



LOGISTICS AND SUPPLY CHAIN MANAGEMENT

OVERVIEW AND PROSPECTS

PREPARED BY:

**SERVICE INDUSTRIES AND
CAPITAL PROJECTS BRANCH**

This *Overview and Prospects* on the Canadian logistics and supply chain management industry is part of the **Sector Competitiveness Frameworks** series, which is being produced by Industry Canada in collaboration with Canada's key stakeholders in the industry.

The **Sector Competitiveness Frameworks** series focusses on opportunities, both domestic and international, as well as on challenges facing each sector. The objective is to seek ways in which private industry and government together can strengthen Canada's competitiveness and, in doing so, generate jobs and growth. In all, some 28 industrial sectors are being analysed.

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F O R E W O R D

The new Canadian marketplace is expanding from national to global horizons and its economic base is shifting increasingly from resources to knowledge. These trends are causing Canadian industries to readjust their business approaches, and government must respond with new tools to help them adapt and innovate. Industry Canada is moving forward with strategic information products and services in support of this industry reorientation. The goal is to improve competitiveness of Canada industry in the global marketplace and to aid the private sector in what it is best qualified to do – create jobs and growth.

Sector Competitiveness Frameworks are a series of studies published by Industry Canada to provide more focussed, timely and relevant expertise about businesses and industries. They identify sectors or subsectors having potential for increased exports and other opportunities leading to jobs and growth. They cover 28 of Canada's key manufacturing and service sectors.

While they deal with “nuts and bolts” issues affecting individual sectors, the Sector Competitiveness Frameworks also provide comprehensive analyses of policy issues cutting across all sectors. These issues include investment and financing, trade and export strategies, technological innovation and adaptation, human resources, the environment and sustainable development. A thorough understanding of how to capitalize on these issues is essential for a dynamic, job-creating economy.

A recent electronic document titled *Industrial Development Issues in a Changing Global Economy* provides a summary of these cross-sectoral issues in the Overview and Prospects documents released to date, and contains useful web-site links to assist the reader in locating relevant and up-to-date information and analysis of Canada's key manufacturing and service sectors (<http://strategis.ic.gc.ca/SSG/tm00106e.html>).

Both government and the private sector must develop and perfect the ability to address competitive challenges and respond to opportunities. The Sector Competitiveness Frameworks illustrate how industry and government can commit to mutually beneficial goals and actions.

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Logistics is the process of planning, implementing and controlling the flow and storage of goods and services and related information from the point of origin to the point of consumption. It is an in-house activity in manufacturing and distribution industries as well as an emerging but not recognized industry where specialized firms offer services on a contract basis.

Supply chain management provides supervision and direction for the various parts of the distribution system including production scheduling and inventory control, transportation, warehousing, wholesaling, retailing and brokerage.

Logistics and supply chain management contribute to productivity growth. Efficient logistics practices shorten the time taken to get the goods from the supplier to the customer, and also contribute to lower inventory levels, which leads to cost savings.

- Logistics is one of the leading determinants of the cost of goods and services. The logistics industry plays a key role in the international competitiveness of Canadian goods and services and has a direct impact on profitability.
- All businesses and organizations need to use logistics services at some point in their operations, especially manufacturing, wholesaling and retailing industries. Firms address their logistics requirements by assigning staff and resources to carry out logistics activities, or by outsourcing one or several functions to third-party logistics services providers (3PLs).
- Total revenues for logistics firms in 1997 were estimated at \$50 billion.
- In 1998, over 400 000 people worked directly in logistics-related industries, including transportation services, storage, postal and courier and business services.
- Another 480 000 people worked in 1998 as in-house logisticians in manufacturing, wholesale, retail trade and other industries. These people are not considered part of the logistics industry, however, they are part of the same human resources and skills pool.
- Firms in the emerging 3PL subsector provide a designed set of customized logistics services, tailored to the exact needs and specifications of clients, on a third-party basis. They integrate all logistics functions into a seamless supply chain management system.
- The demand for logistics closely follows the business cycle: it grows when the economy grows and declines when the economy declines.

1.1 Major Trends

- Globalization of markets and the emergence of e-business have rapidly changed the nature and structure of the logistics function. The best distribution system wins.
- Whereas logistics managers formerly concentrated on the internal logistics functions including warehousing, transportation, etc., logistics managers today focus more on external functions, especially those functions that collectively satisfy customers.
- The nature of competition in a given industry is changing. Replacing direct competition between firms is emphasis on who best manages the “information float” for the total supply chain.
- Carriers and shippers are integrated via electronic tendering, inventory confirmation and delivery tracking. 3PL firms are encouraging customers to access their information systems through the Internet.
- More businesses are moving toward build-to-order models and low inventories. Greater value is being placed on fast and accurate inbound and outbound logistics information. Many web-based businesses outsource their order management, warehousing, packaging and customer support function to major courier and logistics firms.
- The technology revolution and the Internet are changing the basic cost structure of sales, procurement, supply chains and distribution channels. The historical barriers to entry (size and infrastructure) are diminishing in importance. The emphasis now is based on speed rather than size.
- The Internet allows many companies to become integrated into a virtual collaborative network, which includes manufacturers, customers, carriers, brokers, agents, distributors, suppliers and wholesalers. It is the end customer who ultimately benefits. The result is improved customer service, improved cycle time, improved productivity, reduced rework and returns and improved financial performance.

- Governments around the world are increasingly lowering tariff and non-tariff barriers, which is stimulating strong international trade growth. International trade raises logistics challenges and puts upward pressure on costs due to the multiplicity of business cultures, customs procedures, foreign regulatory regimes and related compliance that must be dealt with. This increased complexity coupled with the ever increasing importance of international trade are presenting opportunities for logistics services providers who are positioning themselves as facilitators of international trade.
- The increasing sophistication of supply chain management software is paving the way to integration and productivity improvements. Greater integration results in improved customer satisfaction, faster cycle time, reduced errors and cost savings in many cases.
- Given the pace of technological change, firms must renew their capital equipment and software regularly to stay competitive. State-of-the-art technology is essential to successfully integrate the different components of the supply chain and facilitate information flows.
- Logistics jobs are increasingly characterized by demanding skill sets across traditional logistics functions, as well as integration skills, a sound knowledge of corporate culture and the ability to work in multidisciplinary teams. As a result, logistics jobs that are on the rise are higher-end knowledge jobs, which increases the demand for qualified college and university graduates.
- Logistics services providers must have knowledge of and comply with an extended set of regulations affecting transportation, warehousing and the international movement of goods. Governments are changing their approach to regulation and compliance, which affects logistics operations and requires that logisticians adapt quickly to new environments. The deregulation of transportation services combined with technological advances have resulted in improved logistics systems and greater productivity.
- Growing emphasis on sustainable development is ushering the way for reverse logistics, a growing industry devoted to moving used packaging materials in a reverse direction in the supply chain. The efficient use of electronic commerce could be the key to keep costs under control in the reverse logistics process.

1.2 The Bottom Line

- The demand for 3PL firms will continue to accelerate. It is being fueled by the increasing importance of logistics and supply chain management in business strategy and the increasing acceptance of outsourcing as a business practice.
- The logistics industry will continue to benefit from international trade, the integration of the supply chain, the growing focus on technology and the emergence of electronic commerce.
- Regulatory differences between countries are complicating the exchange of goods and related information for trade. Strong opportunities for 3PL firms with expertise in international regulations will continue to grow.
- Logisticians need to understand international business and logistics systems, foreign regulatory regimes, ethical standards and possess language and “cultural” skills to successfully deal with supply chain partners around the world. Similarly, they must be sophisticated users of technology, be capable of developing strategies to deploy technology to competitive advantage.
- Information and communication technologies and their various uses will continue to provide growth prospects for the 3PL industry.
- Traditional service providers will continue to offer an increasingly extended set of services as well as ways to integrate these services into supply chain management systems. This will enable them to eventually join 3PL firms in the growing market for logistics and supply chain integration services. They will continue to focus on developing their international networks through alliances and partnerships. In addition, they will build a reputation of excellence in supply chain optimization by focussing on quality standards and performance measurement along with 3PL firms.

