Chapter 2: Role of Logistics in Supply Chains

Learning Objectives

After reading this chapter, you should be able to do the following:

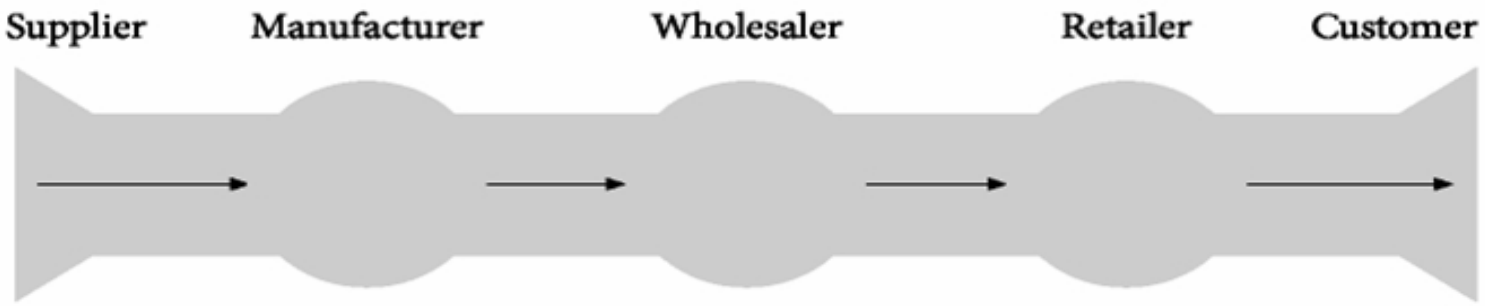
- Understand the role and importance of logistics in private and public organizations.
- Discuss the impact of logistics on the economy and how effective logistics management contributes to the vitality of the economy.
- Understand the value-added roles of logistics on both a macro and micro level.
- Explain logistics systems from several perspectives.

Learning Objectives (cont.)

After reading this chapter, you should be able to do the following:

- Understand the relationship between logistics and other important functional areas in an organization, including manufacturing, marketing, and finance.
- Discuss the importance of management activities in the logistics function.
- Analyze logistics systems from several different perspectives to meet different objectives.
- Determine the total costs and understand the cost tradeoffs in a logistics system

Figure 2-1 Contemporary Supply Chain Profile



Source: Center for Supply Chain Research, Penn State University (2008).

- What is Logistics?
  - Logistics management
  - Business logistics management
  - Integrated logistics management
  - Materials management
  - Physical distribution management
  - Marketing logistics
  - Industrial logistics
  - Distribution

Table 2-1 Logistics Definitions

Perspective	Definition
Inventory	Management of materials in motion and at rest
Customer	Getting the right product, to the right customer, in the right quantity, in the right condition, at the right place, at the right time, and at the right cost (called the "seven Rs of logistics")
Dictionary	The branch of military science having to do with procuring, maintaining, and transporting material, personnel, and facilities
International Society of Logistics	The art and science of management, engineering, and technical activities concerned with requirements, design, and supplying and maintaining resources to support objectives, plans, and operations
Utility/Value	Providing time and place utility/value of materials and products in support of organization objectives
Council of Supply Chain Management Professionals	That part of the supply chain process that plans, implements, and controls the efficient, effective flow and storage of goods, services, and related information from point of origin to point of consumption in order to meet customer requirements
Component support	Supply management for the plant (inbound logistics) and distribution management for the firm's customers (outbound logistics)
Functional management	Materials requirements determination, purchasing, transportation, inventory management, warehousing, materials handling, industrial packaging, facility location analysis, distribution, return goods handling, information management, customer service, and all other activities concerned with supporting the internal customer (manufacturing) with materials and the external customer (retail stores) with product
Common culture	Handling the details of an activity

Source: Adapted from Stephen H. Russell, "A General Theory of Logistics Practices," *Air Force Journal of Logistics* 24, no. 4 (2000): 15.

Logistics Definitions

- Inventory:
  - Management of materials in motion and at rest
- Customer:
  - Getting the right product, to the right customer, in the right quantity, in the right condition, at the right place, at the right time, and at the right cost (called the dictionary “seven Rs of logistics”)
- International Society of Logistics:
  - The branch of military science having to do with procuring, maintaining, utility/ value and transporting material, personnel, and facilities
- Council of Supply Chain Management
  - The art and science of management, engineering, and technical activities concerned with requirements, design, and supplying and maintaining resources to support objectives, plans, and operations

Logistics Definitions

- Component support:
  - Providing time and place utility/value of materials and products in support of Functional management organization objectives

- Common culture:
  - That part of the supply chain process that plans, implements, and controls the efficient, effective flow and storage of goods, services, and related information from point of origin to point of consumption in order to meet customer requirements

  - Supply management for the plant (inbound logistics) and distribution

  - Management for the firm's customers materials requirements, purchasing, transportation, inventory management, warehousing, materials handling, industrial packaging, facility location analysis, distribution, return goods handling, information management, customer service, and all other activities concerned with supporting the internal customer (manufacturing) with materials and the external customer (retail stores) with product

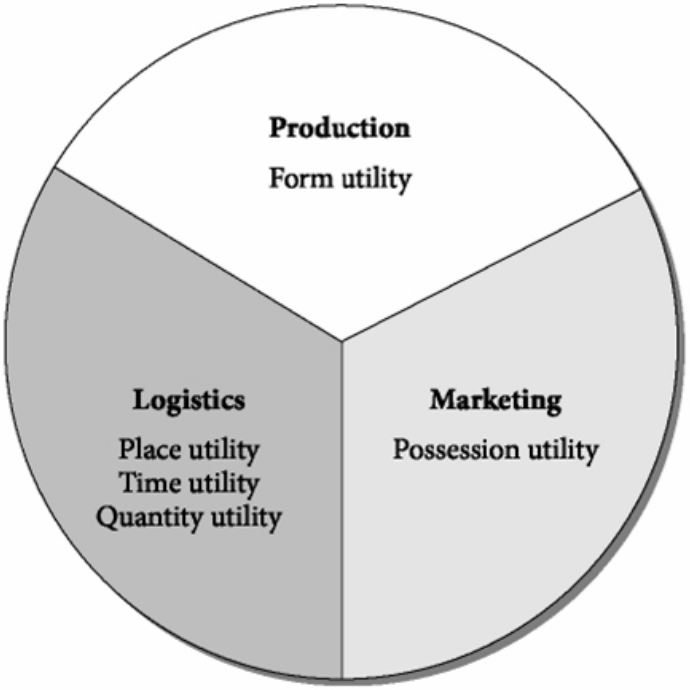
Four Subdivisions of Logistics

- Business logistics:
  - That part of the supply chain process that plans, implements, and controls the efficient, effective flow and storage of goods, service, and related information from point of use or consumption in order to meet customer requirements.
- Military logistics:
  - The design and integration of all aspects of support for the operational capability of the military forces (deployed or in garrison) and their equipment to ensure readiness, reliability, and efficiency.
- Event logistics:
  - The network of activities, facilities, and personnel required to organize, schedule, and deploy the resources for an event to take place and to efficiently withdraw after the event.
- Service logistics:
  - The acquisition, scheduling, and management of the facilities/assets, personnel, and materials to support and sustain a service operation or business.

