

C.40 Transportation Methods

TRANSPORTATION MODES AND RATES

Selection of a means of transporting product from manufacturing sites to warehouse locations and to customers is a component in the marketing logistics system. The **marketing logistics system** deals with the storage and movement of finished goods from the producer to the consumer. Other decision elements in the marketing logistics system include **inventory level** (see GLOSSARY entry C.15) and **warehouse location** (see GLOSSARY entry C.41).

These three decision areas in marketing logistics planning—transportation, inventory level, and warehouse location—are interrelated; a decision in one area affects the outcome in the others. Selection of transportation method, for example, affects delivery speed. Higher delivery speeds shorten the replenishment cycle and thus reduce inventory needs. At the same time, selection of transportation method will be influenced by the availability of warehouses. Warehouses permit consolidation of shipments and use of low-cost carriers that handle high-volume shipments, with more flexible transportation methods used only for warehouse to customer deliveries. As a result of interactions such as these, marketing logistics needs to be treated as an interactive system, with each decision made only after considering the impact on other elements in the system.¹

Characteristics of Alternative Forms of Transportation. Selecting a mode of transportation, like most marketing logistics decisions, involves a tradeoff between the level of service provided and the cost. Each of the ma-

ajor transportation alternatives provides a different form and level of service that must be compared with the needs of the product as a part of the tradeoff analysis.

■ **Rail Transportation.** Although its market share has diminished, railroads still have the largest share of intercity freight volume in both revenues and ton-miles. The greatest advantage of rail transportation lies in long-distance movement of high-bulk, high-weight products because of its low cost for such items compared to other transportation methods. However, much of the economy is lost if the volume to be shipped is in less than carload lots. Rail transportation is available wherever the rail network extends, but in other locations, or if rail sidings are not available, it is necessary to reload and transship, usually by truck, to the final destination. Rail transportation is not fast. Once underway, trains move relatively quickly, but many delays are experienced in making up trains, in breaking up and redirecting parts of trains, and in breaking up trains to get cars to individual destinations. Railroads are relatively reliable, but not overly secure, and handling may be too rough for fragile items.

■ **Truck Transportation.** The advantage of truck transportation is its great flexibility and accessibility. Trucks can deliver anywhere the highway network extends and can usually provide door-to-door delivery without transshipping or repacking. As a result, in-transit times are often short. Trucks can flexibly handle shipments of mixed goods and less-than-truckload lots.

Offsetting the accessibility of truck transportation is its relatively high cost. Compared to rail transportation, trucks have high variable costs of fuel and labor. As a result, truck transport is most appropriate for lower bulk, higher value products and smaller, short-distance shipments direct to end users or storage points.

■ **Water Transportation.** Included in water transportation are barge lines, bulk ore and grain carriers, and ocean-going ships. The strength of water transportation lies in its ability to carry large, low-value loads over long dis-

¹For discussion of a systems approach to marketing logistics, see David P. Herron, "Managing Physical Distribution for Profit," *Harvard Business Review* (May-June 1979), pp. 121-32, and Ross Pirasteh, "Prevent Blunders in Supply and Distribution," *Harvard Business Review* (March-April 1969), pp. 113-27.

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tances at very low cost. Heavy users of water transportation include such goods as iron ore, cement, grain, and coal. Exporters to overseas markets are also dependent on water transportation. (See GLOSSARY entry C.14 on **international market entry strategy**.)

Several disadvantages offset the low cost of water transportation. It is the slowest of the major transportation modes and is accessible **without transshipment only for waterside locations**. Special loading and off-loading facilities are usually necessary.

- **Air Freight.** One of the newest, and least utilized modes of transportation, is air freight. The major advantage of air transport is speed of delivery. This makes it appropriate for perishable products or emergency shipments. Air transportation is reasonably accessible, although it must usually be combined with truck transport at each end of the flight.

Air transportation is the most expensive form of transportation due to the high costs of fuel, maintenance, and personnel and its low capacity. Air transportation can be used as a means of maintaining customer service with smaller inventories, thus offsetting the high cost. In general, however, its use is limited to high-value, low-bulk products.

