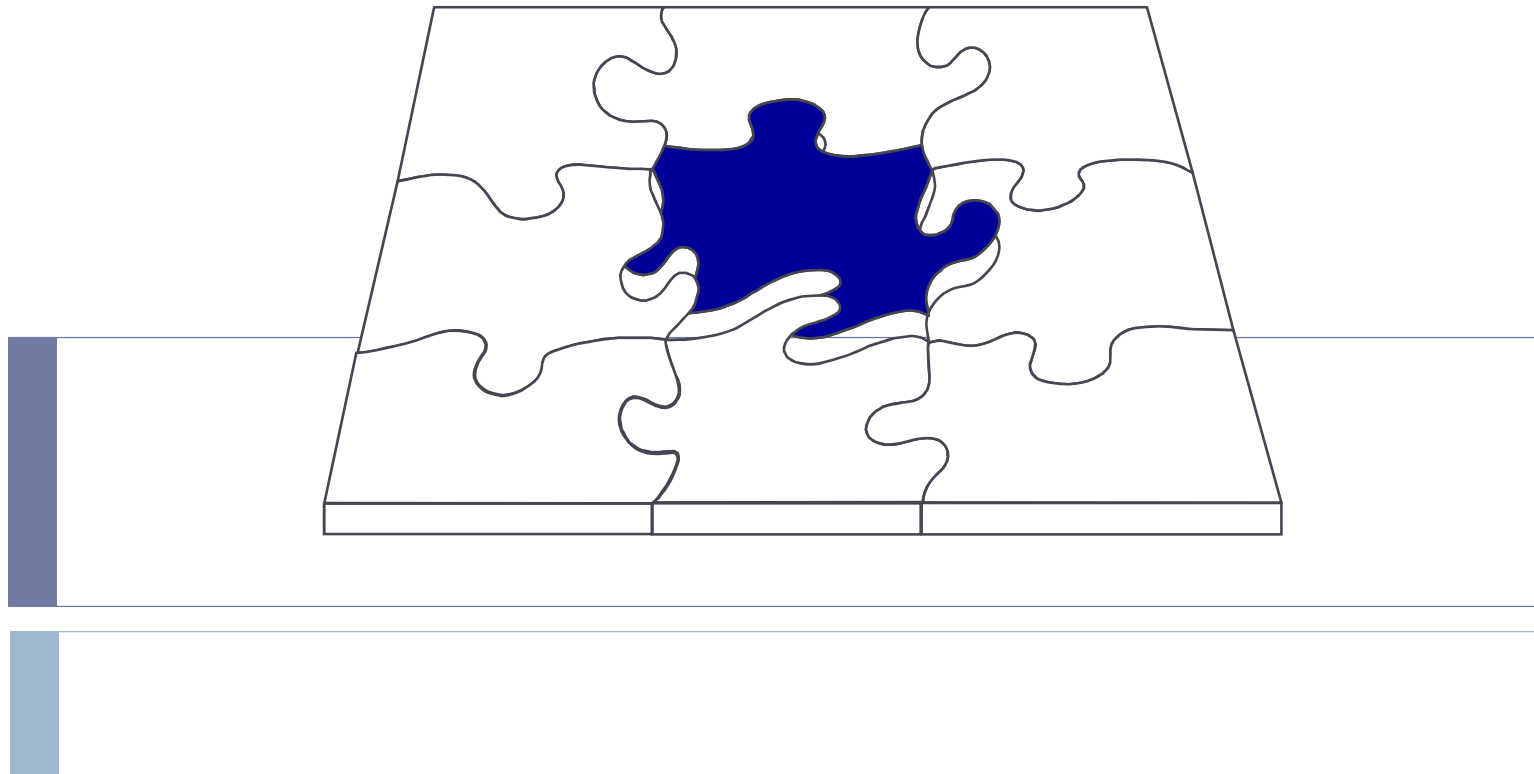


# Production and Operations Management

Norman Gaither

Greg Frazier



# Chapter 1

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## **Production and Operations Management (POM): An Introduction**



# Overview

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- ▶ Introduction
- ▶ Factors Affecting POM Today
- ▶ Different Ways of Studying POM



# Introduction

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- ▶ Production and operations management (POM) is the management of an organization's production system.
- ▶ A production system takes inputs and converts them into outputs.
- ▶ The conversion process is the predominant activity of a production system.
- ▶ The primary concern of an operations manager is the activities of the conversion process.



# Definition of Organizations

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- ▶ An organization is a collection of people working together in a coordinated and structured fashion to achieve one or more goals.