Value-Added Roles of Logistics

- The five principal types of economic utility which add value to a product or service are:
  - Form
  - Time
  - Place
  - Quantity
  - Possession

Figure 2-2 Fundamental Utility Creation in the Economy

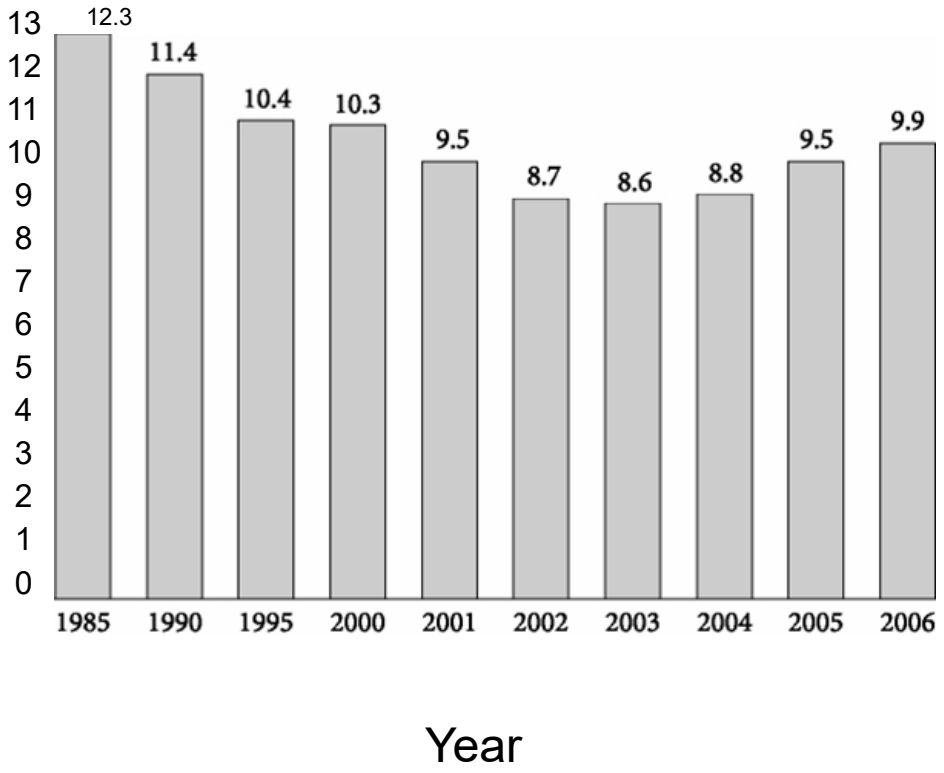


Source: Center for Supply Chain Research, Penn State University (2008).

Logistics Activities

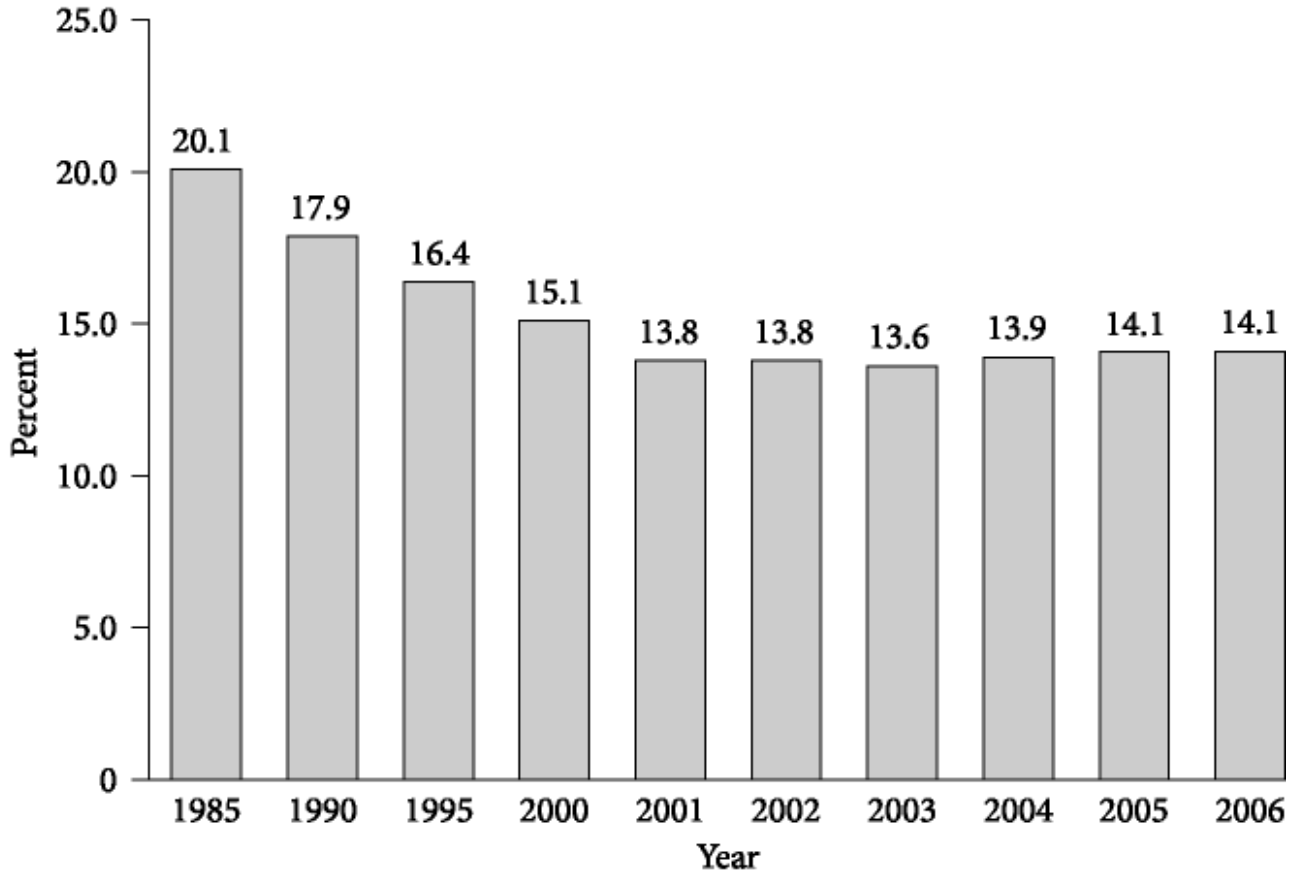
- Transportation
- Warehousing and storage
- Industrial packaging
- Materials handling
- Inventory control
- Order fulfillment
- Demand forecasting
- Production planning/scheduling
- Procurement
- Customer service
- Facility location
- Return goods handling
- Parts and service support
- Salvage and scrap disposal