2 KEY POINTS ABOUT THIS INDUSTRY

Logistics and supply chain management functions are wide ranging. The Canadian Professional Logistics Institute and Human Resources Development Canada (“Logistics Labour Market Information Study: Phase 2, Final Report,” Ottawa, June 1997) include the following activities in the industry description:

- purchasing
- production scheduling and inventory control (demand forecasting, inventory management, production planning, and scheduling)
- distribution (warehousing, materials handling, packaging, shipping and loading, storage, order processing, picking, and customer service)
- transportation and traffic (rates analysis and dispatching)
- customs clearance (customs brokerage)
- international freight forwarding (international shipping of cargo).

All of these activities are paralleled by a corresponding flow of business and financial information such as contracts, legal requirements, bills of lading, customs documentation, and the tracking of production and inventory levels. Logisticians seek the optimal combination of the logistics activities and their attributes such as price, quality, speed and security, and manage the resulting information and monetary flows. Logistics activities are among the leading determinants of prices of goods and services, and logistics has a direct impact on profitability.

This *Overview and Prospects* describes the logistics and supply chain management services industry, examines its strengths, weaknesses, challenges and prevailing development trends. Its main purpose is to serve as a tool for logistics services providers and governments in their effort to develop practical approaches to strengthening the industry, thereby enhancing its competitiveness.

The sector cuts across a number of standard industries reported by Statistics Canada including transportation, storage, postal and courier services, and part of business services.

Better logistics =
lower prices +
higher revenues

Scarce industry data come from many sources

3 types of service providers:

- in-house
- traditional
- emerging 3PL

While data on various components of the logistics industry are readily available, there is difficulty in putting together a comprehensive picture of logistics due to measurement issues (see Annex B). Significant amounts of logistics activity are occurring in other industries such as business services, wholesale trade, retail trade and manufacturing industries. The task is further complicated by the strong growth in the difficult-to-measure components of the logistics industry such as logistics and supply chain consulting services and specialized information technology and software development.

The data used in compiling this Overview have been taken from the following main sources:

- *1996 Census of Canada*, Statistics Canada, which provides data on occupations where logistics services are being performed in-house
- Statistics Canada Input-Output Matrices for 1981, 1986, 1991 and 1996
- various other Statistics Canada publications covering related sectors such as transportation and storage, postal and courier services, business services and general economic indicators such as investment, employment and productivity (see source notes to figures and tables for catalogue numbers)
- various publications and web sites by private and public organizations including Transport Canada, the Canadian Association of Logistics Management (CALM) and KPMG Consulting.

Businesses and organizations address their logistics requirements by assigning staff to carry out logistics activities (i.e. in-house logistics), or by outsourcing one or several functions to third-party providers. Businesses and organizations are increasingly outsourcing their whole supply chain management to third parties to take advantage of their skills in supply chain optimization. This range of options in managing logistics and supply chain systems gives rise to three basic components of the logistics industry:

- *In-house logistics*: As an alternative to hiring third-party providers, firms assign their own staff to manage logistics functions. In smaller firms, staff having related responsibilities often perform these functions.
- *Traditional service providers*: These establishments in industries such as transportation (e.g. trucking), freight forwarding, customs brokering and warehousing specialize in selected logistics services. However, they often offer several related value-added services. For example, freight forwarders often offer customs brokerage and storage services.

- *Third-party logistics (3PL):* Firms in this emerging component of the industry provide a designed set of customized logistics services, tailored to the exact needs and specifications of clients on a third-party basis. They integrate all logistics functions into a seamless supply chain management system. These firms often emerge from the traditional service providers by offering a more extensive and integrated set of services, or by forming alliances and partnerships with other firms. (In this document, traditional service providers and 3PL firms are also referred to as “logistics services providers.”)

On the demand side, all businesses and organizations need to use logistics services at some point in their routine operations. Manufacturers need to move input materials from the point of origin to the plant and then distribute finished products to their clients. As well, they have to store these inputs and/or products during the process. Wholesalers and retailers need to move products to their own locations and then distribute these products to consumers. Importers and exporters must distribute goods through direct sales to end users and resellers or via agents and other partners. Governments, service firms and non-profit organizations tend to require the services of firms that ship small packages.

There are several current trends in the management of logistics. The principal trend, driven by competitive pressures and client need, and enabled mainly by information technology, is to combine and streamline various logistics activities such as purchasing, storage and transportation. This trend is occurring both within organizations that handle their own logistics requirements in-house as well as within the operations of logistics services providers. For example, trucking firms often offer storage, packaging and other related services. Consequently, as traditional service providers continue to increase their lines of business, they tend to join the 3PL component by becoming capable of offering seamless or integrated services tailored to meet the exact needs of clients.

All firms use logistics services at some point in day-to-day operations

Logistics is key part
of global economy

Supply chain
integration presents
numerous challenges

NAFTA's integration of
distribution networks
with automated
customs procedures
fosters growth of
3PL segment

2.1 Global Context

Logistics is a key part of the global economy. Logisticians have to deal with multiple languages, cultures, business practices and government regulations. The increased globalization of markets, including the integration of Europe's economic and monetary systems, is encouraging firms to think and act globally rather than rely on country-specific strategies.

Moving goods and/or services from source to intermediate or final consumption including storage consumes a considerable amount of resources. The costs of logistics services account for 10–13 percent of gross domestic product (GDP) in most developed countries and regions around the world. These costs include transportation, inventory holding (e.g. interest charges, depreciation, insurance) as well as administrative charges related to inventory and transportation. In the United States, logistics costs excluding in-house logistics represent 10 percent of GDP (Bob Delaney, "10th Annual 'State of Logistics Report'," Cass Information Systems, 1999).

The Asia-Pacific region is a very complex market presenting many logistical challenges to supply chain integration. For instance, its three billion people live in more than 20 countries, speak 25 languages and more than 700 dialects, and are located on 24 000 separate land masses, many of which are small islands. The relatively smooth operation of international networks can be credited to the efficiency of international hubs in Hong Kong and Singapore. However, international networks often lack efficient connections with domestic networks because of great distances between cities, poor infrastructures, regulatory hurdles, difficult customs procedures and slow ground transportation.

2.2 North American Context

The emergence of third-party logistics providers (3PLs) and a greater integration and collaboration among supply chain partners is changing the face of the logistics market in North America. The North American Free Trade Agreement (NAFTA) has substantially integrated the Canadian and the U.S. economies, resulting in increasingly integrated distribution networks with more efficient and automated customs procedures. The 3PL market segment reflects this integration, as most major players conduct business in all parts of North America.

2.3 Canadian Industry

World-class logistics services and smooth and efficient supply chain management practices are essential to the competitiveness of Canadian businesses. Efficient logistics services ultimately impact on the standard of living of all Canadians through their effect on our ready access to goods and services as a result. They also provide Canadian businesses with the ability to better compete in the global marketplace.

The Demand for Logistics Services

There are over one million businesses in Canada. They all have to arrange for the smooth flow of goods and services among other businesses and the 30 million Canadian consumers, as well as among other businesses and consumers worldwide. While all businesses have logistics requirements, manufacturing, wholesaling and retailing are the most logistics-intensive sectors. Together they employ half of the logistics work force, and they are the largest customers of firms that provide logistics services.

Manufacturing

Statistics Canada (Catalogue 31-203) reports that there were 35 000 manufacturing establishments across Canada in 1997 (the most recent year for which these data are available). Their shipments that year were worth \$434.2 billion.

Efficient logistics is essential to the competitiveness of manufacturing firms, as they must find ways to bring materials into their establishments and to ship their outputs to clients in a cost-effective way. In many cases, their requirements include smooth processing at national borders, in order to successfully export. Table A-1 at the end of this Overview provides greater detail on the sectoral distribution of manufacturing establishments as well as on their size and shipments.

Wholesaling

There were 59 456 wholesale locations in Canada in 1996 (the most recent year for which such data are available), according to Statistics Canada (Catalogue 63-236). They generated revenues of \$351.8 billion.

Logistics work force is concentrated in 3 segments

... manufacturing – delivery of raw materials and finished products ...

... wholesaling – for inbound and outbound movement of goods ...

... retailing – for
low inventories and
high customer service

Logistics efficiency is of prime importance to wholesalers, as the performance of their distribution network is the basis of their business. The transportation of goods and products to wholesaling establishments, their storage and subsequent reshipment to clients consume a variety of logistics services. Wholesalers employ logisticians and use logistics services firms to look after the inbound and outbound movement of goods and related information and financial flows. The logistics needs of wholesale establishments depend on the nature of the products they sell and the type of clients to whom they sell. Table A-2 at the end of this Overview summarizes the sectoral distribution of wholesale locations and provides information on inventory turnovers and the type of clients.