- **Pipelines.** The use of pipelines as a transportation mode is limited to petroleum products—oil and natural gas. Where available, pipelines provide the lowest-cost form of transportation for these products, although availability of pipelines is obviously limited. Movement of product through pipelines is slow, but operation is continuous and highly reliable.
- **Combination Transportation Systems.** A recent development has been the appearance of transportation systems that combine two transportation modes to gain the advantages of each. The available systems combine truck transportation, to gain the advantage of flexibility and local delivery, with one of the low cost and/or long distance carriers. Piggyback combines truck and rail, fishyback combines truck and water, and birdyback or airtruck combines truck and air transport. These systems frequently utilize special containers that can be transferred from one transportation mode to another without unpacking and repacking.

Because of the advantages of these combination services, growth has been rapid, particularly of the rail-truck combination. However, availability of the combination services is still limited.

- **Other Transportation Services.** Several other

transportation services that are highly useful in specialized situations are available. Several package delivery services provide local and long distance delivery of small packages. Best known of these are United Parcel Service and Greyhound Bus's package service. These services provide a relatively fast, but expensive means of quickly distributing small items direct to buyers. Air express services, such as Federal Express, provide rapid, but expensive air shipment of small packages.

Freight forwarders serve shippers by consolidating the small shipments of multiple firms to earn a bulk rate with the carrier. At the destination point, the bulk shipment is broken down into its original components for local delivery. Freight forwarders are available for surface, air, and international transport.

Freight brokers serve as selling agents for a number of carriers and serve shippers by locating available transportation space and, in some cases, helping to consolidate shipments with those of other firms.

Transportation Rates. Although there have been significant recent changes, most forms of transportation have historically been subject to substantial government regulation. Federal regulation of transportation began with the 1887 Act to Regulate Commerce which established the Interstate Commerce Commission and gave it jurisdiction over interstate commerce. After 1887, additional legislation was passed to increase the power of the ICC and to form other regulatory bodies with authority over specialized transportation forms. The rationale for regulation of transportation was that transport was an essential economic service and that transportation providers had quasi-monopoly powers. Regulation, it was felt, was necessary to assure that transportation services were made available at fair rates without discrimination.

Among the powers granted to the ICC and other regulatory agencies was the power to regulate rates. However, beginning in 1977, a series of acts were passed that greatly reduced transportation rate regulation in an effort to introduce greater competition into transportation and greater influence of the free market in rate setting. This resulted in deregulated air freight and freight for-

warder rates. Rail and truck rate making, although still partially regulated, is far more flexible and competitive than in the past.

Although federal agencies retain rate regulation authority in some fields, regulatory commissions themselves do not set rates.² Instead, the carriers determine the rates that they will charge and file these rates with the appropriate regulatory authority. The agencies may then investigate these rates and, if they find them to be unreasonable, they may set them aside. Today, carriers have considerable flexibility in rate setting.

Determining the prices of transportation alternatives that are available to a shipper is difficult, with many confusing rates, discounts, and exceptions. However, underlying the complexity are three factors that are most important in determining transportation rates.³

- *Cost of Service.* As in the pricing of any product, the cost of providing the service serves to set a lower limit for transportation rates. The higher the cost of providing the service, the greater the rate will be. Because most transportation services use shared facilities, common costs tend to be high, making determination of cost for any particular service difficult and sometimes arbitrary.
- *Value of Service.* Transportation rates are also determined by what customers are willing to pay. This represents the demand side of pricing and sets a ceiling on price. As transportation markets are deregulated and become more competitive, the level of competitive rates will define demand and set a limit on what can be charged. In general, high-value, low-bulk products are charged higher rates per pound than are low-value, high-bulk commodities because of the difference in margins available for transportation expense.
- *Distance.* Transportation rates vary directly with distance. This is a reflection of the increase in cost with distance the product is moved. However, the increase in rate tends to diminish as distance lengthens. This reflects

the fact that costs also increase at a diminishing rate as distance increases due to the spreading of fixed costs over more transportation miles.

CRITERIA FOR SELECTING TRANSPORTATION MODE

A major decision to be made in establishing the marketing logistics system is to select the method of transportation to be used. The choice involves a tradeoff between cost and service provided, with the service required being dependent upon the characteristics of the product to be transported and the service strategy of the firm. These three determinants, product, cost, and service level, are considered separately below, but it should be kept in mind that the three are interrelated.⁴

Influence of Product Characteristics on Transportation Method. The choice of transportation mode will vary with the type of product. Products that have high time value, because they are perishable, are emergency goods, or have high turnover, need high speed transport. For short distances this would suggest truck and for longer distances, air transport.

Product bulk is an important determinant of transportation method. For high-bulk, heavy commodities, especially over long distances, rail and water transportation will often be the only forms able to handle the product. Trucks often play an important role with such products in transshipping from the bulk carrier to end user.