Figure 2-3 Logistics Costs as a Percentage of GDP



Source: 17th Annual State of Logistics Report, 2006

Figure 2-5 Macro Inventory as a Percentage of GDP



Source: 18th Annual State of Logistics Report, 2007

Figure 2-4 Total Logistics Costs—2006

CARRYING COSTS–$1.857 TRILLION ALL BUSINESS INVENTORY	$ BILLION
Interest	93
Taxes, obsolescence, depreciation, insurance	252
Warehousing	101
Subtotal	446
Transportation costs	
Motor carriers	
Truck—Intercity	432
Truck—Local	203
Subtotal	635
Other carriers	
Railroads	54
Water (international 32, domestic 8)	37
Oil pipelines	10
Air (international 15, domestic 23)	38
Forwarders	27
Subtotal	166
Shipper—related costs	8
Logistics administration	50
Total logistics cost	1,305

Source: *18th Annual State of Logistics Report*, http://www.cscmp.org (2007).

- Logistics in the Firm: The Micro Dimension
  - Another dimension of logistics is the micro perspective which examines the relationships between logistics and other functional areas in an organization
    - Marketing
    - manufacturing/operations
    - Finance
    - Accounting
    - Others

The impact that logistics can have upon return on assets (ROA) or return on investment (ROI) is very significant

- ROA is defined as follows:
  - ROA = Revenue - Expenses/Assets Or
  - ROA = Gross Profit/Assets

Figure 2-6 The Relationship Between Required Inventory and Order Cycle Length from a Customer Perspective

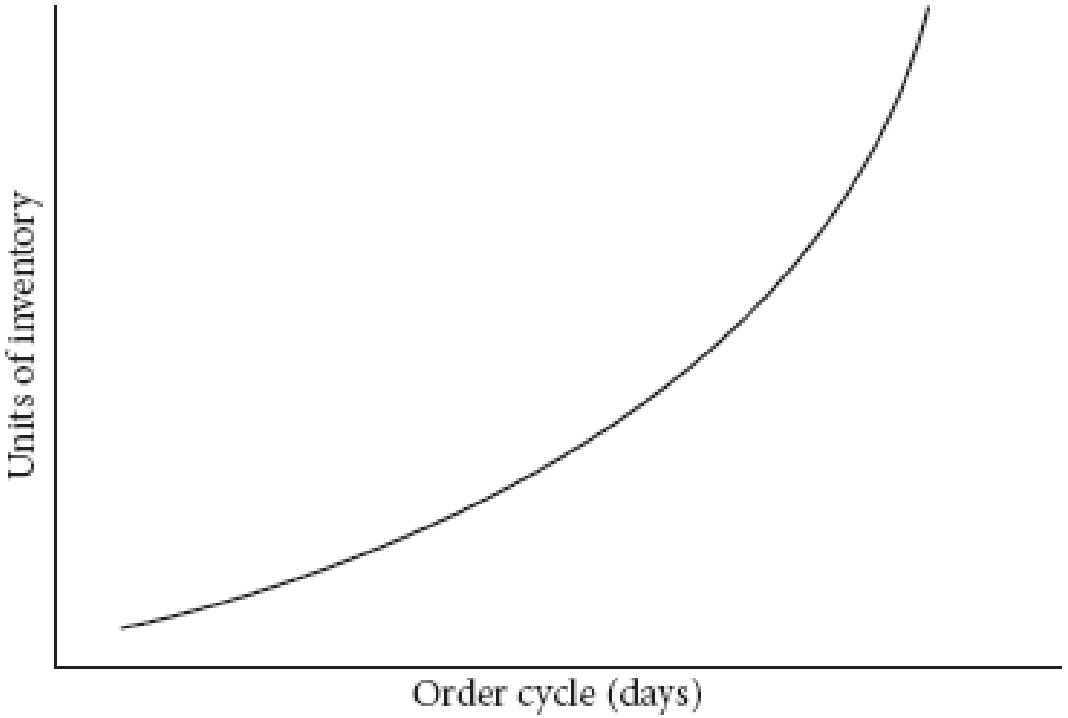
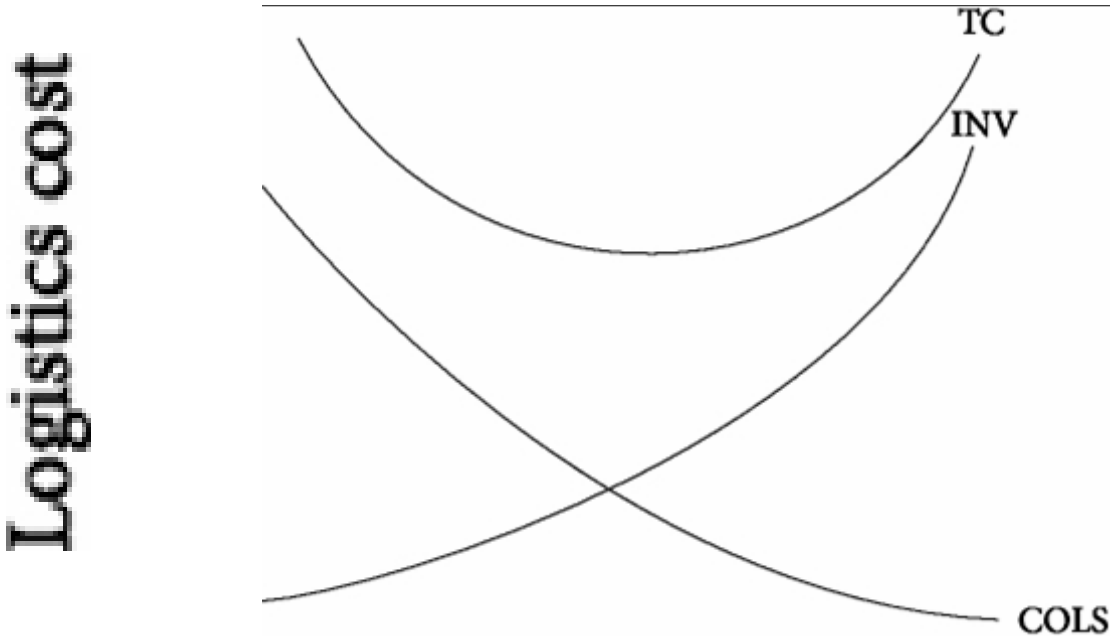
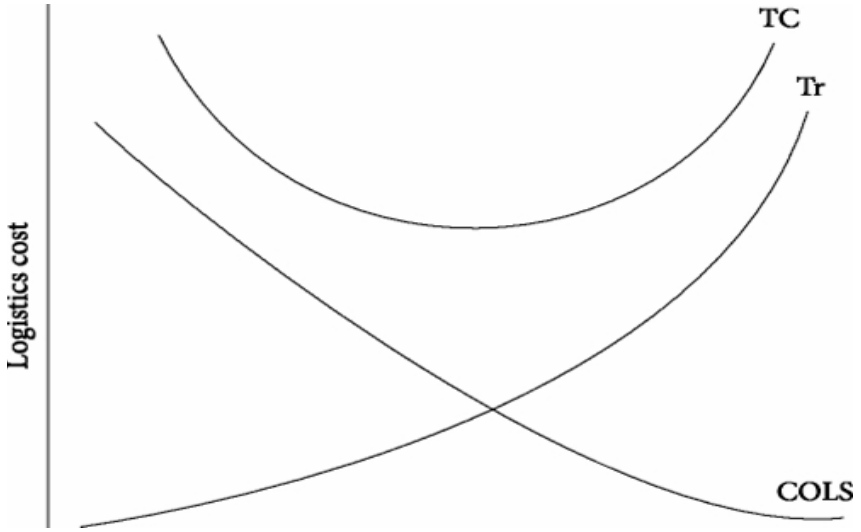