# Organizations Role in Society

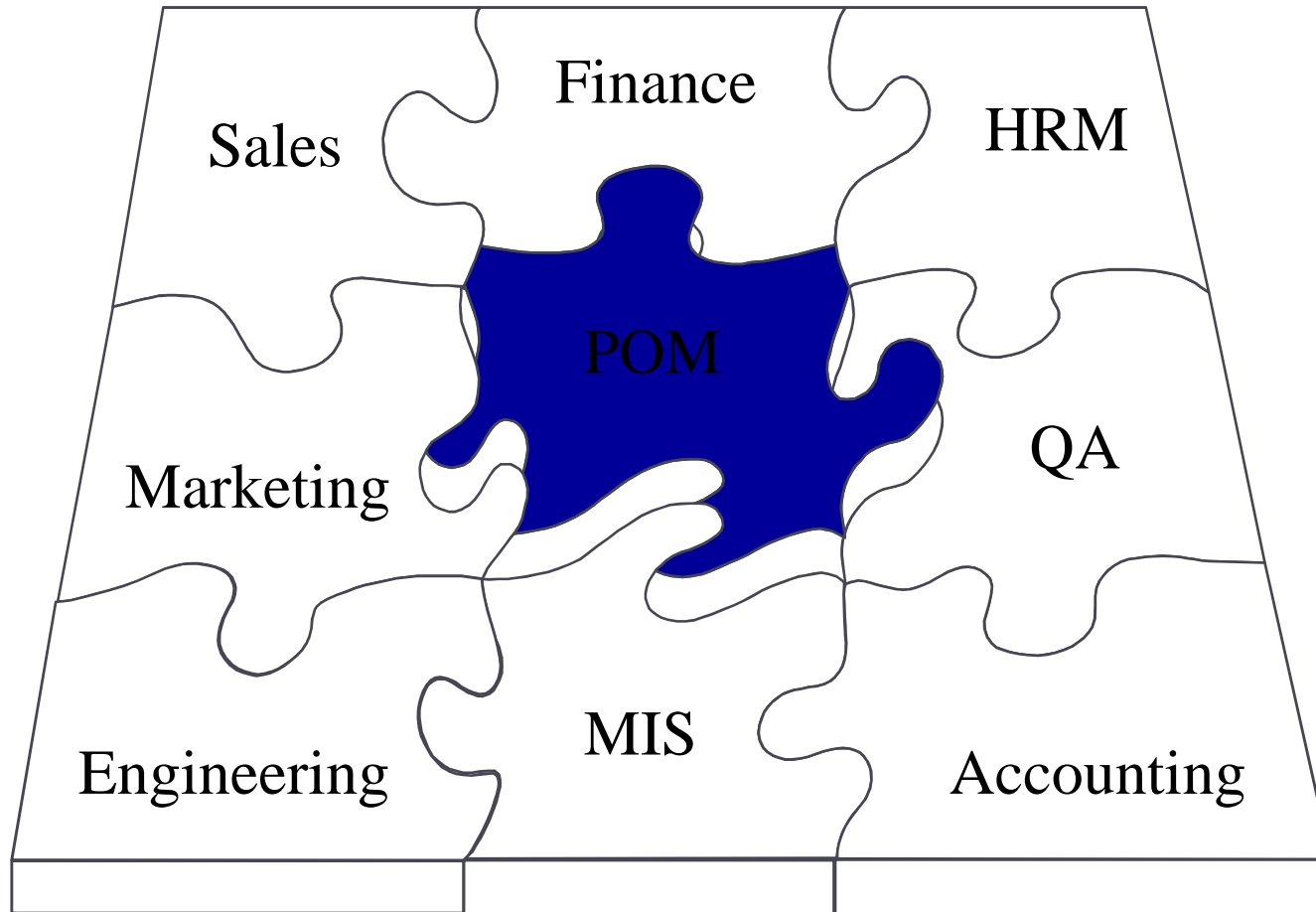
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- ▶ Organizations exist to allow accomplishment of work that could not be achieved by people alone.
- ▶ As long as the goals of an organization are appropriate, society will allow them to exist and they can contribute to society.