Retailing

Retailing in Canada in 1996, according to Statistics Canada (Catalogue 63-236), totalled 20 580 establishments and generated \$50.8 billion in revenue. Efficient supply chain management is key in enabling retailers to keep inventories low while meeting customers' demands and to control costs in order to make a profit.

The large number of retail locations and high inventory turnover rates indicate the extent of the logistics challenges involved in bringing goods and services to the shelves of retailers and, in many cases, to the homes and/or businesses of clients at a competitive price. Logistics requirements depend on the size of the retailers, the type of goods or services they sell and whether they operate an independent or chain store. Chains have well-established distribution networks and benefit from economies of scale, whereas smaller independent stores tend to rely on close partnerships with distributors.

Since the early 1990s, traditional retailers have experienced stiff competition from a number of discount, specialty and warehouse format store chains. This increased competition is forcing retailers to enhance their logistics systems to reduce costs. For example, the expansion of Wal-Mart stores during the past decade has put logistics efficiency at the forefront of retailing business strategy.

Table A-3 at the end of this Overview provides greater details on the sectoral distribution of locations, as well as on inventory and revenue information.

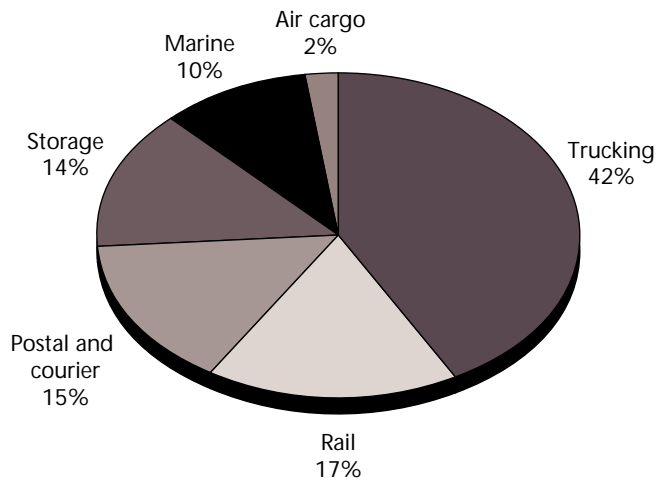
The Supply of Logistics Services

The Logistics Industry

The logistics industry consists of the following subsectors: transportation (rail, trucking, marine and air cargo), storage, postal and courier services, and third-party logistics providers that are not primarily in one of the previous subsectors.

Total revenues in 1997 were \$50 billion. Figure 1 provides the distribution of revenues among the traditional logistics services providers.

Figure 1. Distribution of Logistics Revenues, by Subsector, 1997



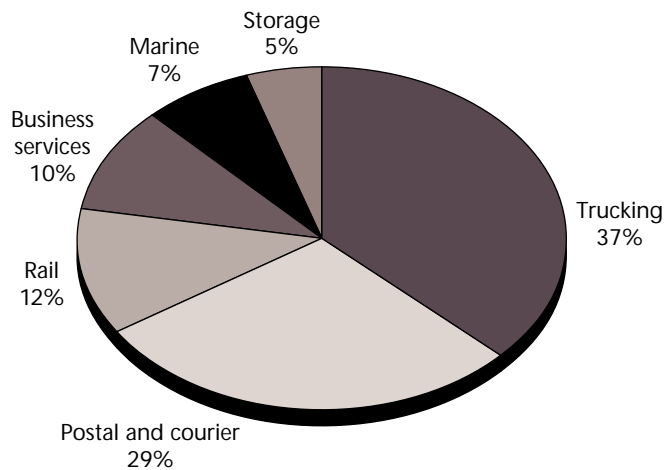
Source: Statistics Canada, "Canadian Civil Aviation," Catalogue 51-206-XPB; Statistics Canada, "Financial and Taxation Statistics for Enterprises," Catalogue 61-219-XPB.

Rail showed an operating profit margin of 16.4 percent in 1997, followed by 6.8 percent for marine, 4.4 percent for trucking, 4.2 percent for storage and 3.7 percent for postal and couriers. Rail's healthy operating profit position was the result of a strong decline in operating costs from 1991 to 1997 (-1.4 percent per annum).

Logistics employment:
400 580 jobs

The logistics industry including transportation services, storage, and postal and courier services accounted for 362 030 direct jobs in 1998. Figure 2 shows the distribution of these jobs for the logistics subsectors. In addition, 38 550 people worked as logistics services providers that were officially part of business services, based on the 1996 Census. Total logistics employment was 400 580, not including logistics services providers who worked in-house.

Figure 2. Distribution of Logistics Industry Employment, by Subsector, 1998



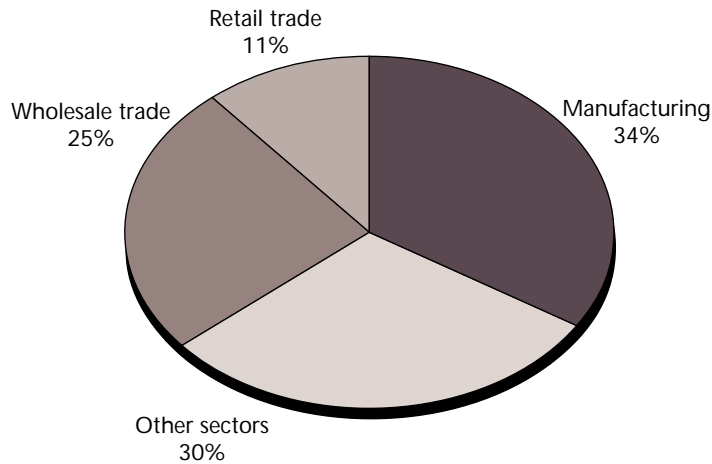
Source: Statistics Canada, CANSIM 4285. The data for business services are from the 1996 Census, which indicates that a number of third-party logisticians reside in this category.

In-house Logistics

Many logisticians work as in-house staff of firms in a variety of sectors, such as manufacturing, wholesaling and retailing. These occupations include purchasing managers, transportation managers, custom brokers, shippers and receivers. These people are not normally included in the logistics industry. However, they are performing key logistics-related functions and are part of the same human resources and skills pool.

Figure 3 illustrates the percentage distribution of logistics-related jobs that are considered part of the in-house logistics activity. Approximately 480 000 people worked in various in-house logistics occupations in 1996.

Figure 3. Distribution of In-house Logistics Jobs, by Sector, 1996 Census



Source: Statistics Canada, 1996 Census.

Traditional Service Providers

The various sectors from which 3PLs are emerging or with which they are making alliances are described in this subsection. Firms in these sectors provide traditional logistics services that have to be combined in a firm’s logistics system or supply chain. They also benefit from the increased practice of outsourcing logistics functions. In response, they are offering more and more extended sets of services to provide integrated solutions to supply chain optimization and to develop the expertise to gradually join the ranks of 3PLs.

Trucking– Trucking is the preferred choice of shippers to move goods and materials along the supply chain because of its flexible, timely service and efficiency. More than 90 percent of the goods moved within Canada depend on truck transportation, either solely or as part of an intermodal shipment. Trucking is constrained only by the extent of road network.

Trucking is also important in Canada’s international trade. Of the total \$389 billion in goods that Canada traded with its NAFTA partners in 1996, some 67 percent was transported by truck. On the Canada–United States border, trucks account for three quarters of total trade, which amounts to \$30 million worth of goods crossing each hour. The transborder market accounts for about 27 percent of for-hire trucking services revenue. The intra-provincial and extra-provincial markets each represent 37 percent of revenue.

Trucking is preferred logistics medium; revenue: \$34B

Two thirds of NAFTA trade moves by truck

The trucking industry in Canada is divided into two major components: private and for-hire trucking. Private trucking is carried on by companies whose primary business is not trucking, for example, manufacturers or retailers who maintain a fleet of trucks and trailers to haul their own goods and who occasionally use their fleets to haul goods for others. For-hire trucking companies carry freight for a fee under various service types, principally truckload (TL) and less-than-truckload (LTL). Owner-operators are also important components of the trucking industry. Owner-operators work under contract for either for-hire or private carriers, generally using their own trucks. As a result, their revenue and expenses are accounted for in the for-hire and private carriers statistics. Table 1 provides information on these groups.

