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Integrating Transportation and Logistics Management

The movement of various goods and people from one place to another along with the means of accomplishing this movement is known as transportation. It is an integral part of logistics. The topics elaborated in this chapter will help in gaining a better perspective about the integration of transportation in logistics management.

Transportation

Transportation is the movement of goods and persons from place to place and the various means by which such movement is accomplished. The growth of the ability—and the need—to transport large quantities of goods or numbers of people over long distances at high speeds in comfort and safety has been an index of civilization and in particular of technological progress.

In business, at its most basic level, transportation is simply moving products and materials from one place to another. This includes shipment of raw materials to the manufacturer and movement of finished product to the customer. Transportation also includes the movement of parts to assembly areas as they are assembled.

Logistics management involves getting your products to your customers on time, in the correct quantities, in good condition at the right price. This includes overseeing transportation, as well as storage of materials, production and inventory management. Logistics also includes the packaging of products for storage and shipment. Logistics involves both internal and external distribution networks.

For most companies, the key to transportation and logistics is finding the right balance between efficiency and cost. Perhaps one of the most successful companies at doing this is Amazon, which has dozens of distribution centers across the United States and spends billions in developing state-of-the-art fulfillment centers to get its products to customers quickly while managing to make a profit.

Minimization of Transportation Costs

The easiest way to minimize transportation costs is to eliminate unnecessary transportation. You can do this by finding closer suppliers. You can reduce transportation costs by consolidating shipments, buying partially assembled products from vendors and reducing the number of trips needed to ship in raw materials. Having work stations within the factory close to each other minimizes material transportation, which is a non-value-added labor cost. Consolidating transportation service providers increases the volume each transportation firm provides and can allow for a negotiated volume discount.

Minimization of Logistical Costs

Logistical costs are directly reduced by just in time, or JIT, manufacturing. Use material resource planning or MRP systems to time orders so that a minimum of stock is on hand. Order parts in packaging that can be directly sent and stocked in the warehouse. This eliminates the wasteful process of receiving, unpacking and then labeling product for the company's own inventory management system. Work with suppliers to have bar code labels or RFID chips that are cross-compatible, allowing the entire supply chain to use the same part numbers and equipment to track and manage inventory.

Mitigatation of Transportation and Logistical Risk

Consolidating shipments increases the risk of a lost shipment bringing a JIT assembly line to a standstill. A surprise shortage will shut down production. This means that JIT requires a secure supply chain. The orders must be able to be delivered quickly and rapidly, with a minimum risk of delays. This is the reason many JIT suppliers build factories or distribution centers close to their major suppliers.

If the supplier is close by, a shutdown of air traffic or a massive traffic jam across town will not prevent parts from being walked over. Suppliers that are not located close by must have multiple backup routes for their product. If the overnight delivery truck is unable to depart on time, there needs to be a mitigation plan in place, such as reserve vehicles or shipping companies on retainer that can send out another vehicle and team to unload the down vehicle, reload to the new vehicle, and then deliver the parts and material.

Role of Transportation in Logistics

Transportation is a key process in the logistics chain, which is involved at every stage, right from the manufacturing of the product, to its final delivery at the required location. The role that transportation has come to acquire in the recent times can be judged from the fact that freight transportation costs contributed to over 6% of the GDP of the United States in the past year. While the basic goal of transportation in the supply chain invariably remains ensuring that the good reaches the customer within the stipulated time, there are several subsidiary roles that are met with efficient transportation management. These range reduced inventory costs to better warehouse management.

The success of any supply chain can be judged from its transportation management. Wall-Mart is an ideal example of how the use of the simple technique of cross-dorking can make the entire transportation system responsive and streamlined. Another major role that efficient transportation plays in the logistics chain is the globalization of products. This is made possible by facilitating transportation of goods from countries with cheap labor like China and India, not just contributing to their economy, but also helping to create a channel of flow for these products.

There are various decisions that need to be made by both the carrier as well as the shipper for the proper functioning of any transportation system. The most important of these factors are those relating to cost. The carrier might need to incur a fixed operating cost in case of access to an operating facility, despite whether he is actually using the facility or not. Apart from that, the major cost incurred is trip-related, which covers labor and fuel costs. This can be minimized by strategizing on transportation routes, and minimizing labor by making use of advanced technologies like bar code reading and tagging.