# Organizational Model

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# Engineering/Design Organization

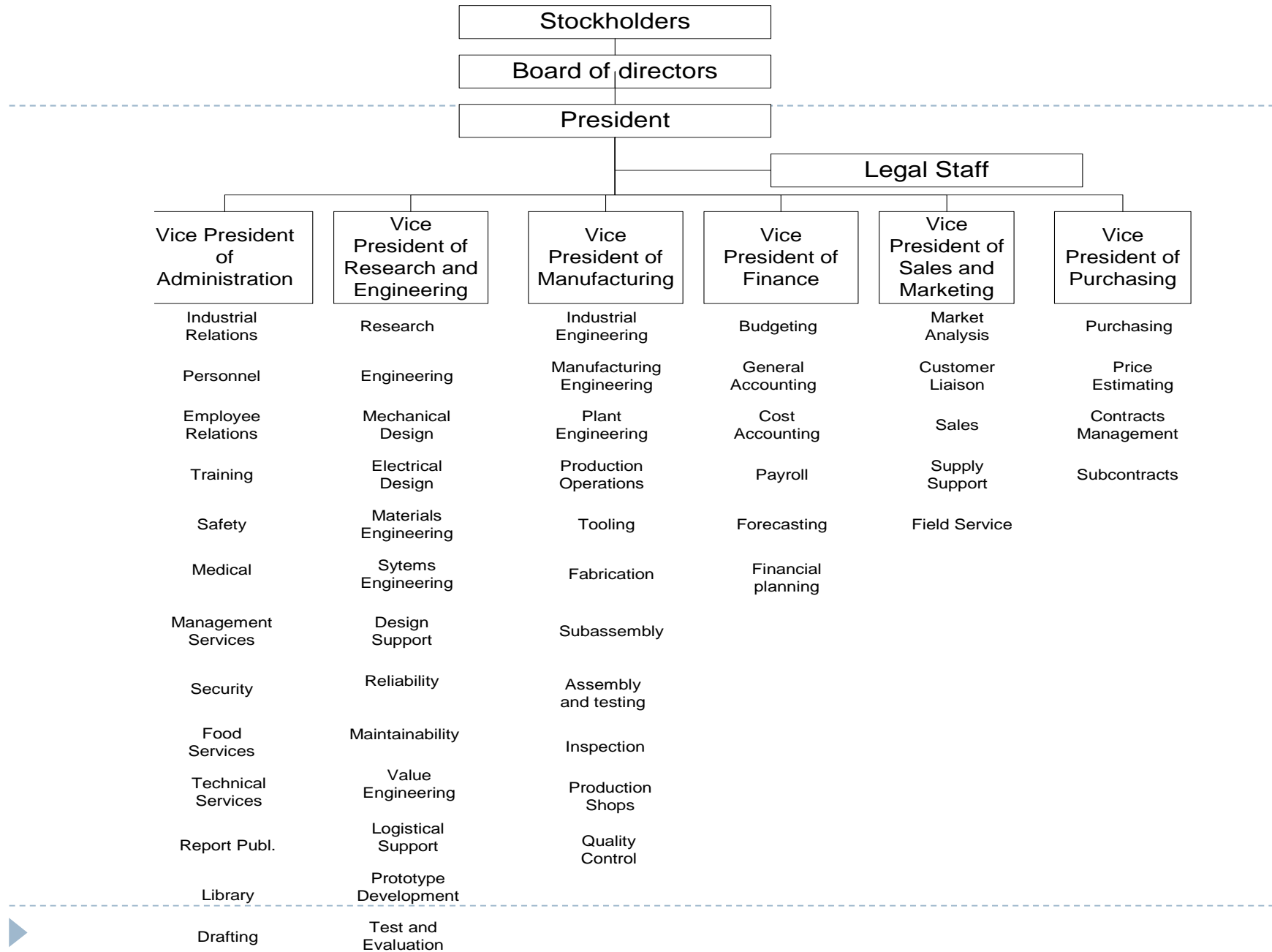
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- ▶ Traditional Organizational Structure
- ▶ Project Organizational Structure