Table 1. Trucking Services in Canada, 1996^a

Category	Type of operator			Total
	For-hire	Private (large)	Owner-operators	
Firms	10 182	456	39 530	50 168
Trucks	65 898	14 362	52 904	133 164
Revenue	\$15.2 billion	\$18.8 billion	–	\$34 billion

^a A significant number of smaller private carriers are not included in this table.
 Source: Canadian Trucking Research Institute (1998) and Private Motor Truck Council of Canada (1998).

Trucking links with warehousing services raise its profile in logistics

Due to the importance of the trucking industry in supply chain management, trucking companies tend to migrate their way up the value chain by offering an ever increasing portfolio of distribution services. Some trucking firms jump-start the expansion of their offerings by forming alliances with complementary service providers such as warehouses and technology consultants. In the United States, there is a trend, mostly by transportation firms, to enter the integrated logistics field by capitalizing on their experience in warehousing.

An important subcomponent of the trucking industry is the couriers and local messengers industry. Couriers specialize in the expedited, on-demand delivery of mail and small packages, often enlisting other transporters including intercity bus companies, air cargo operators and LTL carriers. In 1997, the 11 417 courier and local messengers establishments generated \$3.8 billion in revenue, according to Statistics Canada (Catalogue 50-002). The 703 largest establishments, with annual revenues of \$150 000 or more, accounted for more than 90 percent of the total revenue in the industry that year. The largest establishments segment is dominated by courier enterprises that provide national and/or international delivery services and account for 86 percent of revenue, while local messengers account for 14 percent. Many of these firms are positioning themselves as global, integrated logistics solutions providers.

Couriers provide fast, international movement of mail and small parcels; revenue: \$3.8B

Rail – Rail carriers are a critical component of the supply chain and they are becoming increasingly more involved in logistics. In the automotive industry, for example, rail carriers coordinate various aspects of just-in-time delivery and offer value-added services such as quality inspection and installation of optional equipment. Rail carriers are mostly involved in carrying bulk commodities over large distances (the average haul is about 1000 kilometres), but they are working on making the rail mode increasingly flexible.

Rail carriers posted \$7.4 billion in freight revenue in 1997 (Table 2). The two large Class I railways accounted for 90 percent of this figure.

Table 2. Rail Services in Canada, 1997

	Rail carriers			Total
	CN	CP	Class II ^a and III	
Firms	1	1	51	53
Freight revenue	\$3.9 billion	\$2.8 billion	\$0.7 billion	\$7.4 billion
Freight tonnes	125.7 million	98.7 million	93.7 million	318.1 million
Tonne-kilometres	160.9 billion	117.8 billion	28.3 billion	307.0 billion

^a Class II railway companies are regional and short-line operators. Half of the trackage is controlled by five lines.
Source: Statistics Canada, Catalogue 52-216.

Rail is low-cost choice for bulk commodities; revenue: \$7.8B

Bulk commodity movements are dominated by rail, although trucking services provide some competition in the transportation of selected manufactured, industrial and automotive commodities. The top five commodities carried by rail are coal, iron ore, wheat, containers on flat cars and potash, which together account for 48 percent of the total annual rail tonnage.

Rail carriers play prominent roles in the international shipment of goods as well as in inter-regional markets (e.g. between British Columbia and Ontario). In terms of tonnage carried, the interregional market is the most important market segment (44 percent), followed by international (29 percent) and intra-regional (26 percent) shipments. Export shipments by rail outnumber import shipments by a 3:1 ratio, which represents a challenge in terms of pricing and optimizing container movements. Some 24.2 percent of rail cargo is exported to the United States, while 31.9 percent of rail freight is transported to Canadian ports for shipping to foreign markets.

Air – Canadian airlines carry air cargo primarily in the belly of their passenger aircraft. Air cargo typically consists of high unit value items, quickly perishable goods, and time-sensitive items such as magazines and newspapers. Lean inventory and just-in-time strategies by businesses tend to favour their utilization of the fastest mode of transport for a variety of items. In response, air cargo services offer speedy, convenient and reliable solutions, although at a cost premium in some cases. Shipping by air ensures that products and goods arrive quickly to the customer and that no time is wasted on a long trip.

Air offers convenient express movement of high-value items; revenue: \$1B

Statistics Canada (Catalogue 51-206) reports that Canadian airlines in 1997 posted cargo revenue of \$1 billion, representing 9.3 percent of their total revenue that year.

Cargo revenues are relatively more important for smaller airlines (Class IV carriers), which have annual gross revenue of \$500 000 or more but carry fewer than 5000 passengers and less than 1000 tonnes of goods. Cargo revenues accounted for over 21 percent of their total revenue in 1997.

Small air carriers place premium on logistics for growth

Canadian air carriers also participate in transborder courier operations by providing services to courier companies. All-cargo air services (scheduled and charter) to and from Canada are provided by foreign air carriers such as Air France, Lufthansa, Cathay Pacific Airways and Korean Air Lines. A number of these carriers are dedicated to contract carriage for major North American courier companies.

The six major global air express cargo carriers — UPS, Federal Express, Emery Worldwide, Burlington Air Express, Airborne Express and DHL — are increasingly positioning themselves to provide shippers with integrated logistics services including transportation, warehousing, customs clearance, freight tracking and tracing, order processing, inventory control and even assembly of merchandise. They have invested heavily in information systems and have shortened the time window for shipments, although other logistics services providers (trucking companies, freight forwarders, customs brokers) are also investing heavily in technology as well as creating alliances and partnerships in order to remain competitive.

Marine – Marine transportation plays an important role in international shipment of goods. International shipments account for more than 85 percent of marine tonnage handled at Canadian ports (Statistics Canada, Catalogue 54-205). The leading commodity exports carried by marine transportation are coal (19.4 percent of tonnage), iron ore (17.5 percent) and wheat (10.5 percent), while the leading commodity imports are crude petroleum (32.3 percent), coal (15.5 percent) and iron ore (8.5 percent).

Statistics Canada (Catalogue 54-205) reports that Canadian for-hire marine carriers in 1996 posted revenues of \$2.1 billion, of which \$1.1 billion were for the transport of commodities. This sector is dominated by a few large players. The six largest companies collectively received 55.5 percent of the revenues.

Given the nature of goods traded, most of Canada's marine exports and imports are moved through bulk shipping operators under term contract arrangements. Bulk shipping freight rates are set in the highly competitive global open market. A smaller proportion of Canada's marine trade is moved through liner shipping. Liner services are offered according to published schedules on specific trade routes.

Freight Forwarders – Freight forwarders arrange for the transportation and delivery of goods and commodities. They provide or arrange for packaging, storage, handling, export credits, insurance and trade documentation, which may include customs clearance (although clearing cargo arriving in Canada is usually performed by licensed customs brokers).

Marine is low-cost favourite for bulk commodity exports; total revenue: \$2.1B

Forwarders integrate many related services for clients; revenue: \$1.5B

Trade growth boosts customs brokerage demand; revenue: \$532M

The freight forwarding industry had 1085 establishments in June 1999 (Statistics Canada, Business Register). The industry is represented by the Canadian International Freight Forwarders Association, which has 140 regular members and 75 associate members.

Forwarders may be engaged by shippers to provide a variety of services as agents or as transportation intermediaries. As agents, forwarders simply arrange the services for a fee that includes an additional charge to the amount paid out on behalf of their clients. When acting as a transportation intermediary, the forwarder purchases cargo space on specific routes for a fixed price, which is resold to shippers. A large portion of the industry’s revenue comes from providing ancillary activities, mainly customs brokerage and public warehousing. Large firms tend to offer both freight forwarding and customs brokerage services.

Demand for freight forwarding services is closely linked with the overall demand for transportation services. It is also driven by specific factors such as efforts by industries to reduce inventories, the adoption of just-in-time distribution practices and the tendency to shipping small volumes more frequently in response to increasingly demanding customer needs.