When carefully planned, transportation can be a leading competitive strategy for a firm. The two most important factors that need to be optimized are transportation costs and customer responsiveness. Transportation managers are faced with various critical decisions, such as the ratio of outsourced transportation to company-owned transportation; whether or not to own and manage an independent transportation fleet; how to minimize the need for backup inventory by improving customer responsiveness, etc. This can be made possible with the use of information technology including satellite communication with on-road vehicles.

Principles and Practices of Transportation

The role of transportation in logistics has changed dramatically over the last four decades. Prior to transportation deregulation, the purchase of transportation could be likened to buying a commodity such as coal or grain. There was very little difference between transport suppliers in terms of product, service or price. Transportation deregulation in 1980 introduced pricing flexibility and significantly increased the range of services transportation companies could provide customers.

Today a wide range of transportation is available to support supply chain logistics. For example, logistics managers may integrate private with for-hire transportation to reduce total logistics costs. Many for-hire carriers offer a wide variety of value-added services such as product sortation, sequencing and customized freight delivery and presentation. Technology has enhancement real-time visibility of the location of freight throughout the supply chain advanced information concerning delivery. Precise product delivery reduces inventory, storage and material handling. As a result, the value of transportation has become greater than simply moving product from one location to another.

Relationship between Transportation and Logistics in Supply Chain Management

- Transportation provides the critical links between these organizations, permitting goods to flow between their facilities.
- Transportation service availability is critical to demand fulfillment in the supply chain.
- Transportation efficiency promotes the competitiveness of a supply chain.

Transportation Function and Principles in Logistics and Supply Chain

Transport Function

1. Product movement: Whether in the form of materials, components, work-in-process or finished goods, the basic value provided by transportation is to move inventory to specified destinations. The primary transportation value proposition is product movement throughout the supply chain. The performance of transportation is vital to procurement, manufacturing and customer accommodation. Transportation also plays a key role in the performance of reverse logistics. Without reliable transportation most commercial activity could not function. Transportation consumes time, financial and environmental resources.

Transportation has a restrictive element because inventory is generally inaccessible during the transportation process. Inventory captive in the transport system is referred to as in-transit inventory. Naturally, when designing logistical systems, managers strive to reduce in-transit inventory to a minimum advancements in information technology have significantly improved access to in-transit inventory and arrival status of shipments by providing exact location and arrival times.

Transportation also uses financial resources. Transportation cost results from driver labor, vehicle operation, capital invested in equipment and administration. In addition, product loss and damage are significant costs.

Transportation impacts environmental resources both directly and indirectly. In direct terms, transportation represents one of the largest consumers of fuel and oil. Although the level of fuel and oil in consumption has improved as a result of more fuel-efficient vehicles, total consumption remains high. Indirectly, transportation impacts the environment through congestion, air pollution and noise pollution.

2. Product storage: A less visible of transportation is the performance of product storage. While a product is in a transportation vehicle, it is being stored. Transport vehicles can also be used for product storage at shipment origin or destination but they are comparatively expensive storage facilities. Since the main value proposition of transportation is movement, a vehicle committed to storage is not otherwise available for transport. A trade-off exists between using a transportation vehicle versus temporarily placing products in a warehouse. If the inventory involved is scheduled to be shipped within a few days to a different location, the cost unloading, warehousing and reloading the product may exceed the temporary cost of using the transportation vehicle for storage.

Another transport service having storage implication is diversion. Diversion occurs when a shipment destination is changed after a product is in transit. For example, the destination of a product initially shipped from Chicago to Los Angeles may be changed to Seattle while in transit. Traditionally, the telephone was used to implement diversion strategies. Today, internet communication between shippers, carriers headquarters and vehicles facilities more efficient diversion. While diversion is primarily used to improve logistical responsiveness, it also impacts the duration of in-transit storage.

So although costly, product storage in transportation vehicles may be justified from a total cost or performance perspective when loading or unloading costs, capacity constraints and ability to extend leadtimes are taken into consideration.