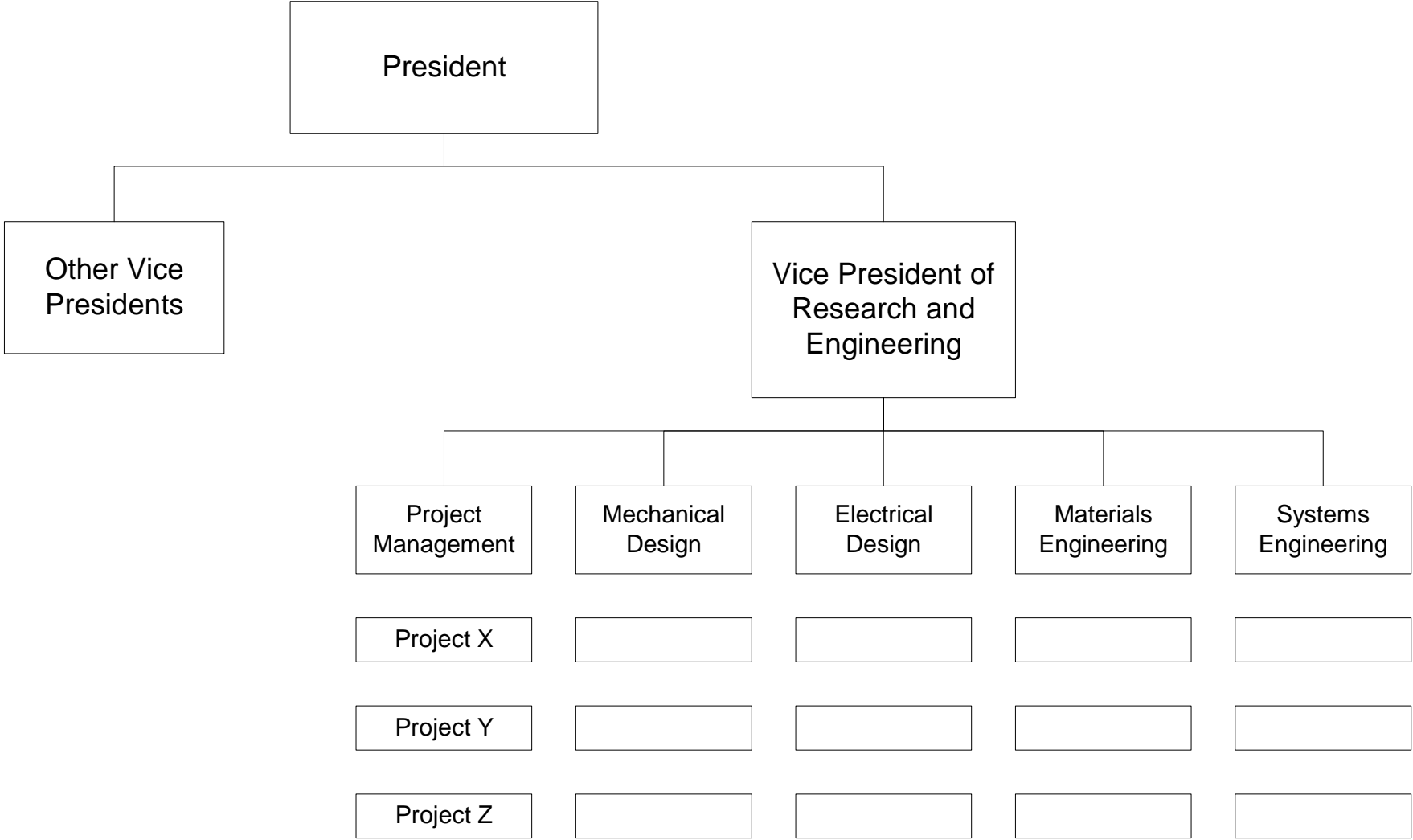




# Traditional Organizational Structure



# Project Organizational Structure



# Functional Organizations

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“Functional organizations, as an organization type, are best when a firm makes only one or a few products and where technology does not change. The traditionalists in shipbuilding look simplistically at the entire as the end product of the shipyard.” The product-oriented organization, on the other hand is “. . . a structure based on a Product Work Breakdown Structure and Group Technology which permits diversification . . . aimed at interim products . . . That makes it possible for large firms to cope with technological change and multiple markets.”



# Entry-Level Jobs in POM

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- ▶ Purchasing planner/buyer
- ▶ Production (or operations) supervisor
- ▶ Production (or operations) scheduler/controller
- ▶ Production (or operations) analyst
- ▶ Inventory analyst
- ▶ Quality specialist



# Today's Factors Affecting POM

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- ▶ Global Competition
- ▶ U.S. Quality, Customer Service, and Cost Challenges
- ▶ Computers and Advanced Production Technology
- ▶ Growth of U.S. Service Sector
- ▶ Scarcity of Production Resources
- ▶ Issues of Social Responsibility



# Different Ways to Study POM

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- ▶ Production as a System
- ▶ Production as an Organization Function
- ▶ Decision Making in POM



# The Production System

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## ▶ Input

- ▶ A resource required for the manufacture of a product or service.

