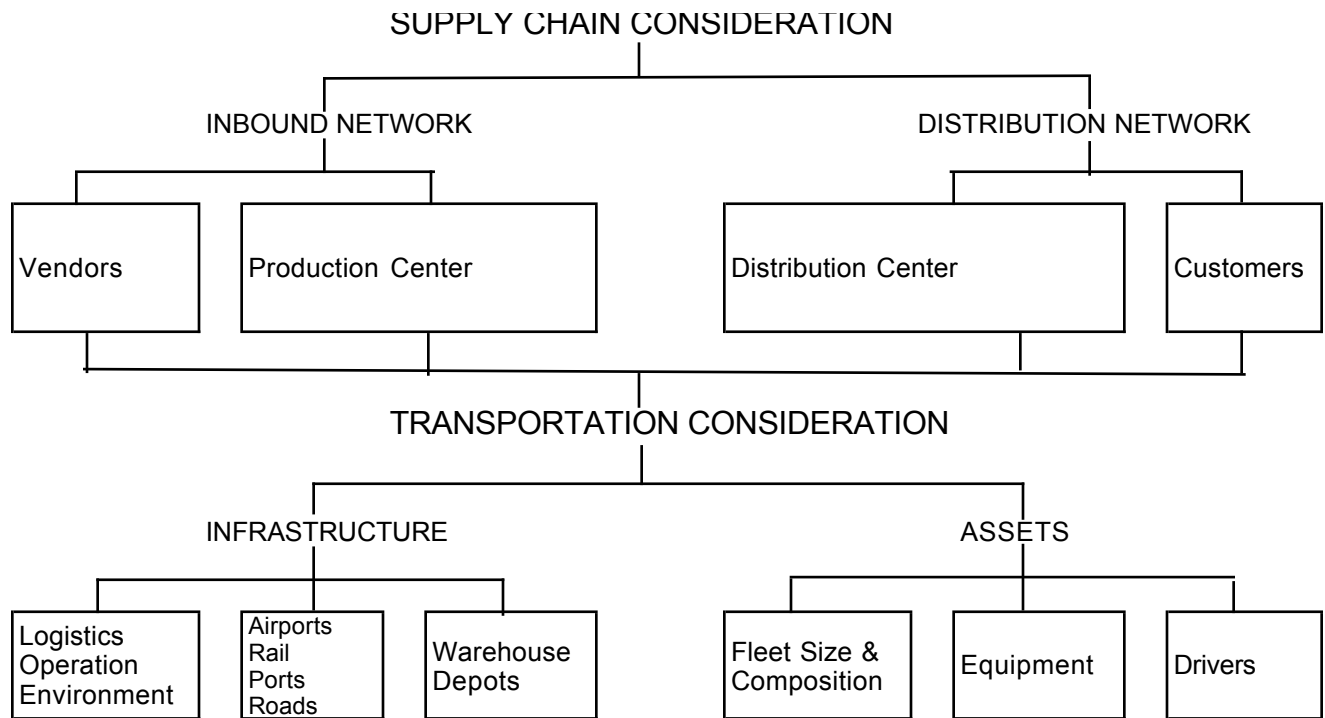


at the right time. This is important as inventories are kept at a minimum and the goal of supply chain management is to increase efficiencies by minimizing costs of holding inventory at every stage – including after sales service. Information technology and electronic data transmission are critical for harmonizing order shipments – such investments are crucial for realizing efficiencies at the warehouse.

The link between supply chain and one part of it, namely, transportation is shown in Figure 1. The inbound network affects the interrelationship between vendors and production centers. The outbound network links distribution centers, which can be centralized or decentralized, with customers who can be wholesalers, retailer or end users. There are considerable variations in these networks between countries, and even, between regions within a country. Logistical decisions, such as transportation mode or fleet composition for example, have to be made in the context of these geographical variations in physical, communication and institutional infrastructures. Transportation logistics is, thus, affected by the environment for logistical operations. The logistical operating environment refers to region specific characteristics such as quality of the infrastructure, including communication infrastructure, availability and sophistication of software, skilled personnel and like variables. Logistical strategies have to be crafted in the context of a logistical operating environment defined in this fashion. Other considerations are the level of infrastructure modernization, particularly, the coordination between physical and electronic systems. For example, tracking of shipments is dependent on incorporation of electronic technologies, such as scanners and transponders, with evolving, newer scanning technologies of physical infrastructure.

Figure 1. Transportation & Supply Chain Links



Source: Lata Chatterjee, 2000

Transportation logistics also depends on system assets such as fleet size, loading equipment, and reliability of drivers. Reduction in overland transportation costs can be partly explained by increased truck size – from 45ft in 1982 to 53ft in 1998, or 28% increase in cubic area of the average truck or the use of double and triple trailers, that is, in scale efficiencies (Schneider, 1998). However, a major cause of costs savings and reliability of service in trucking have been fueled by logistical advances.

Logistics has both strategic and operational components, as it relates to manufacturing and marketing strategies, in which information management is a key to organizational change. For instance, the design of distribution networks or decisions regarding third party logistics are

strategic issues; while transportation mode choice and optimal fleet size are operational issues. In Table 4 the supply chain, decomposed into strategic, tactical or operational components are shown. For example, the location of a new factory or warehouse, which is a strategic decision, is increasingly being taken in the context of logistics where procurement and marketing concerns are addressed. Capacity of an assembly operation, or its geographical siting, are strategic decisions based on efficiencies of inbound and outbound logistics. While the coordination of sourcing with production and marketing is a strategic decision, where to source components is a tactical one. There are many alternative locations for sourcing.