Transport Principles

Economy of scale

Economy of scale in transportation is the cost per unit of weight decreases as the size of a shipment increases. For example, truckload shipments utilizing an entire trailer capacity have a lower cost per pound than smaller shipments that utilize a limited protion of vehicle capacity. It is also generally true that larger-capacity transportation vehicles such as rail and water vehicles are less costly per unit of weight than smaller-capacity vehicles such as trucks and airplanes. Transportation economies of scale exist because fixed cost associated with transportation a load is allocated over the increased weight. Fixed costs include administration related to scheduling, cost of equipment, time to position vehicles for loading or unloading and invoicing. Such costs are considered fixed

because they do not vary with the shipment size. In other words, it costs as much to administer a 100 pound shipment as one weighing 1000 pounds.

Economy of Distance

Economy of distance refers to decreased transportation cost per unit of weight as distance increased. For example a shipment of 800 miles will cost less to perform than two shipments of the same weight each moving 400 miles. Transportation economy of distance is often referred to as the tapering principle. The rationale for distance economies is similar to economies of scale. Specifically, longer distances allow fixed cost to be spread over more miles, resulting in lower per mile charges.

Participant's Decisions

Shipper

Shipper and consignee have a common interest in moving goods from origin to destination within a given time at the lowest cost. Services related to transportation include specified pickup and delivery times, predictable transit time and zero loss and damage as well as accurate and timely exchange of information and invoicing.

Carriers and Agents

The carrier, a business that performs a transportation service, desires to maximize its revenue for movement while minimizing associated costs. As a service business, carriers want to charge their customers the highest rate possible while minimizing labor, fuel and vehicle costs required completing the movement. To achieve this objective, the carrier seeks to coordinate pickup and delivery times to group or consolidate many different shippers' freight into movements that achieve economy of scale and distance. Brokers and freight forwarders are transport agents that facilitate carrier and customer matching. A more recent development has been the emergence of internet or online brokers that match carrier capacity and shipper requirements.

Government

The government has a vested interest in transportation because of the critical importance of reliable service to economic and social well-being. Government desires a stable and efficient transportation environment to support economic growth. Because of the direct impact of transportation on economic success, governments have traditionally been very involved in oversight of carrier practices. Government historically regulated carriers by restricting markets they could service and approving prices they could charge. Governments also promote carrier development by supporting research and providing right-of-way such as roadways and airports. In some countries government maintains absolute control over markets, services and rates. Such control allows government to have a major influence on the economic success of regions, industries and firms.

The Public

The final transportation system participant, the public is concerned with transportation accessibility, expense and effectiveness as well as environment, security and safety standards. The public

indirectly creates transportation demand by purchasing goods. While minimizing transportation cost is important to consumers, concerns also involve environmental impact and safety. The effect of air pollution and oil spoilage is a significant transportation-related social issue. The cost environmental impact and safety is ultimately paid by consumers.

Supplier Transportation Services

Single Modes

The various types of single-service are the rail, truck, air, water and pipeline. These basic transportation modes offer its service directly to users.

The most basic carrier type is a single-mode operator that offers service utilizing only one transport mode. This degree of focus allows a carrier to become highly specialized, competent, and efficient.

However, the approach creates significant difficulties for intermodal transport because it requires negotiation and a transaction with each individual carrier. Airlines are an example of a single-mode carrier for both freight and passenger service since they only offer service from airport to airport. The shipper or passenger is responsible for movement to and from the airport. A series of single-mode operations require more management effort and, thus, increase cost.

Specialized Carriers

Over the past several decades a serious problem existed in small-shipment transportation. It was diffietilt for a common carrier to provide a reasonably' priced small-shipment service because of significant overhead cost associated with terminal and line-haul service. This overhead forced motor carriers to assign a minimum charge for handling any shipment.

Intermodal Operators

Intermodal transport services refer to the use of two or more carriers of different modes in order to transport the products. Intermodal services maximized the primary advantages of the combined mode and minimize their advantages. Although there are various combination but the most prevalent forms have been truck-rail, truck-water and truck-air.

The truck-rail is commonly known as piggyback; truck-water as fishyback and truk-ari as birdyback. The combination mode physically transfers the motor carrier trailer with the cargo intact in another mode.

Modes of Transportation in Logistics

- Transportation via Roadways: This is one of the most common modes of transportation used by almost every logistics firm across the world. The reason behind this being the accessibility of roadways even in the most remote and smallest of town. Usually, transportation via roadways is done with the help of trucks and Lorries.