## ▶ Conversion System

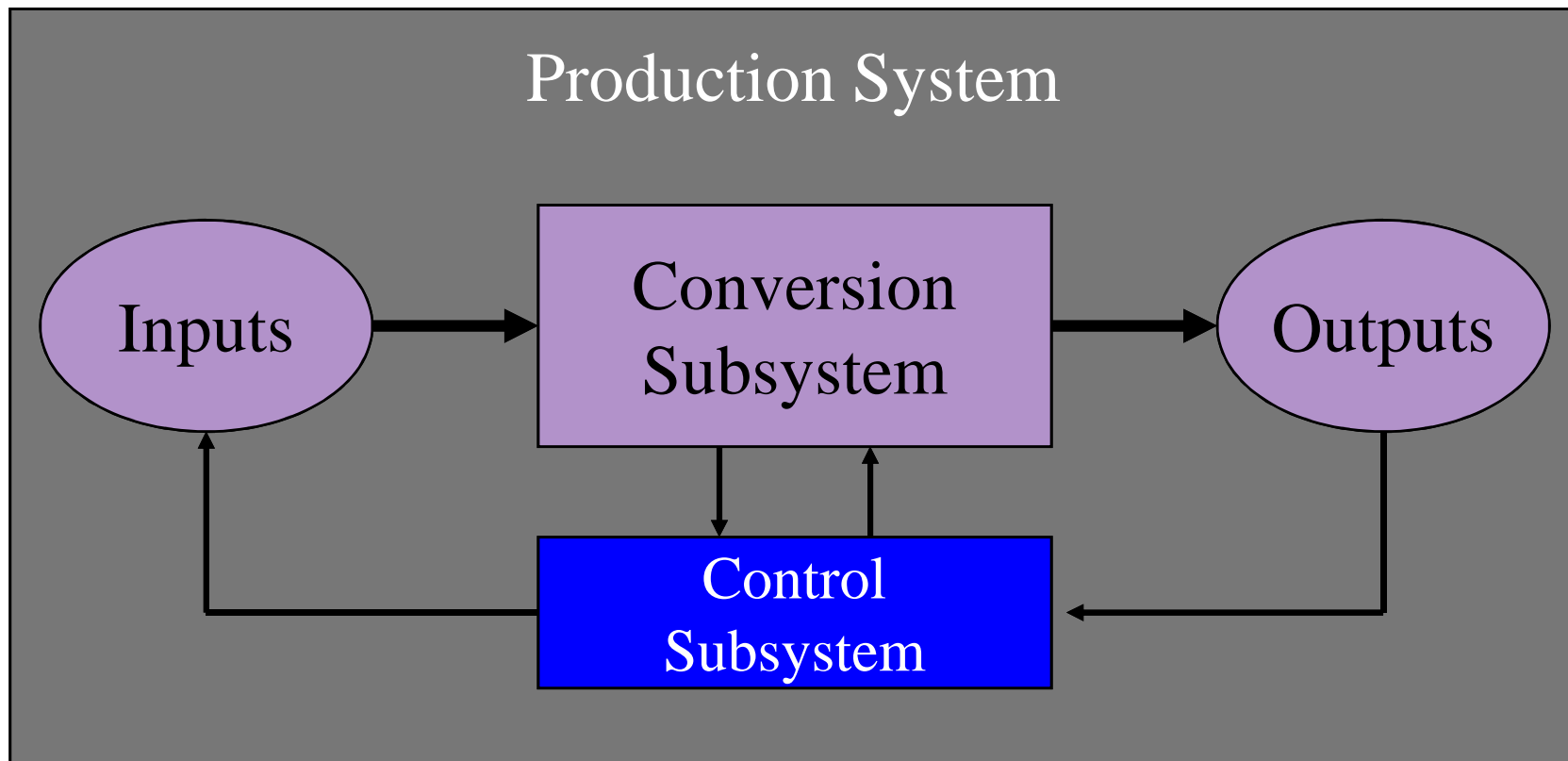
- ▶ A production system that converts inputs (material and human resources) into outputs (products or services); also the production process or technology.

## ▶ Output

- ▶ A direct outcome (actual product or service) or indirect outcome (taxes, wages, salaries) of a production system.