Figure 2-7 The General Relationship of the Cost of Lost Sales to Inventory Cost



TC = Total cost
INV = Inventory cost
COLS = Cost of lost sales

Figure 2-8 The General Relationship of the Cost of Lost Sales to Transportation Cost

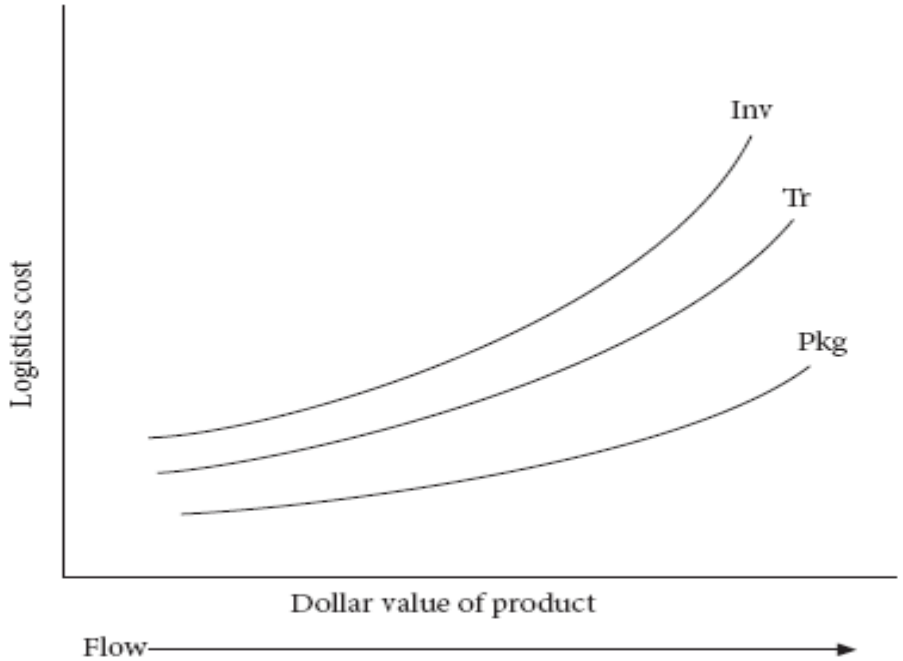


Improved transportation service

Flow ----------

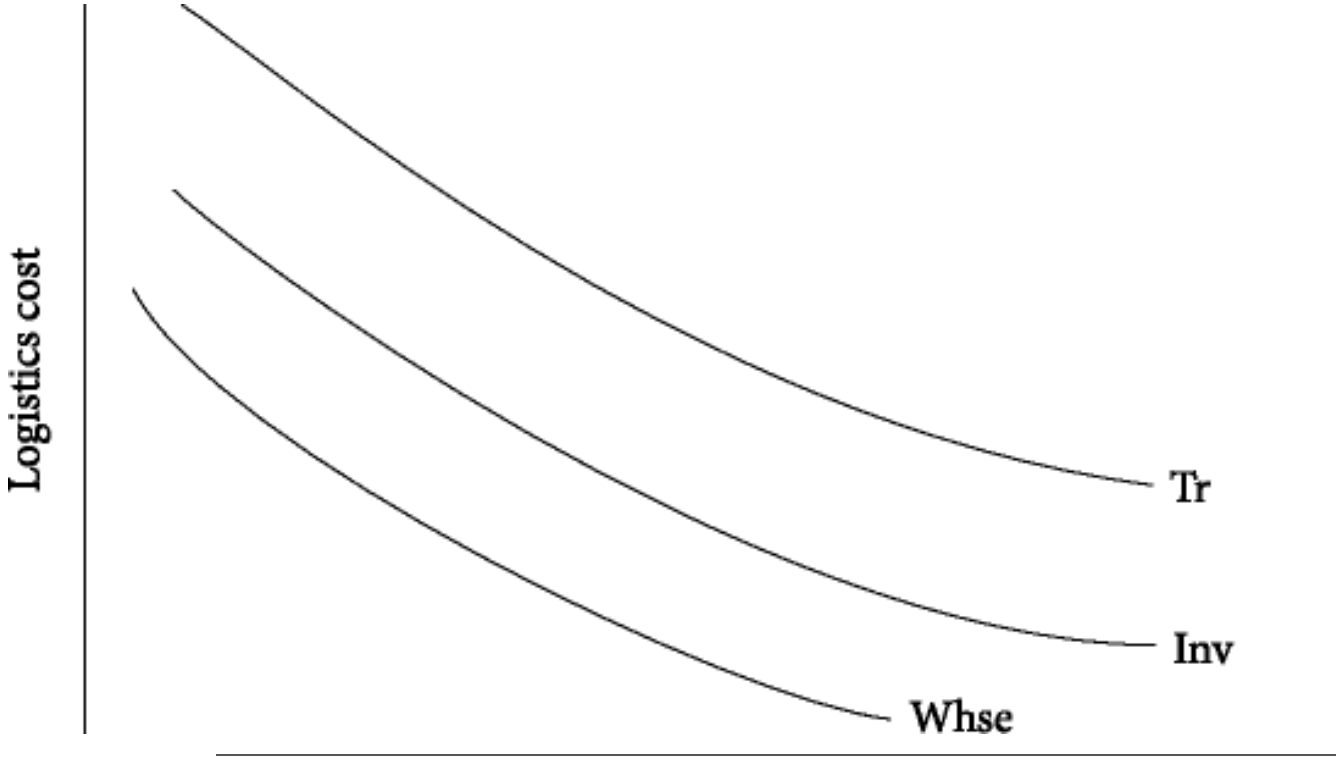
TC = Total cost
Tr = Transportation cost COLS = Cost of lost sales