- Transportation via Waterways: When the amount and quantity of goods and services is very high, companies prefer waterways for transportation. Not only you can handle cargo from one country to another, but it is very cost effective as well because waterways are the cheapest means of transportation.
- Transportation via Railways: Railways is yet another important mode of transportation used in logistics. Apart from being able to handle the cargo from one place to another in a short period of time, railways are also used for handling cargo from a specific sea port to different parts of the country.
- Transportation via Airways: Undoubtedly, airways are the fastest means of transportation used in linguistics. But on the other hand, it is very expensive and is used only for handling valuable and less heavy materials.
- Other Modes of Transportation: There are yet another means of transportation used in linguistics that includes barges and boats, and local animals.

The way goods are moved around the country hasn't changed all that much over the years. Ships, trains, trucks and planes for smaller shipments remain the primary methods of shipping. What has changed is how large the shipments are and how they are tracked by software. We now see smaller, more personalized orders, more frequent shipments and a predominant rise of e-commerce in logistics. There has been a lot of innovation, and transportation has become more nimble because of it.

Transport by Ship

Ocean liners are giant ships used to transport goods. These ships traverse regular routes on fixed schedules. Liner vessels include container ships, bulk carriers and tankers. Container ships carry most of the world's goods, while bulk carriers transport raw materials like coal or iron ore, and tankers transport oil, petroleum and other chemicals.

Because they can carry a lot of cargo, up to several warehouses-worth of goods, liner ships are very efficient. Although shipping has been around for a very long time, today's ships can carry more cargo and are more fuel- efficient.

Carrying Goods by Train

There are two main options when it comes to shipping goods by rail are:

- Carload service: If your business is located close to a rail station, you can load freight directly onto or into rail cars and have it delivered to its destination.
- Intermodal service: This type of transportation involves two different forms of freight, such as trucks and trains. The freight is first loaded into trailers, then trucked to the rail station where the freight is loaded onto the train. At the final destination, trailers are loaded back onto another truck and delivered.

Rail shipping has several benefits. It's cost-effective and environmentally friendly because trains use less fuel than trucks to transport goods across the country.

Shipping by Truck

A semi or trailer truck, also known as a freight truck, transports items larger than 150 pounds. If your shipment exceeds 10,000 pounds, an entire freight truck is required to move it. Some companies also offer an LTL (Less Than a Truckload) option. In this shipping situation, you will only pay for the space you use.

Shipping by truck has some advantages. You have greater flexibility than you do with a train. Transportation is direct, rather than the go-betweens needed with a train, and transit times are often shorter. However, trucking causes environmental damage. Trucks are subject to accidents and inclement weather may cause delays.

Shipping by Planes

Shipments by plane will cost your company the most but will deliver goods the fastest. Light shipments that need to arrive quickly will benefit from a plane shipment. In 2017, Amazon shipped over 200 million pounds of goods by air, leasing planes from two different airlines.

Benefits of Transportation Management

TMS Logistics and Visibility

Proper transportation management begins with a transportation management system (TMS). A TMS will automatically tender loads, track shipments, and gather and analyze historical performance data. This data, often referred to as big data, allows a company to see what's happening in its shipping operations. Once visibility is gained into transportation operations, changes can be implemented to increase efficiency and customer satisfaction, reduce transportation spend, and optimize packaging or stored procedures that are harmful to overall supply chain goals.

Inventory Flow

Effective transportation management keeps a company's whole supply chain running smoothly. With successful transportation execution, inventory can be kept lean and can be moved in and out of a warehouse quickly and efficiently. This improves warehouse efficiency, reduces overall lead time and saves money on storage. Supply chain disruptions can be costly while hurting customer satisfaction and loyalty. Creating effective inventory flow through transportation avoids damage caused by the disruption.

Sustainable Logistics

Consumers are more and more aware of what it is they're buying and what ideals a company subscribes to. Also, transportation is an emission-heavy industry. Customers want to buy from companies who take social responsibility seriously and work hard to reduce their carbon footprint and minimize their energy consumption. Having inefficient transportation processes increases these environmentally-hazardous processes. Also, it can make a product unappealing to a customer due to the harm that comes with it.