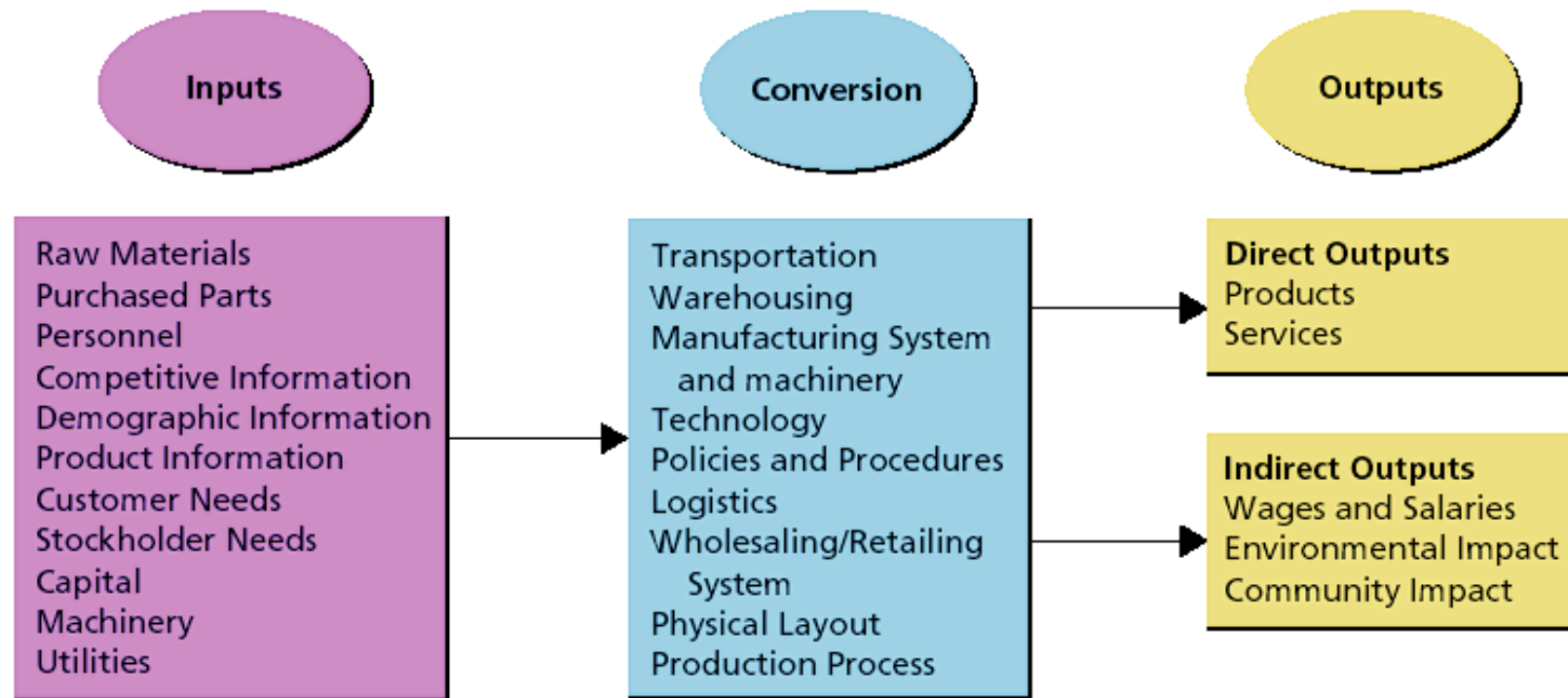
# Production as a System

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# The Basic Production System



# Production System Components

**TABLE 15-1**

**Components of Some Typical Production Systems**

Production System	Primary Inputs	Purpose of Conversion Subsystem	Outputs
1. Pet food factory	Grain, water, fish meal, personnel, tools, machines, paper bags, cans, buildings, utilities	Converts raw materials into finished goods	Pet food products
2. Public accounting firm	Supplies, personnel, information, computers, buildings, office furniture, machines, utilities	Attracts customers, compiles data, supplies management, information, computes taxes	Management information, tax services, and audited financial statements
3. College or university	Students, books, supplies, personnel, buildings, utilities	Transmits information and develops skills and knowledge via lectures, exams, computerized instruction	Educated persons

Source: Adapted from Norman Gaither, *Production and Operations Management*, 5th ed. (Fort Worth, TX: The Dryden Press, 1992), pp. 22-23.

# Inputs of a Production System

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- ▶ **External**

- ▶ Legal, Economic, Social, Technological

- ▶ **Market**

- ▶ Competition, Customer Desires, Product Info.

- ▶ **Primary Resources**

- ▶ Materials, Personnel, Capital, Utilities



# Conversion Subsystem

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- ▶ Physical (Manufacturing)
- ▶ Locational Services (Transportation)
- ▶ Exchange Services (Retailing)
- ▶ Storage Services (Warehousing)
- ▶ Other Private Services (Insurance)
- ▶ Government Services (Federal)



# Outputs of a Production System

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- ▶ **Direct**

- ▶ Products

- ▶ Services

- ▶ **Indirect**

- ▶ Waste

- ▶ Pollution

- ▶ Technological Advances



# Production as an Organization Function

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- ▶ U.S. companies cannot compete using marketing, finance, accounting, and engineering alone.
- ▶ We focus on POM as we think of global competitiveness, because that is where the vast majority of a firm's workers, capital assets, and expenses reside.
- ▶ To succeed, a firm must have a strong operations function teaming with the other organization functions.