Customs Brokers – Customs brokers are international trade specialists who act on behalf of clients in all matters relating to the Canada Customs and Revenue Agency. They prepare and submit import documentation, select the most beneficial tariff classifications for imported goods, and arrange for the payment of duties and taxes owing on the shipments. Customs brokers also advise clients on export-related shipping issues, such as documentation requirements abroad and laws and regulations in the country of destination. Evolving customs regulations and the increased automation of border crossings have encouraged customs brokers to redefine themselves as international trade consultants/specialists as opposed to processors of customs information.

Approximately 335 firms in Canada offered customs brokerage and related services in 1993 (the most recent year for which such data are available). Total revenues that year amounted to \$532 million (Table 3). Customs brokering is labour intensive, with salaries and benefits accounting for 58 percent of the cost.

Table 3. Customs Brokers in Canada, 1993

Firm size, by revenue	Share of firms in category (%)	Share of revenue earned (%)
Less than \$2 million	80	21.6
\$2–5 million	13	20.7
More than \$5 million	7	57.7

Source: Statistics Canada, Catalogue 63-232 (Business Services 1991–1993).

Canada imports about \$300 billion worth of goods annually, mostly from the United States (77 percent of the total). Customs brokers act as intermediaries between the importer and the government on an estimated 80 percent of imports. They make it easier for individuals and firms to comply with complex government legislation and at the same time assist the government by encouraging and obtaining compliance.

Customs brokers are a critical part of the supply chain. Given the increasing importance of international trade, there is a growing need for efficient and cost-effective clearance of imported goods. Shippers require an effective and economical alternative to developing in-house customs expertise. Many registered customs brokers are in a primary business other than customs brokerage, such as freight forwarding and truck transportation. Customs brokers are extensive users of technology (e.g. electronic clearance, electronic data interchange), which gives them access to information on the entire logistics process of their clients. Consequently, they often provide a more comprehensive set of logistics services, such as inventory tracking and shipping. They also contribute significantly to the overall trends toward the integration of supply chain management activities in Canada through their alliances with 3PL firms.

Warehousing – There are three categories of warehouses: private, public and contract. A private warehouse is operated as a division of a company whose business is other than warehousing. A public warehouse offers services to a broad clientele. Its contracts are typically for 30 days. A contract warehouse offers services to a more restricted clientele, under formalized long-term outsourcing contracts.

Public and contract warehousing companies provide a broad range of services for the storage and distribution of goods, including shipping and storage insurance, claims inspection, transport documentation, freight consolidation, cartage, and the collection and payment of accounts. They typically specialize in one or several categories of goods, such as odour-producing items, refrigerated items or dangerous goods.

Warehousing is growing, profitable adjunct to other logistics services

3PL firms are young, in business a decade or less

According to a 1996 survey (Trevor Heaver and Lennart Henriksson, “Trends and Practices in the Canadian Warehousing Industry,” report prepared for the Canadian Association of Warehousing and Distribution Services, Ottawa: Industry Canada, 1996) of 388 firms in the public/contract warehousing industry, the distinction between public and contract warehousing is and will continue to be blurred, as fewer companies provide exclusively public warehousing space. They all tend to offer more and more contract warehousing space. In addition, the survey results showed that warehousing is a secondary business for a number of participants. Transportation, freight forwarding and customs brokering are most often mentioned as their primary business, thus suggesting a strong integration of supply chain management activities.

The operation of efficient distribution facilities, dedicated as well as shared, is becoming increasingly important to the management of supply chains. All industries, and manufacturers, wholesalers and retailers, in particular, are increasingly looking for efficiency gains from their supply chain.

Third-party Logistics (3PL)

Few statistics are available for the 3PL industry. Most firms are young, having started business after 1989 (Garland Chow, “Logistics in Canada: Survey Results,” Annual Conference Proceedings, Council of Logistics Management, San Diego, CA, October 8–11, 1995). They offer a full range of logistics services on an outsourcing basis as opposed to transaction-based services. Outsourcing contracts typically are for three to five years. Many carry out activities mainly in the United States, with plans for expansion into the Canadian market.

3PL firms provide integrated logistics services. They address the comprehensive logistics needs of their clients by integrating transportation, warehousing, inventory control, order processing, customs brokerage and other logistics activities into a seamless supply chain management system. Their emergence and strong growth is directly related to the increasing trend to outsource supply chain management activities. Around 15 percent of all logistics activities are outsourced to logistics services providers.

These suppliers of logistics services have their roots in two fundamental industries, namely, transportation and warehousing. In fact, most 3PL firms are still affiliated with companies in these sectors. They complement their transportation and warehousing offerings with value-added services and strategic alliances with related service providers such as carriers (LTL, TL and rail/intermodal, ocean), freight forwarders, air freight/express/courier services, consultants, warehousing and software firms. These alliances enable them to act as the facilitators, paving the road toward integration of logistics services.

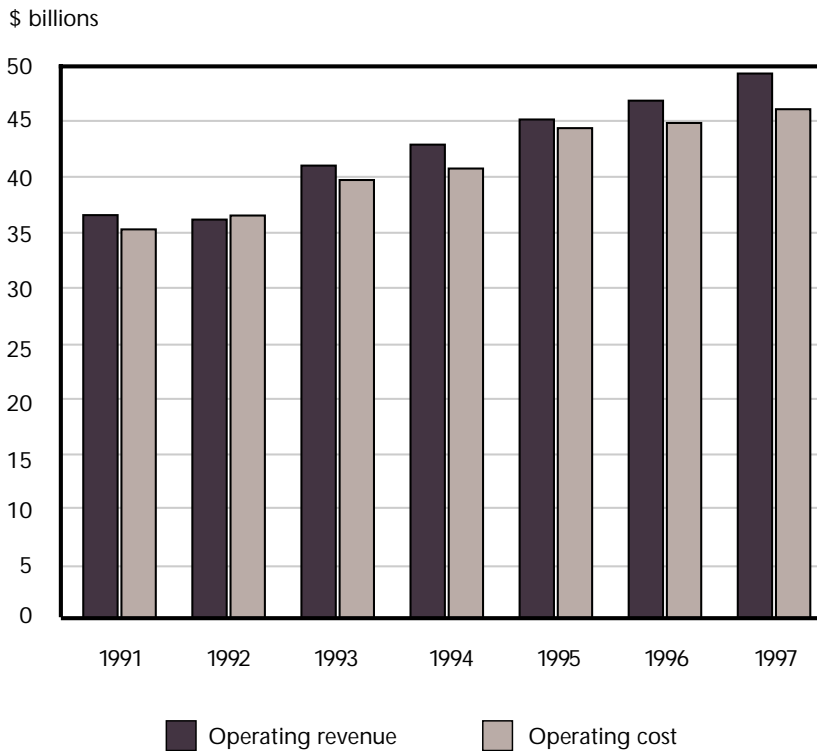
Many 3PLs arose from transportation and warehousing

2.4 Performance and Productivity

The main firms in the Canadian logistics industry generate about \$50 billion in annual sales. The average annual growth rate from 1991 to 1997 was 5.8 percent (Figure 4). Logistics activities include trucking, rail and marine services, postal and courier services, and storage including other services incidental to transport.

Annual logistics revenues: \$50B

Figure 4. Logistics Activity



Source: Statistics Canada, Catalogue 61-219-XPB.

Just-in-time inventory
and management
results in huge
cost savings

Modern logistics practices are key to industries such as wholesale and retail trade and transportation equipment. For example, in a modern automotive plant, the rate of delivery of new parts to the factory is measured in minutes, rather than in hours as in previous decades. Most major retail and wholesale chains now contract out transportation logistics to third-party carriers. The result is substantial savings in capital equipment, improved service and more satisfied customers. These gains are being felt in all areas of logistics. For example, transportation, inventory management and information flow management benefit from rapid advances in technology, and these improvements contribute to logistics productivity.

Advances in transportation, inventory management and logistics all contribute to improved performance of the Canadian economy, especially in manufacturing, retailing and wholesaling. Improved logistics practices shorten the time taken to get the goods from the supplier to the customer. A substantial savings from improved logistics practices is attributed to lower inventory (and carrying) costs as products are distributed on a just-in-time basis. Faster inventory turnover rates lead to improved productivity as operating costs are substantially reduced.