Preferred Shipper Status

The ATA estimates the transportation industry is currently short 48,000 truck drivers. This shortage is expected to grow to 239,000 by 2022. A truck capacity crunch is due to the significant lack of drivers. Since there is much less trailer space to go around, shippers must compete to secure capacity. A company that has optimized transportation processes, such as short dwell-times and long tender lead times, will be a preferred shipper and have an easier time finding capacity because carriers will want to work with someone who boosts their efficiency. Having access to reliable capacity in the coming years can save logistics costs. Additionally, it can continue to provide a high level of service for customers.

Customer Satisfaction

The processes in between procurement and shipping can be long and complicated, but out of all of these processes, transportation is the one where a company has direct contact with a customer. The point of delivery reflects the competency of the entire organization – if a company is constantly delivering products late, the customer will have a very negative view of this company and will likely not use their services again. Last mile logistics, the last stretch before delivery, is complex, costly, and it is often this part of the delivery that causes disruptions and delays. Proper management of transportation can ensure high delivery performance and consistent customer satisfaction. Therefore, the importance of transportation management is hard to overestimate.

Transportation Management System

A transportation management system (TMS) is part of supply chain management (SCM) centered on transportation logistics. A TMS enables interactions between an order management system (OMS) and distribution center (DC) or a warehouse.

TMS handles four important operations of transport management:

- Planning: Defines the best transportation strategies based on specified parameters, which would be of higher or lower importance as per the user policy. This includes transportation expenditure, minimum stops possible to guarantee quality, shorter lead-time, flows regrouping coefficient and so on.
- Transportation execution: Enables the transportation plan execution. This includes carrier-rate approval, carrier sending, electronic data interchange (EDI), etc.
- Transportation follow-up: Permits the following up of any administrative or physical operation regarding transportation. This includes event-by-event transportation traceability, receipt editing, customs clearance, invoicing as well as reserving documents, transport alerts delivery, etc.
- Measurement: Includes or should include strategic key performance indicator (KPI) report functionality for transportation.

Standard TMS software modules consist of:

- Load optimization
- Route planning and optimization
- Delivery
- Freight audit, payment, etc.
- Yard administration
- Advanced shipping
- Order visibility
- Carrier administration

TMSs are intended to reach the goals mentioned below:

- Minimize expenditures by means of more effective route planning, load optimization, carrier combination as well as mode selection.
- Enhanced accountability with exposure to the transportation chain.
- Better flexibility to make modifications in delivery plans.
- Realization of important supply chain execution demands.

Transportation Logistics Management

Transportation logistics management is an integral part of delivering goods from suppliers to customers. Everything and everyone involved in the delivery of products or materials is encompassed by supply chain management, including transportation logistics management. Logistics experts need to focus on transportation, specifically the efficient planning and procurement of transportation for products and materials. Freight trains, trucks, ships, and planes move goods every day. Knowledge of the rules, regulations, benefits, and costs associated with these modes of transport is necessary for professionals in this field. To succeed, you may also need strong skills in strategic planning, customer service, leadership, and math.

Interrelationship between Transportation and Logistics

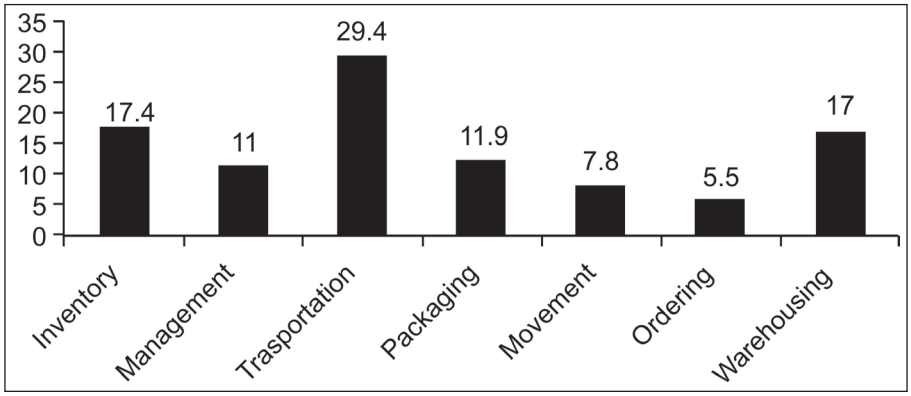
Without well-developed transportation systems, logistics could not bring its advantages into full play. A good transport system in logistics activities could provide better logistics efficiency, reduce operation cost, and promote service quality. The improvement of transportation systems needs the effort from both public and private sectors. A well-operated logistics system could increase both the competitiveness of the government and enterprises.