Figure 2-9 The General Relationship of Product Dollar Value to Various Logistics Costs



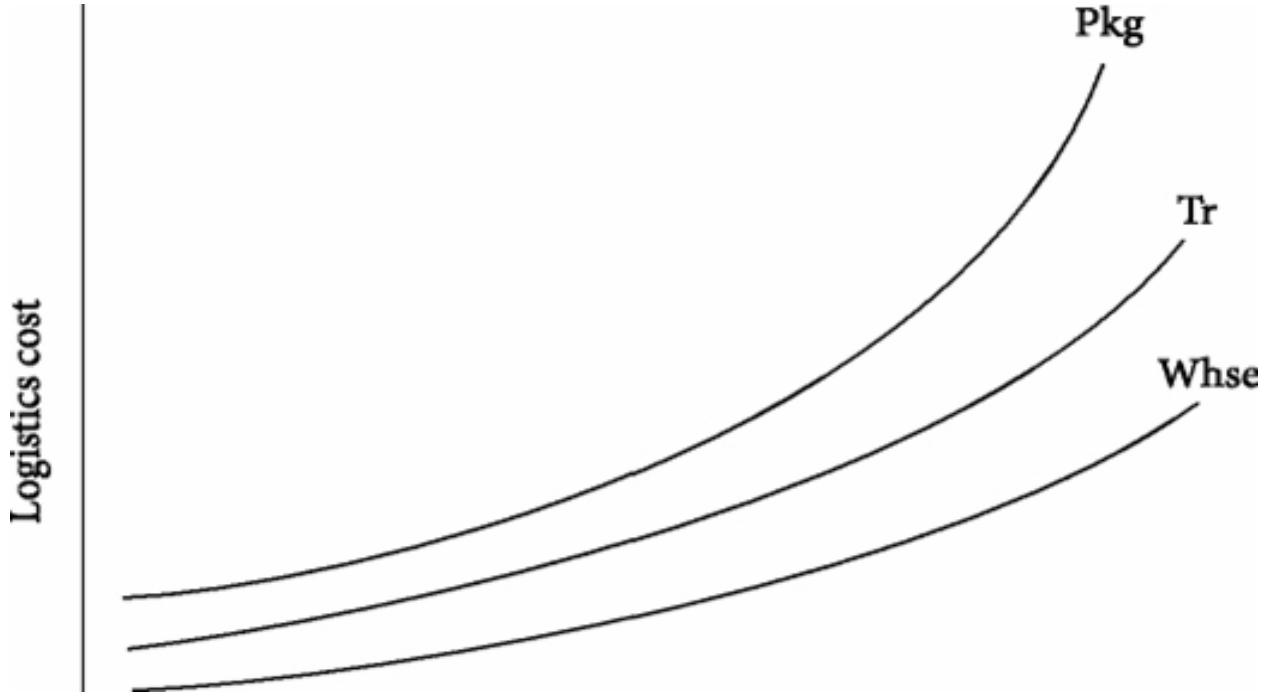
Inv = Inventory cost (including storage)
Tr = Transportation cost
Pkg = Packaging cost

Fig 2 -10 The General Relationship of Product Weight Density to Logistics Costs



Tr = Transportation cost
Inv = Inventory cost (including storage) Whse = Warehousing cost

Figure 2-11 The General Relationship of Product Susceptibility to Loss and Damage to Logistics Cost



Pkg = Packaging cost
Tr = Transportation cost
Whse = Warehousing cost

Spatial Relationships:

Spatial Relationships are extremely significant to logistics is spatial relationships, the location of fixed points in the logistics system with respect to demand and supply points. Spatial relationships are very important to transportation costs, since these costs tend to increase with distance.

Figure 2-12 Logistics and Spatial Relations

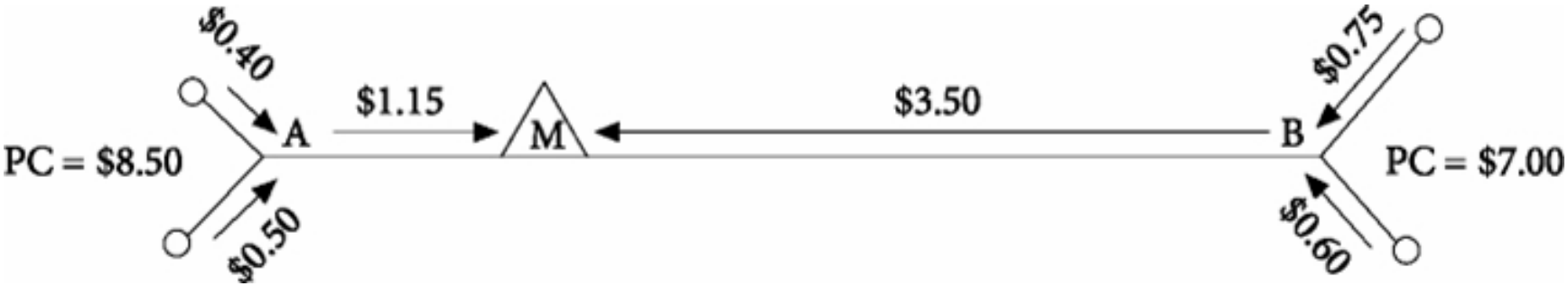


Table 2-3 Analysis of Total Logistics Cost with a Change to a Higher Cost Mode of Transport

Cost Centers	Rail	Motor
Transportation	$3.00	$4.20
Inventory	5.00	3.75
Packaging	4.50	3.20
Warehousing	1.50	0.75
Cost of lost sales	2.00	1.00
Total cost	$15.00	$13.00*

*Costs per unit.