There is also increased efficiency in managing the information flow along the supply chain. For example, Canada's modern and innovative financial payments and clearing system (which is a key aspect of logistics) help facilitate improved productivity at the industry firm level. Financial transfers between suppliers and customers take place almost instantaneously due to modern electronic commerce and electronic data interchange (EDI) applications. Internet applications continue to increase velocity of transactions and information flows and allow for better service to logistics users.

In some cases, transportation costs have been lowered by technical innovations and lower unit costs for rail lines and trucking firms. Even when transportation costs have remained static or have increased, overall cost savings have been achieved through improved services (availability of trucks on a just-in-time basis, etc.) or more efficient loading and unloading equipment.

Gross Domestic Product (GDP)

The demand for logistics closely follows the business cycle: it grows when the economy grows and declines when the economy declines. Growth is also fueled by the acceptance of outsourcing as a sound business practice and by the increased awareness of the impact of supply chain management on business performance.

During the 1990s, new business management practices such as electronic commerce and technological developments enabled a quicker inventory turnover in most industries. Along with the above trend, the role of a warehouse also changed, from a pure storage facility to a dynamic link in the supply chain. As a result, the storage sector (excluding grain) is one of the most dynamic sectors of the economy, with annual real GDP growth averaging 8.5 percent in the 1992–98 period (Statistics Canada).

Strong growth also occurred in the trucking and warehousing subsectors during the 1990s, with average growth of 9.1 percent and 4.5 percent, respectively. However, these figures do not show the emergence of 3PLs, as their relative weight in aggregate data is too small to influence the average. Industry experts estimate that 3PLs, supply chain consulting services and logistics software services are enjoying double-digit annual growth rates.

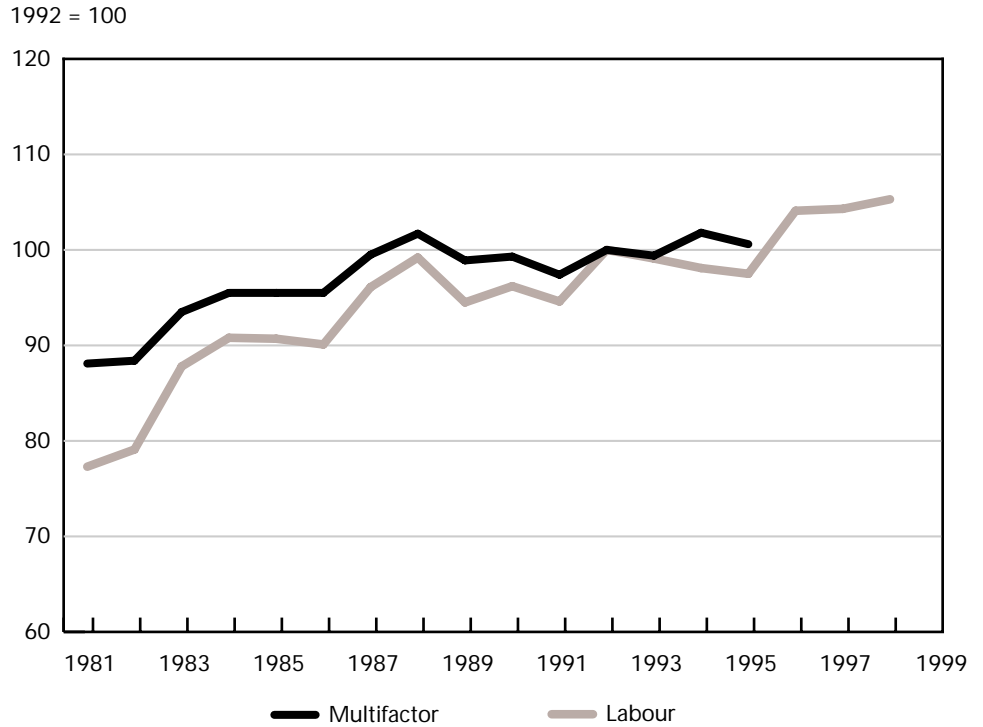
This strong growth reflects the importance that firms and organizations in all sectors give to state-of-the-art supply chain management. Sectors recognize that logistics and supply chain management are areas that contribute to the overall productivity.

Productivity Performance

Labour productivity for the “transportation and storage” sector (a proxy for logistics) grew at an annual average rate of 1.5 percent during the 1981–98 period (Figure 5). The annual average labour productivity growth rate for the overall business economy during this period was 1.1 percent. Multifactor productivity, which includes capital as well as labour as inputs, followed a similar path as labour productivity in the logistics sector.

Strong growth in trucking (9.1%) and warehousing (4.5%); 3PL growth estimated in double-digit range

Figure 5. Transportation and Storage Productivity, Based on Multifactor^a and Labour Inputs



^aMultifactor productivity is based on both capital and labour inputs.

Source: Statistics Canada, Catalogue 15-204, CANSIM 9480 and 9456.

Labour productivity varies by subsector

The aggregate figures noted above are driven by traditional service providers (the “transportation and storage” sector) and vary among subsectors. From 1981 to 1996, labour productivity grew at an average annual rate of 6.2 percent for rail services, 1.6 percent for marine services and 2.1 percent for trucking services. Warehousing and storage grew at an average annual rate of 1.1 percent from 1981 to 1998.

Labour productivity growth rates were higher in the 1990s for some segments of the industry, notably marine and storage. For example, from 1991 to 1996, rail grew at an annual rate of 4.2 percent, marine by 5.3 percent and storage by 4.5 percent. Trucking labour productivity grew at an annual rate of 1.3 percent from 1991 to 1996.

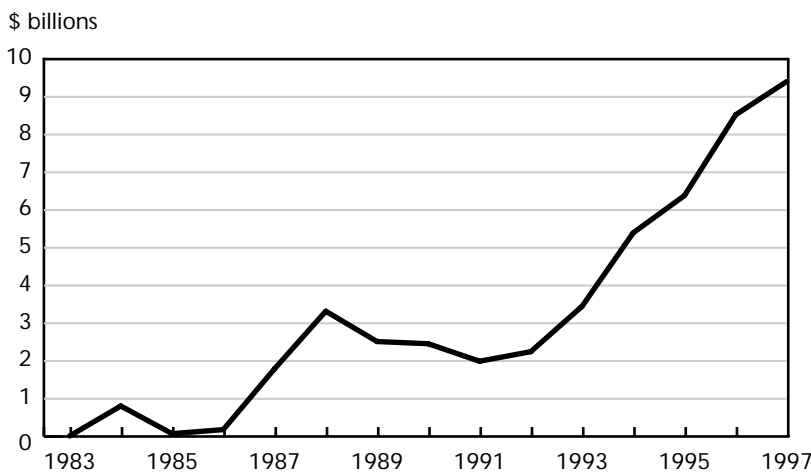
Containerized cargo shipping experienced an average annual growth rate of 4.3 percent over the past decade. Outbound international containerized cargo movements enjoyed an average annual growth of 6.8 percent. However, trade imbalances are a major concern for carriers as the cost of repositioning an empty container is in the range of US\$500–800 (Paul Briggs, “Oceans to Oceans,” *Canadian Transportation and Logistics*, March 1997).

The increased containerization of shipments enables a treatment of smaller goods similar to that of commodities, especially with regard to intermodal transport. The continuing developments in intermodal traffic services contributed to the 107 percent increase between 1991 and 1997 of containers on flat cars traffic.

Price Performance

Transportation inflation has been relatively lower than that in the rest of the economy. Shippers have been encouraged to use better-quality services such as door-to-door delivery on a just-in-time basis. From 1983 to 1997, transportation unit costs have increased less rapidly than unit costs in the economy as a whole. By 1997, total costs in the transportation sector were \$9.3 billion lower than they would have been if they had increased at the same pace as the economy over this period (Figure 6). About 66 percent of the savings came from the reduction in labour costs.

Figure 6. Cost Savings due to Transport Price Reductions



Source: Transport Canada, "Transportation in Canada: 1998 Annual Report" (Ottawa: 1999).