Transport Costs and Goods Characters in Logistics

Transport system is the most important economic activity among the components of business logistics systems. Around one third to two thirds of the expenses of enterprises' logistics costs are spent on transportation. According to the investigation of National Council of Physical Distribution

Management (NCPDM) in 1982 (Chang, 1988), the cost of transportation, on average, accounted for 6.5% of market revenue and 44% of logistics costs.

BTRE indicated that Australian gross value added of the transport and storage sector was $34,496 million in 1999-2000, or 5.6% of GDP. Figure shows the components of logistics costs based on the estimation from Air Transportation Association.



Cost ratio of logistics items.

This analysis shows transportation is the highest cost, which occupies 29.4% (one-third) of logistics costs, and then in order by inventory, warehousing cost, packing cost, management cost, movement cost and ordering cost. The transportation cost here includes the means of transportation, corridors, containers, pallets, terminals, labours, and time. This figure signifies the cost structure of logistics systems and the importance order in improvement processing. The improvement of the item of higher operation costs can get better effects. Hence, logistics managers must comprehend transport system operation thoroughly.

Transport system makes goods and products movable and provides timely and regional efficacy to promote value-added under the least cost principle. Transport affects the results of logistics activities and, of course, it influences production and sale. In the logistics system, transportation cost could be regarded as a restriction of the objective market. Value of transportation varies with different industries. For those products with small volume, low weight and high value, transportation cost simply occupies a very small part of sale and is less regarded; for those big, heavy and low-valued products, transportation occupies a very big part of sale and affects profits more, and therefore it is more regarded.

The Effects of Transportation on Logistics Activities

Transportation plays a connective role among the several steps that result in the conversion of resources into useful goods in the name of the ultimate consumer. It is the planning of all these functions and sub-functions into a system of goods movement in order to minimize cost maximize service to the customers that constitutes the concept of business logistics. The system, once put in place, must be effectively managed.

Traditionally these steps involved separate companies for production, storage, transportation, wholesaling, and retail sale, however basically, production/manufacturing plants, warehousing services, merchandising establishments are all about doing transportation. Production or

manufacturing plants required the assembly of materials, components, and supplies, with or without storage, processing and material handling within the plant and plant inventory.

Warehousing services between plants and marketing outlets involved separate transport. Merchandising establishments completed the chain with delivery to the consumers. The manufacturers limited themselves to the production of goods, leaving marketing and distribution to other firms. Warehousing and storage can be considered in terms of services for the production process and for product distribution. There have been major changes in the number and location of facilities with the closure of many singleuser warehouses and an expansion of consolidation facilities and distribution centres. These developments reflect factors such as better transport services and pressures to improve logistics performance.

The Role of Transportation in Service Quality

The role that transportation plays in logistics system is more complex than carrying goods for the proprietors. Its complexity can take effect only through highly quality management. By means of well-handled transport system, goods could be sent to the right place at right time in order to satisfy customers' demands. It brings efficacy, and also it builds a bridge between producers and consumers. Therefore, transportation is the base of efficiency and economy in business logistics and expands other functions of logistics system. In addition, a good transport system performing in logistics activities brings benefits not only to service quality but also to company competitiveness.

Facility Location

Facility Location is the right location for the manufacturing facility, it will have sufficient access to the customers, workers, transportation, etc. For commercial success, and competitive advantage following are the critical factors.

Overall objective of an organization is to satisfy and delight customers with its product and services. Therefore, for an organization it becomes important to have strategy formulated around its manufacturing unit. A manufacturing unit is the place where all inputs such as raw material, equipment, skilled labors, etc. come together and manufacture products for customers. One of the most critical factors determining the success of the manufacturing unit is the location.

Facility location determination is a business critical strategic decision. There are several factors, which determine the location of facility among them competition, cost and corresponding associated effects. Facility location is a scientific process utilizing various techniques.

Location Selection Factors

For a company which operates in a global environment; cost, available infrastructure, labor skill, government policies and environment are very important factors. A right location provides adequate access to customers, skilled labors, transportation, etc. A right location ensures success of the organization in current global competitive environment.