Techniques of Logistics System Analysis

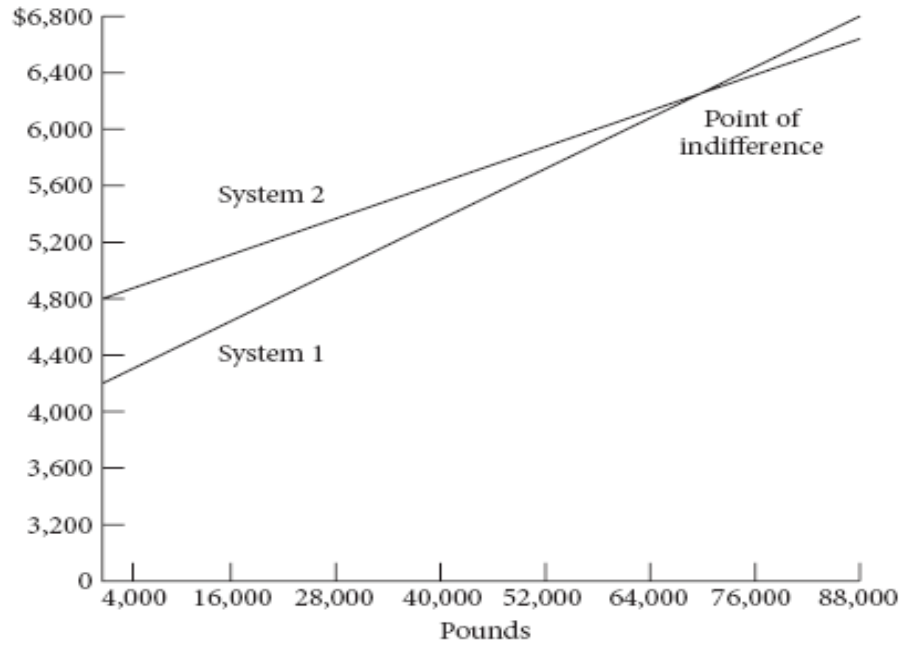
Short-Run/Static Analysis

Long-Run/Dynamic Analysis

- Nodes
  - The nodes are fixed spatial points where goods stop for storage or processing.
- Links

  The links represent the transportation network and connect the nodes in the logistics system.

Figure 2-13 Dynamic Analysis



	Total Cost	Fixed Cost	Total Variable Cost	Variable Cost per Pound
System 1	$5,775	$4,200	$1,575	$0.0315
System 2	$5,950	$4,800	$1,150	$0.0230

Table 2-4 Analysis of Total Logistics Cost with a Change to More Warehouses

Cost Centers	System 1 Three Warehouses	System 2 Five Warehouses
Transportation	$850,000	$500,000
Inventory	1,500,000	2,000,000
Warehousing	600,000	1,000,000
Cost of lost sales*	350,000	100,000
Total cost	$3,300,000	$3,600,000

*Expected cost based upon probabilities of not having stock/inventory available when customers want it.