# Decision Making in POM

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- ▶ Strategic Decisions
- ▶ Operating Decisions
- ▶ Control Decisions



# Strategic Decisions

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- ▶ These decisions are of strategic importance and have long-term significance for the organization.
- ▶ Examples include deciding:
  - ▶ the design for a new product's production process
  - ▶ where to locate a new factory
  - ▶ whether to launch a new-product development plan





# Operating Decisions

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- ▶ These decisions are necessary if the ongoing production of goods and services is to satisfy market demands and provide profits.
- ▶ Examples include deciding:
  - ▶ how much finished-goods inventory to carry
  - ▶ the amount of overtime to use next week
  - ▶ the details for purchasing raw material next month



# Control Decisions

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- ▶ These decisions concern the day-to-day activities of workers, quality of products and services, production and overhead costs, and machine maintenance.
- ▶ Examples include deciding:
  - ▶ labor cost standards for a new product
  - ▶ frequency of preventive maintenance
  - ▶ new quality control acceptance criteria



# Basic Types of Production Processes

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- ▶ **Intermittent Production System**

- ▶ Production is performed on a start-and-stop basis, such as for the manufacture of made-to-order products.

- ▶ **Mass Production**

- ▶ A special type of intermittent production process using standardized methods and single-use machines to produce long runs of standardized items.

# Basic Types of Production Processes (cont'd)

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## ▶ Mass Customization

- ▶ Designing, producing, and delivering customized products to customers for at or near the cost and convenience of mass-produced items.
- ▶ Mass customization combines high production volume with high product variety.
- ▶ Elements of mass customization:
  - ▶ Modular product design
  - ▶ Modular process design
  - ▶ Agile supply networks

# Basic Types of Production Processes (cont'd)

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- ▶ **Continuous Production Processes**
  - ▶ A production process, such as those used by chemical plants or refineries, that runs for very long periods without the start-and-stop behavior associated with intermittent production.
  - ▶ Enormous capital investments are required for highly automated facilities that use special-purpose equipment designed for high volumes of production and little or no variation in the type of outputs.

# The Facility Location Decision

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- ▶ **Decision Factors:**
  - ▶ Customer convenience
  - ▶ Transportation costs
  - ▶ Labor costs and availability
  - ▶ Sources of supplies and raw materials
  - ▶ Owner preferences for specific locations
  - ▶ Government policies, rules, regulations and incentives
  - ▶ Site cost and availability

# Operations Planning And Control Techniques

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- ▶ **Operations or Production Planning**
  - ▶ The process of deciding what products to produce and where, when, and how to produce them.
- ▶ **Operations or Production Control**
  - ▶ The process of ensuring that the specified production plans and schedules are being adhered to.

# Inventory

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## ▶ Types of Inventory Items

- ▶ **Raw materials and purchased parts** from outside suppliers.
- ▶ **Components:** subassemblies that are awaiting final assembly.
- ▶ **Work in process:** all materials or components on the production floor in various stages of production.
- ▶ **Finished goods:** final products waiting for purchase or to be sent to customers.
- ▶ **Supplies:** all items needed but that are not part of the finished product, such as paper clips, duplicating machine toner, and tools.



# Just-In-Time (JIT) (cont'd)

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- ▶ **Seven Wastes and Their Solutions**
  - ▶ Overproduction: reduce by producing only what is needed as it is needed.
  - ▶ Waiting: synchronize the workflow.
  - ▶ Transportation: minimize transport with better layouts.
  - ▶ Processing: “Why do we need this process at all?”
  - ▶ Stock: reduce inventories.
  - ▶ Motion: reduce wasted employee motions.
  - ▶ Defective products: improve quality to reduce rework.

# Computer-Aided Design and Manufacturing

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- ▶ **Computer-Aided Design (CAD)**
  - ▶ A computerized process for designing new products, modifying existing ones, or simulating conditions that may affect the designs.
- ▶ **Computer-Aided Manufacturing (CAM)**
  - ▶ A computerized process for planning and programming production processes and equipment.