Economic Impact of Logistics

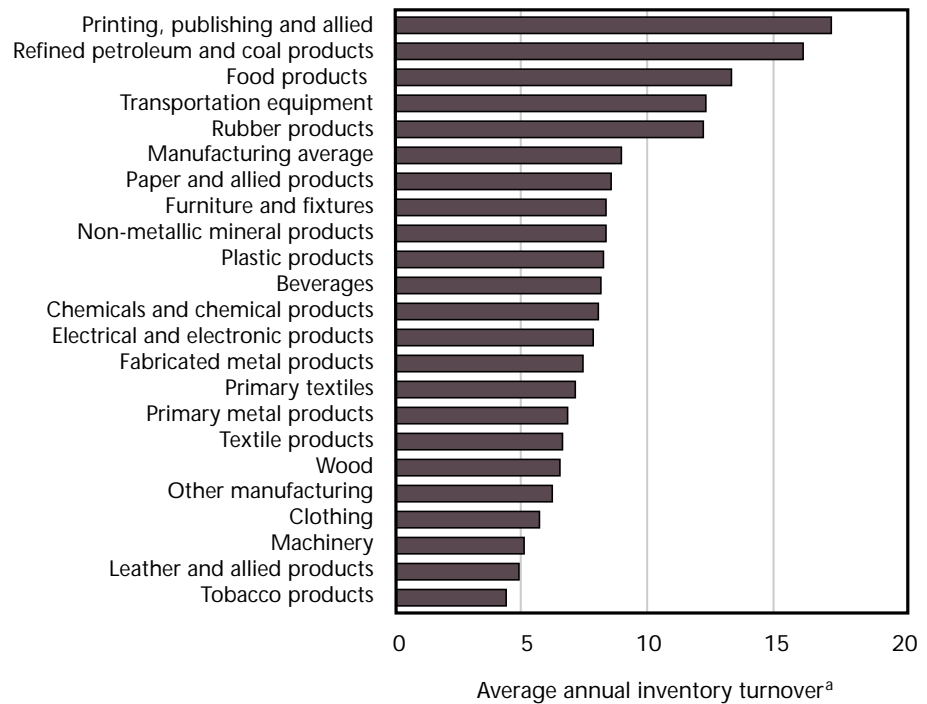
The previous subsection discusses productivity improvements and the overall efficiency of the logistics industry. The following discussion focusses on the impact of logistics on inventory management as well as on overall logistics costs for the total economy and various industries over the past 20 years.

Inventory Performance

In the manufacturing sector, there has been a substantial improvement in inventory turns, especially over the past 10 years, likely in reaction to the high costs of inventories becoming obsolete and inventory carrying costs at current interest rates.

Figure 7 shows average annual inventory turnover rates from 1991 to 1998. The top five industries demonstrating the best inventory turns were printing and publishing, refined petroleum and coal products, food products, transportation equipment and rubber products.

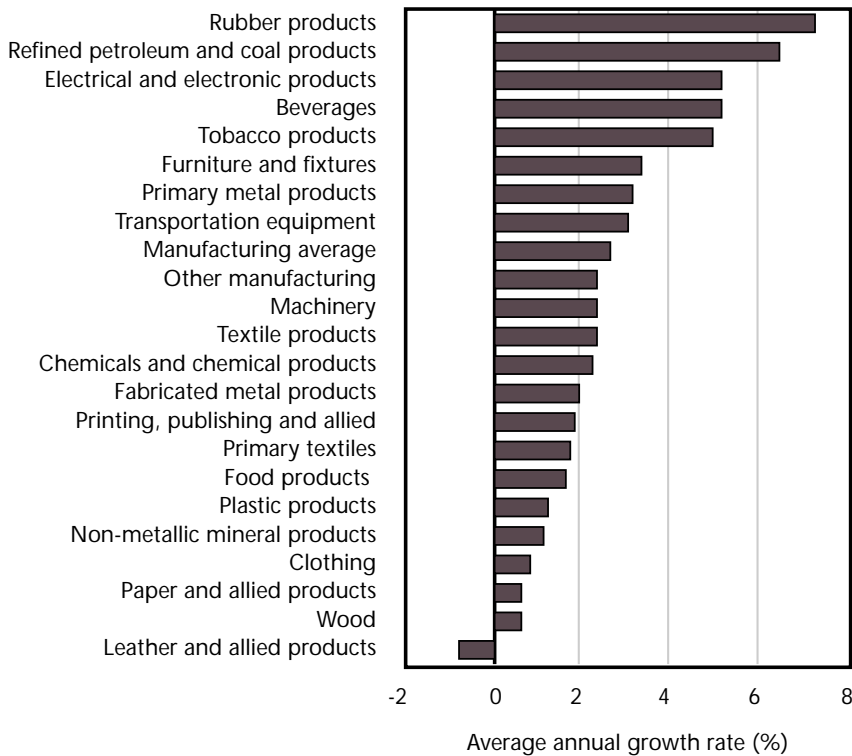
Figure 7. Manufacturing Inventory Turnover, 1991–98



^aInventory turnover = annual sales divided by year-end inventories.
 Source: Statistics Canada, Catalogue 31-001, CANSIM 9564.

Figure 8 shows average annual growth rates in inventory turns from 1981 to 1998. The top five industries showing the fastest annual average improvement in inventory turns from 1981 to 1998 were rubber products, refined petroleum and coal products, electrical and electronic products, beverages and tobacco products.

Figure 8. Manufacturing Inventory Turnover Growth, 1981-98

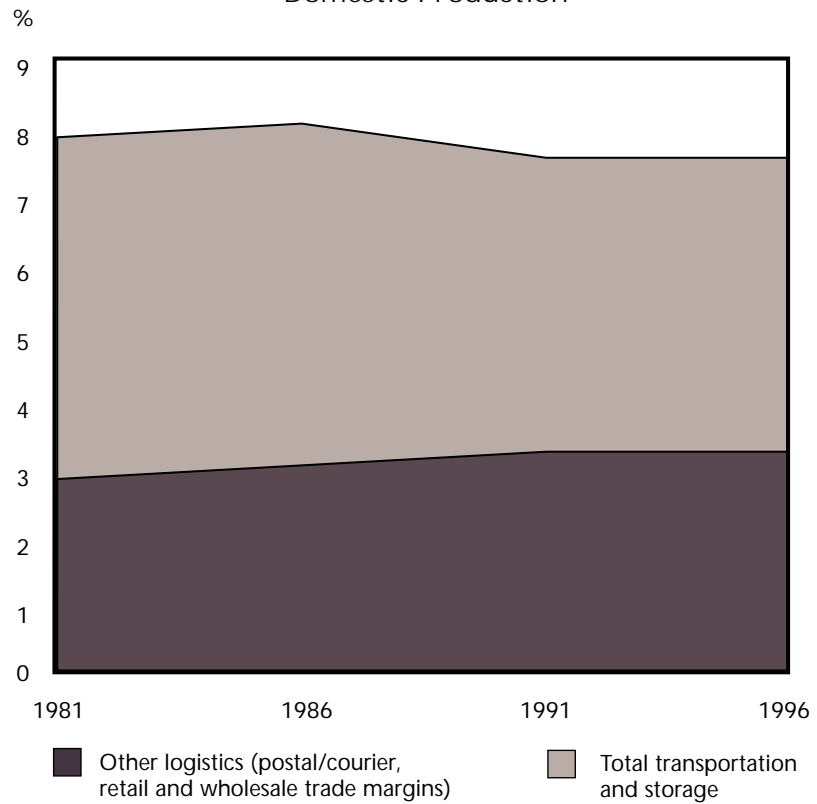


Source: Statistics Canada, Catalogue 31-001, CANSIM 9564.

Cost Performance

This section of the report examines specific logistics costs over a 15-year period based on Statistics Canada input-output matrices for 1981, 1986, 1991 and 1996. Transportation and storage costs for intermediate commodities as well as postal and courier costs have been tabulated (Figure 9). Note that, on aggregate, logistics costs have fallen slightly over this 15-year period, due to decreasing transportation and storage costs.