Figure 2-14 Nodes and Links in a Logistics System

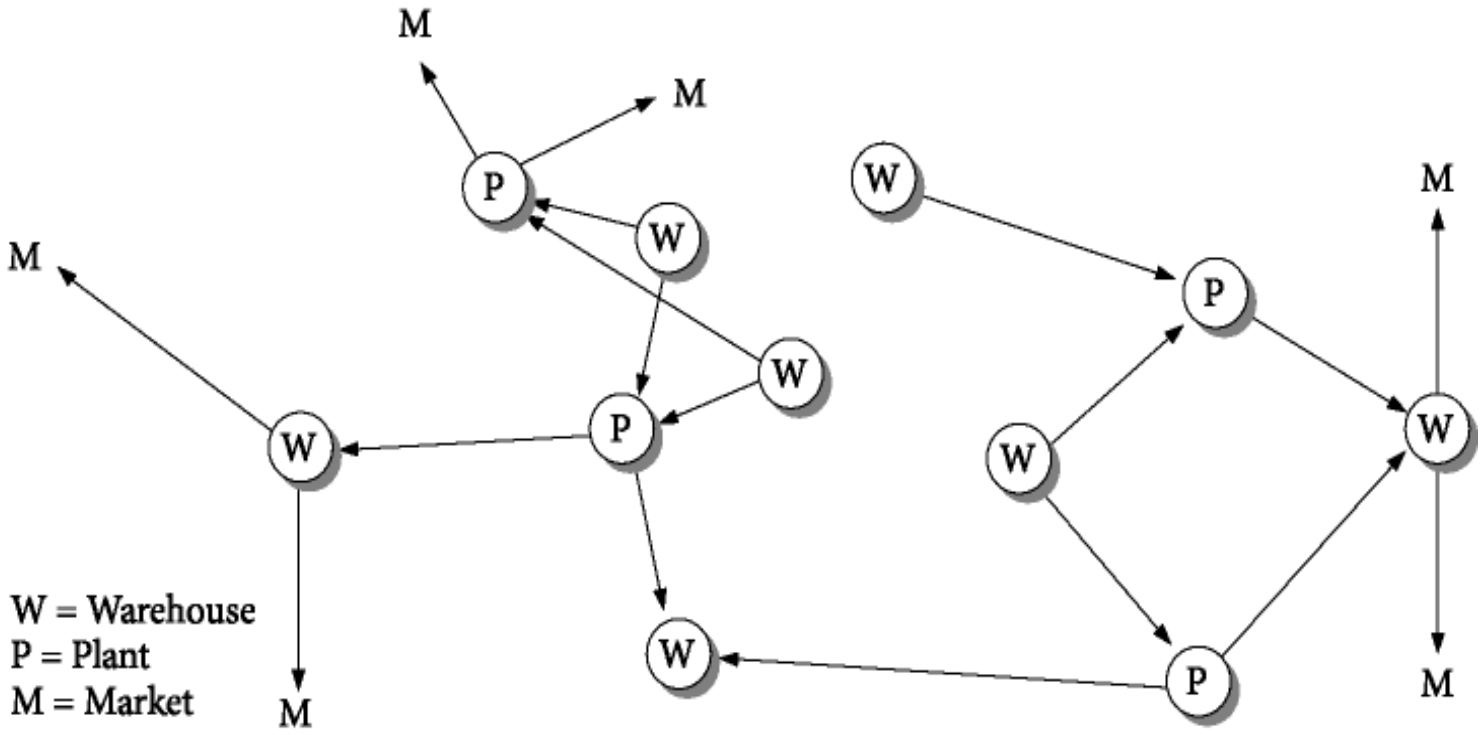


Figure 2-15 A Simple Logistics Channel

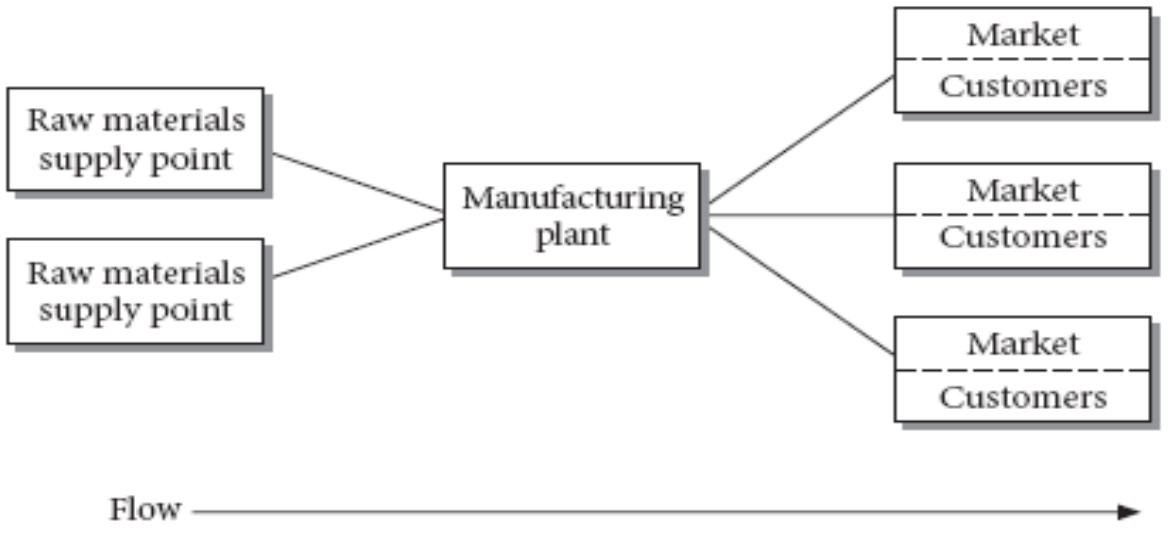


Figure 2-16 A Multi-Echelon Logistics Channel

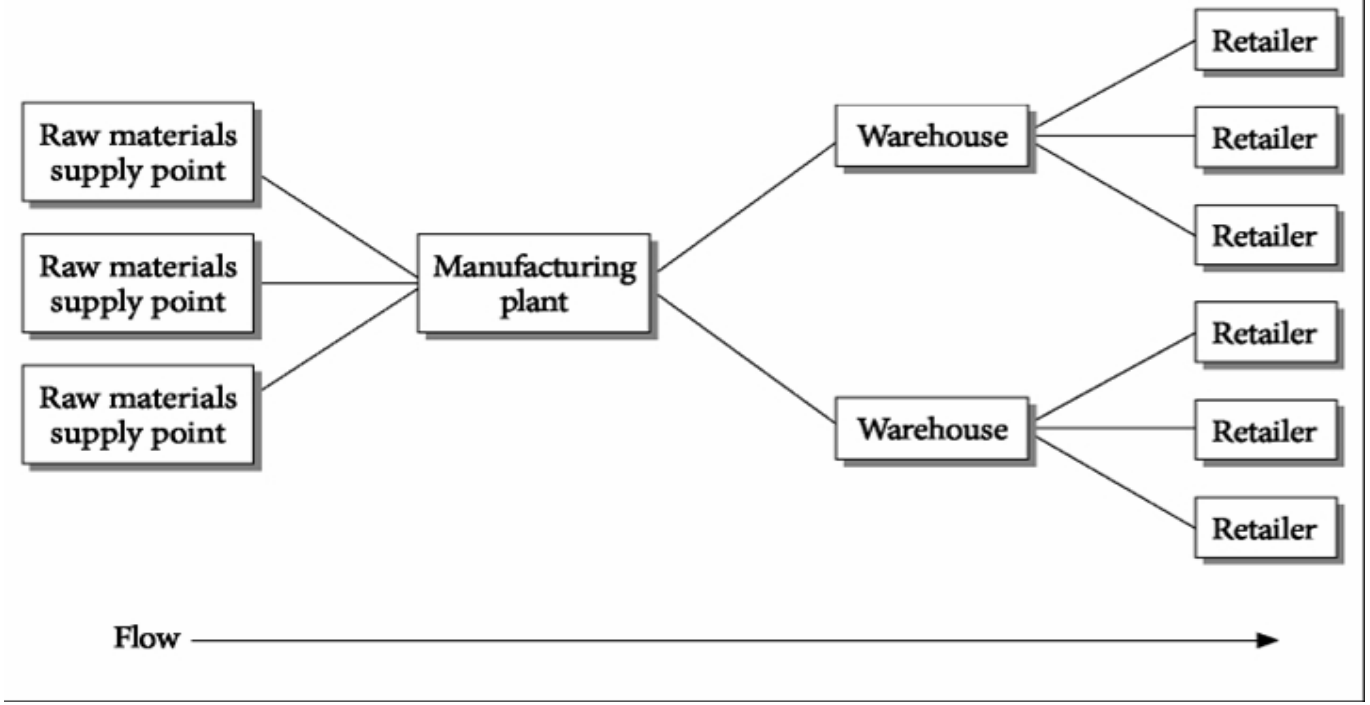


Figure 2-17 A Complex Logistics Channel

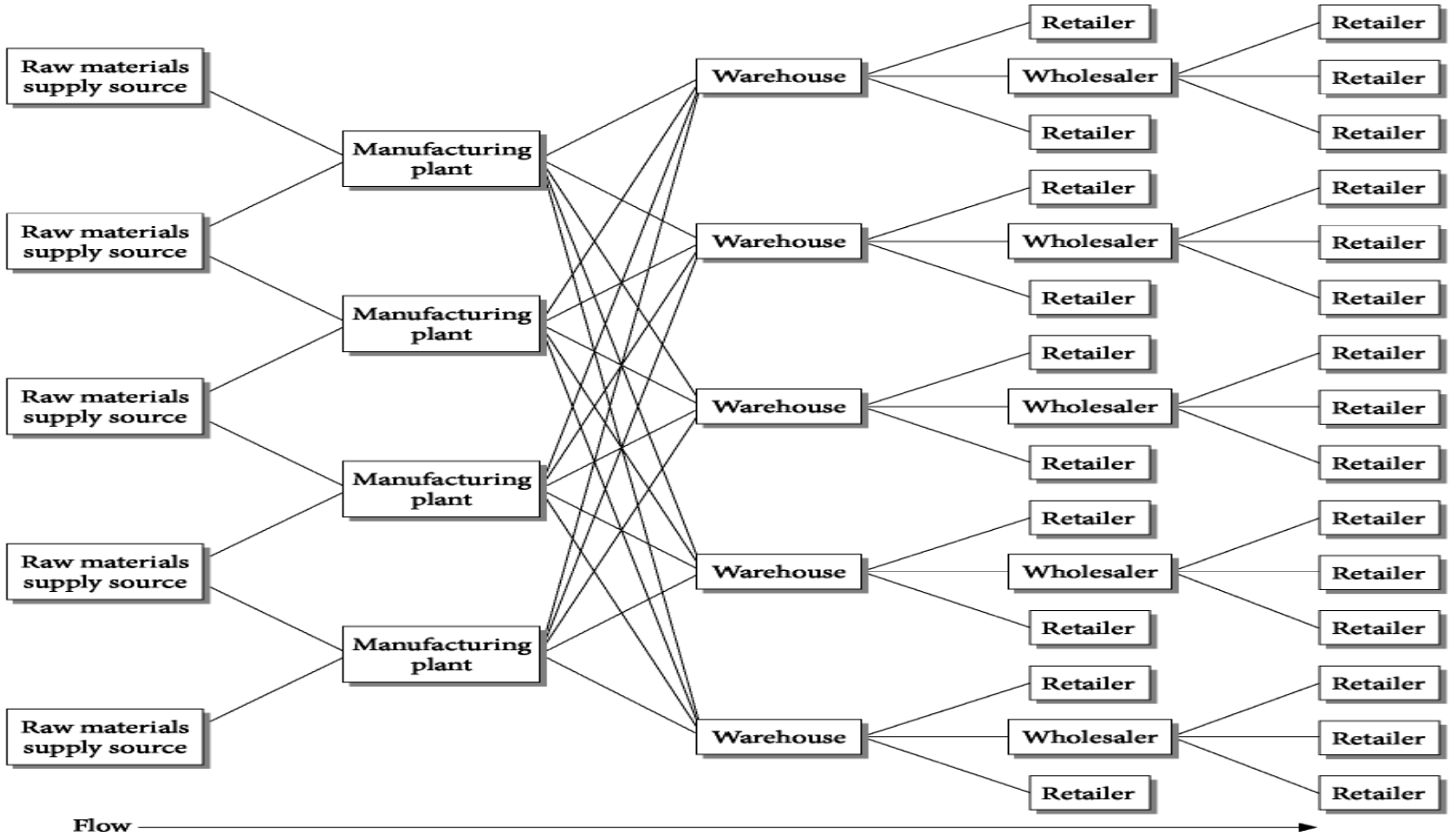
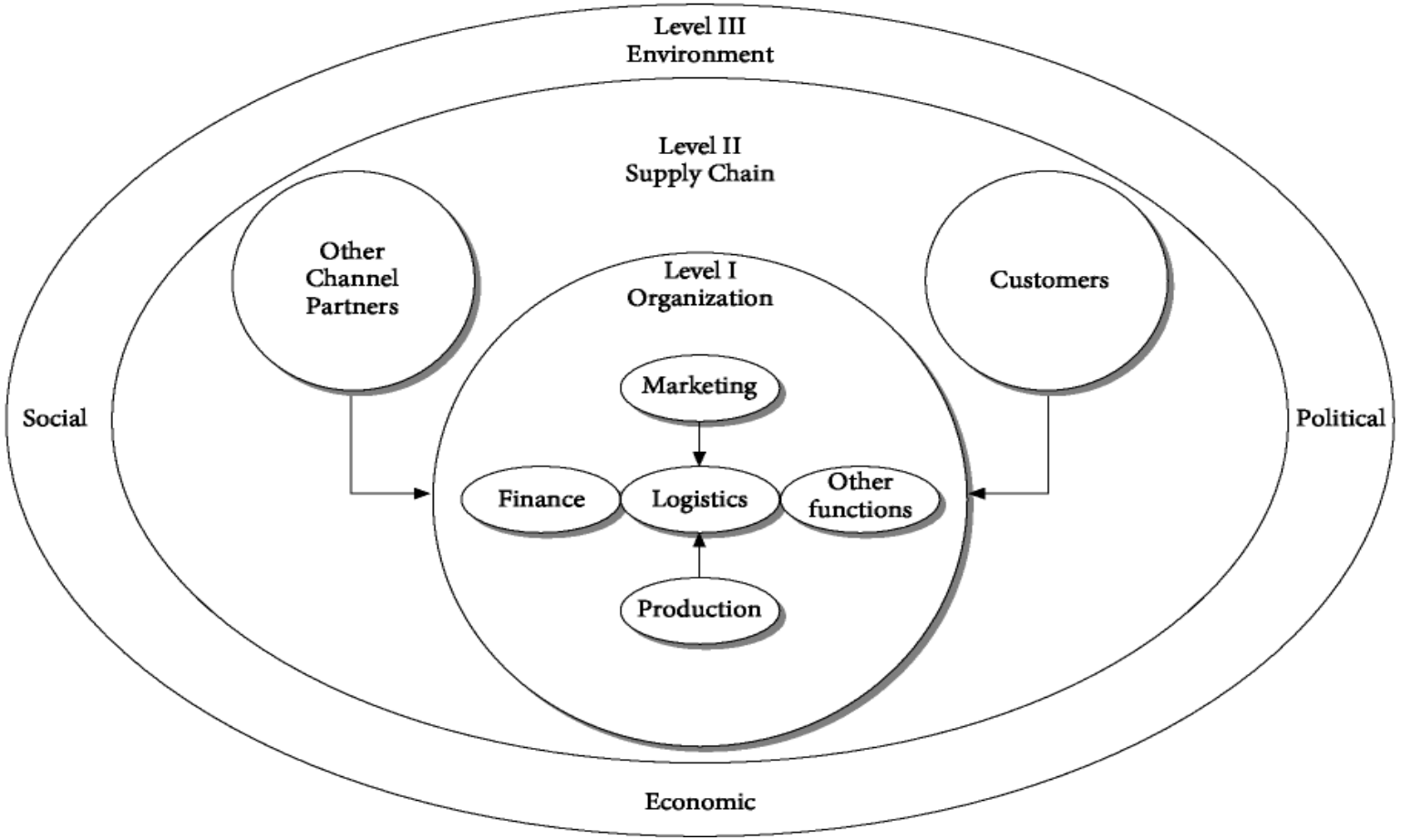


Figure 2-18 Levels of Opportunity



Chapter 2 Summary

- Logistics has developed as an important area or function of business since World War II. It has gone through several phases of development in achieving its present status.
- Logistics is a critical part of supply chain management. The coordination and, perhaps, integration of the logistics systems of all the organizations in a supply chain are necessary requirements for successful management of the supply chain.
- Logistics has a number of different definitions because of the broad-based interest in its activities and the recognition of its importance. The definition developed by the Council of Supply Chain Management Professionals is the primary definition used in this text.
- Logistics is an area of management that has four subdisciplines: business, military, service, and event.

Chapter 2 Summary (cont.)

- On a macro basis, logistics-related costs have been decreasing on a relative basis, which has helped the U.S. economy regain its competitive position on a global basis.
- Logistics adds place, time, and quantity utilities to products and enhances the form and possession utilities added by manufacturing and marketing.
- Logistics has an important relationship to manufacturing, marketing, finance, and other areas of the organization.
- Logistics managers are responsible for a number of important activities, including transportation, inventory, warehousing, materials handling, industrial packaging, customer service, forecasting, and others.

Chapter 2 Summary (cont.)

- Logistics systems can be viewed or approached in several different ways for analysis purposes, including materials management versus physical distribution, cost centers, nodes versus links, and channels. All four approaches are viable for different purposes.
- Logistics systems are frequently analyzed from a systems approach, which emphasizes total cost and tradeoffs when changes are proposed. Either a short- or long-run perspective can be used.
- The cost of logistics systems can be affected by a number of major factors, including competition in the market, the spatial relationship of nodes, and product characteristics.