# Flexible Manufacturing Systems

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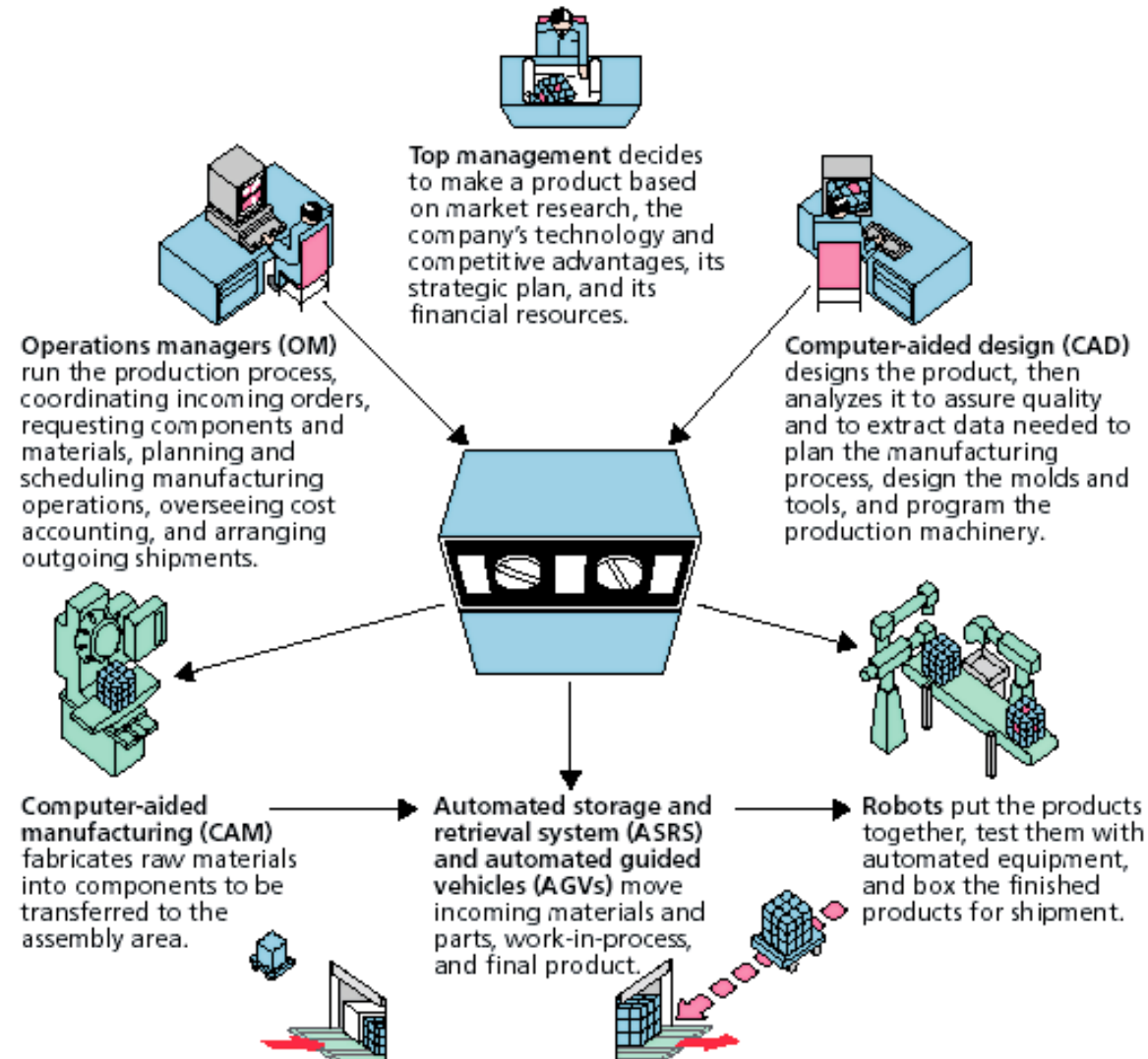
- ▶ **Flexible Manufacturing System (FMS)**
  - ▶ The organization of groups of production machines that are connected by automated materials-handling and transfer machines, and integrated into a computer system for the purpose of combining the benefits of made-to-order flexibility and mass-production efficiency.
- ▶ **Automation**
  - ▶ The automatic operation of a system, process, or machine.

# Computer-Integrated Manufacturing

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- ▶ **Computer-Integrated Manufacturing (CIM)**
  - ▶ The total integration of all production-related business activities through the use of computer systems.
  - ▶ Automation, JIT, flexible manufacturing, and CAD/CAM are integrated into one self-regulating production system.

# The Elements of CIM



Source: Barry Render and Jay Heizer, *Principles of Operations Management*, 2nd ed. © 1997.  
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FIGURE 15-14  
G.Dessler, 2003

# Supply Chain Management

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- ▶ **Supply Chain Management**
  - ▶ The integration of the activities that procure materials, transform them into intermediate goods and final product, and deliver them to customers.

# What Controls the Operations System?

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- ▶ Information about the outputs, the conversions, and the inputs is fed back to management.
- ▶ This information is matched with management's expectations
- ▶ When there is a difference, management must take corrective action to maintain control of the system



# End of Chapter 1

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