Strategic, tactical and operational issues are important for transportation, shipment and warehousing. As noted earlier, warehouse layout or fleet composition are strategic transportation issues. Frequency of deliveries – monthly, weekly, or daily - are strategic shipment concerns. On the other hand, routing strategies depend on load size and shipment location and thus are tactical decisions.

Table 4. Transportation Logistics: Supply Chain Strategic & Operational Issues

	Supply Chain	Transportation	Shipment	Warehousing
Strategic	Site/Location	Warehouse Location	Internal/Outsourcing	Warehouse Layout
	Capacity Sizing	Fleet composition	Dispatch centers	Level of automation
	Sourcing, Production & Marketing coordination	Fleet forwarding decisions	Fleet sizing Delivery frequency	Material handling design & equipment
Tactical	Production Planning	Routing Strategy	Mode Choice	Storage Retrieval
	Sourcing	Network alignment	Zone alignment	IT infrastructure
		Information Technology	Load size	
Operational	Enterprise Resource planning (ERP)	Transit Time Minimization	Vehicle Dispatch	Order Handling
		Storage & stocking	Communication	Order pickup

Source: Lata Chatterjee (2000)

Transportation logistics is still in its developmental stage. However, its evolution is on a rapid growth path due to the increasing capacity of, and increased merging of, information systems and transportation technologies.

3.2 Third Party Logistics

Third party logistics (3PL) firms specialize in the provision of logistical services on contract. Increasingly, many businesses are contracting out their logistical needs to firms specializing in logistical services as these businesses focus on their core competencies to stay competitive in an era of fierce worldwide competition. 3PL firms are, consequently, growing in size and capacity. For example TNT Limited, currently a global logistics firm, started in 1964 as a trucking firm with 2 trucks. By 1996, it employed 60,000 people, operated 3,000 depots and offices in 200 countries. It owned more than 20,000 vehicles, including 20 ships and more than 150 owned or leased aircraft carrying more than 108 million consignments (Knoop, 1996). Trucking firms are emerging as leaders in the provision of transportation logistics. For example, Schneider National also started as a trucking firm, as did J.B. Hunt. Schneider National not only handles the global logistics of J.A. Case – a farm manufacturing group- it develops inventory effectiveness and cost effectiveness systems for them on contract (Schneider, 1998).

The rapid growth of third party logistics derives from the fact that many manufacturing firms lack the quality and quantity of relevant transport assets--such as adequate transport fleet size or appropriate composition and availability of personnel skilled in the new logistical competencies. It is these asset considerations – physical and human capital – that have been fueling the rapid growth of 3PL. Also the increasing presence of transport based third party logistics is being fueled through mergers between transportation service companies seeking to

capture scale economies through freight movement consolidation across regions. While the proportion of logistics contracted to third parties have increased in the last decade, at the same time the number of contracting firms decreased by 33% - thus the larger and better organized firms are able to provide greater efficiencies at lower costs. This is already occurring in the U.S. and Europe. For instance, six of the ten largest truckload carriers – J.B Hunt Transport Services Inc, Covenant Transport Inc, M.S. Carriers Inc., Swift Transportation Co., Xpress Enterprises Inc, and Werner Enterprises Inc. - merged their logistics units to create Transplace.com with a reputed total earnings of \$650m in 1999 from truckload, intermodal and refrigerated services (Purchasing, 2000). Its objective is to provide “a one-stop solution” for transportation, offering suppliers logistics management, brokerage, information systems and consulting in addition to goods transportation. It’s future plans call for expansion to LTL (Less Than Truckload) shipments, package and parcel express, airfreight, cartage, and household delivery services.

Some large logistics firms started as shipping firms. For FedEx, the logistic arm of Federal Express, and UPS provide examples of express shipping firms that are emerging as leaders in third party logistics. While express service links two clients, contemporary logistics involves partnering with customers to handle their business solutions requiring coordination between multiple supply chains involving thousands of suppliers and customers (Knoop, 1996). UPS not only delivers packages in 200 countries, but also provides full logistical support ranging from facility planning to product testing and fleet management (Churchill, 1998). Even large corporations are closing their logistics divisions and contracting out their logistical needs due to the greater asset base of logistical firms. FDX Corp, a holding company that includes Federal Express, RPS and other shipping and logistics companies, attributes its success to the ability of their logistical operations to allow firms to operate against demand (Wilson, 1999). A

description of FedEx's cargo booking system is discussed by Abrams (1997). A World Bank Survey revealed that there was a 60% increase, between 1987 and 1995, in the proportion of logistics conducted by third parties. In the UK about one third of all transportation logistics is contracted out to third parties (Gwilliam, 1998).

Figure 4 provides a schematic diagram of the elements of the information system describing the integrated logistics of TNT - a third party firm. Of the 7 stages of the production process, the production firm focuses on its core competency of production. All other stages from input logistics to post-delivery services is managed for the manufacturing firm by TNT with its Integrated logistics governed by information systems. While this describes the information system of TNT, it is applicable to other large firms such as FedEx and DHL.

The market size for third party logistics is hard to measure given the rapid rates of growth and the lack of systematic data collection by a central agency. Estimates range from \$200 billion to \$1.5 trillion (Knoop, 1996). Table 5 provides some comparative information on selected markets with the UK as the leading market in terms of proportion of companies outsourcing their logistics needs in 1995. Using this statistic as a measure of market maturity, the other major markets are compared to the UK benchmark.

Fourth party logistical providers (4PL) is an even more recent trend. In 4PL, the entire supply chain is managed by for-hire service providers. 4PL firms provide a comprehensive