Product value is a determinant of transportation method. Low-value products have insufficient margins to permit use of high-cost transport. On the other hand, high-value products with greater available margins for marketing costs have the option of selecting higher cost, but higher service transportation methods such as truck and air.

²See John J. Coyle, Edward J. Bardi, and C. John Langley, Jr., *The Management of Business Logistics*, 4th ed. (St. Paul: West Publishing Co., 1988), pp. 356-60.

³Suggested by Coyle, *The Management of Logistics*, pp. 367-71.

⁴The three-way classification of criteria is suggested by Graham Buxton, *Effective Marketing Logistics* (London: Macmillan Press, 1975), pp. 149-53. The discussion that follows draws from the same source.

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Transportation Cost as a Determinant of Transportation Mode. The price charged by different transportation modes varies greatly and must be considered in making a choice of mode. However, price must be considered in relation to the level of service offered and the requirements of the product.

Compared on the basis of cost per ton mile of transport, the major modes range in cost from pipelines at the low end, increasing for water, rail, and truck, with air on the high end. However, cost analysis must deal with the total cost, not the cost per mile. The two important variables in total cost are the volume of product to be shipped and the distance it is to be moved. Generally, transportation methods with high fixed costs, such as rail and pipelines, will show sharply decreasing cost per mile as fixed costs are spread over greater distances. They are the most suitable choice, in terms of cost, for high-volume, long distance moves. Transportation methods such as trucks, have a higher proportion of variable cost with the result that cost per ton mile will decrease little with distance. This makes truck transport economically more feasible for short distance transportation.

Other cost considerations include the requirement for special loading or unloading facilities, the need for special packaging, and costs for breaking down shipments and transshipping.

Service Level Requirements and Choice of Transportation Method. Choice of transportation method also depends upon the type and level of service required. Service required depends, in part, on type of product and also influences cost, the price rising with the level of service.

Transportation modes differ in the services offered.

- *Speed.* Air and truck transport offer the fastest means of transportation. Air transport's speed advantage is greatest for long distances and for overseas transportation. Truck transport is fast because it avoids unloading and reloading activities by delivering door-to-door.
- *Availability.* Transportation modes with fixed

networks, such as rail, water and pipeline, are limited in accessibility to points reached by their networks. Truck transportation is considerably more accessible because it uses the highly flexible network of public highways. Air transportation is limited by the availability of airports and must usually be used in combination with trucks. For overseas shipments, ship transportation may be the only available transportation mode.

- *Reliability.* Transportation modes vary in their reliability. Those that are regularly scheduled and not sensitive to weather or accident are more reliable. Pipelines are largely insensitive to weather while air cargo is very weather sensitive. Rail transport is often subject to delay while awaiting initial makeup of trains and re-routing of sections of trains while in transit.
- *Frequency.* The frequency of service depends upon the size of the transportation unit and the speed of transit. Truck transportation tends to offer frequent service because there is little waiting time to fill a truck. Water transportation is infrequently offered, simply because of the long transit time for each ship or barge.
- *Capability.* To be considered as an alternative, a transportation mode must have the capability of handling the type of product or the load to be shipped. Highly bulky loads, like coal or cement, require special handling equipment and some perishables require refrigerated transport.
- *Security.* Transportation modes vary in their ability to prevent pilferage and damage while the goods are in transit. Trains, which have frequent delays, reloading of cars, and many personnel involved, offer low security. At the other extreme are pipelines. Use of containerized loads with combination transportation methods tends to result in greater security.

SUGGESTIONS FOR FURTHER READING

- BUXTON, GRAHAM. *Effective Marketing Logistics*. London: Macmillan Press, 1975.
- HERRON, DAVID P. "Managing Physical Distribution for Profit." *Harvard Business Review* (May-June 1979), pp. 121-32.
- PIRASTEY, ROSS. "Prevent Blunders in Supply and Distribution." *Harvard Business Review* (March-April 1969), pp. 113-27.

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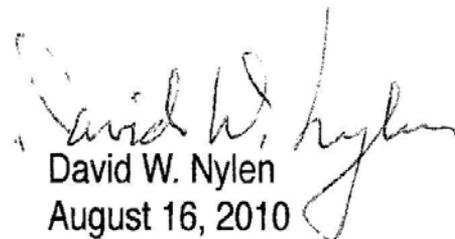
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