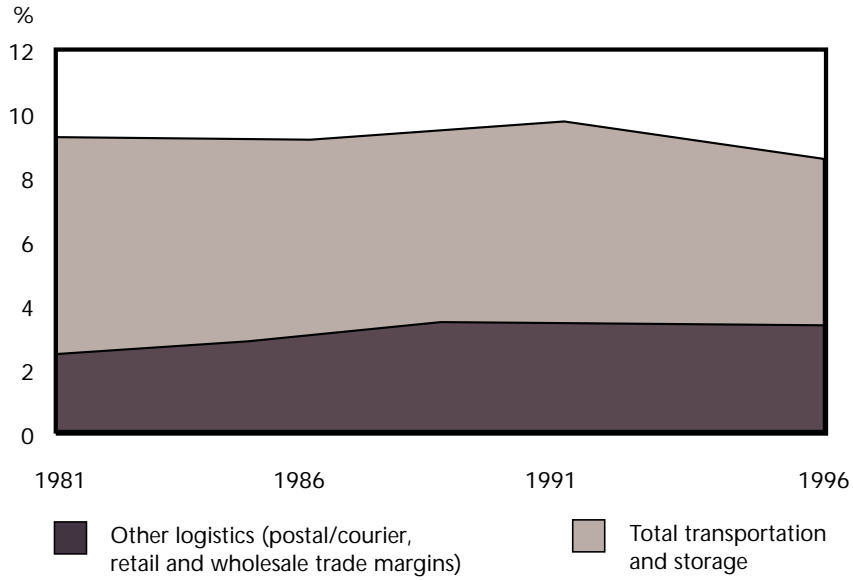
Figure 9. Logistics Costs as a Share of Production Costs, Domestic Production



Source: Statistics Canada, Input-Output Matrices.

Figure 10 shows total logistics costs as a percentage of production costs for exports for 1981, 1986, 1991 and 1996. Relative to output, logistics costs have fallen over this 15-year period, due to the declining importance of transportation and storage costs. Other logistics costs have increased as a share of output.

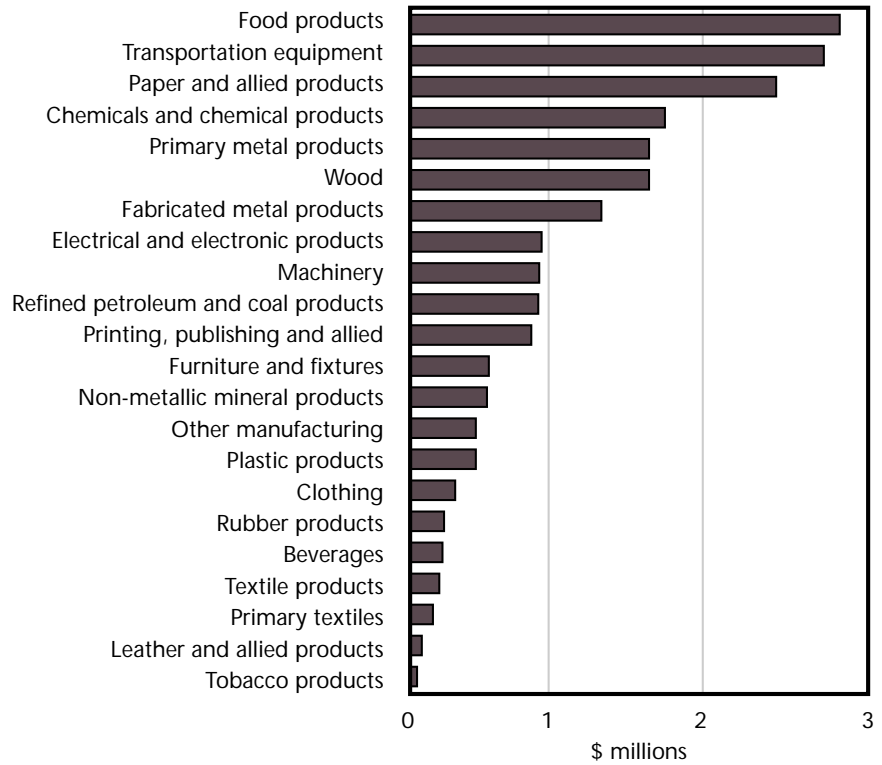
Figure 10. Logistics Costs as a Share of Gross Output, Exports



Source: Statistics Canada, Input-Output Matrices.

Figure 11 identifies those manufacturing industries with the highest logistics costs for 1996. The top five industries consuming the most logistics costs are food products, transportation equipment, paper and allied products, chemicals and chemical products, and primary metal products.

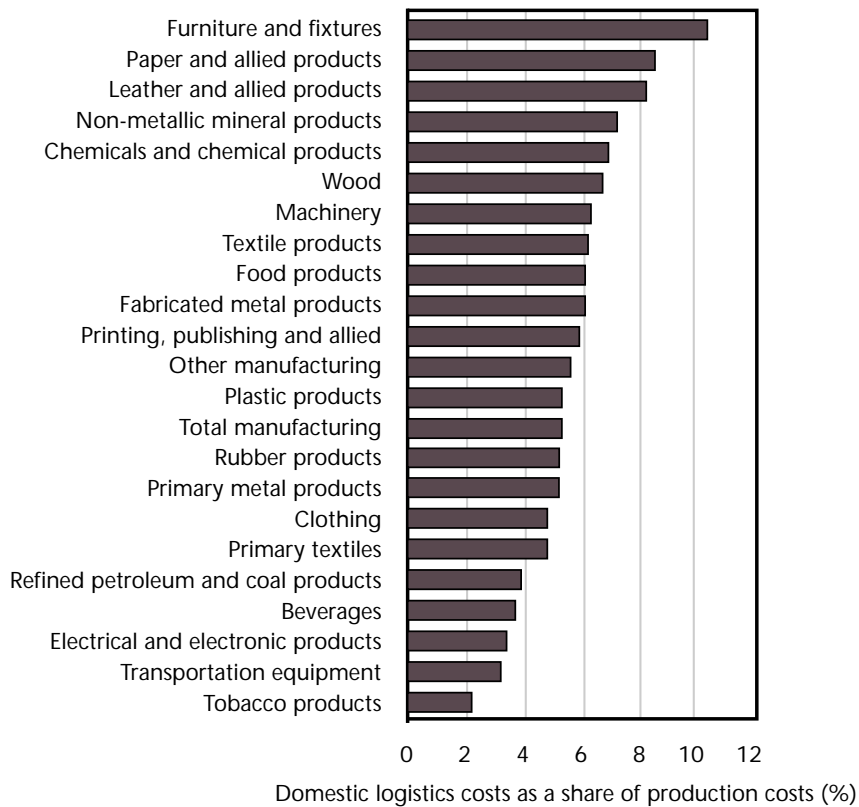
Figure 11. Total Logistics Costs, 1996



Source: Statistics Canada, Input-Output Matrices.

Figure 12 identifies those manufacturing industries with the highest logistics cost intensity for 1996. The top five logistics-intensive industries are furniture and fixtures, paper and allied products, leather and allied products, non-metallic mineral products, and chemicals and chemical products.

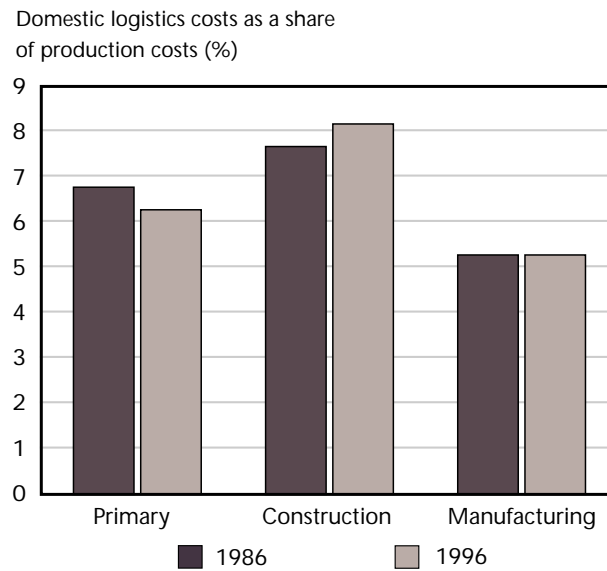
Figure 12. Logistics Intensity, by Industry, 1996



Source: Statistics Canada, Input-Output Matrices.

Figure 13 shows the logistics intensity for the primary, construction and manufacturing sectors for 1986 and 1996. Domestic logistics costs as a percentage of production costs declined slightly for the primary sector, rose marginally for construction and remained flat for manufacturing during this 10-year period.

Figure 13. Logistics Intensity, by Sector, 1986 and 1996



Source: Statistics Canada, Input-Output Matrices.

3 CHANGING CONDITIONS AND INDUSTRY RESPONSE

Firms must continuously adapt to changes in the global business environment in order to increase their competitiveness. The changes being brought about by globalization, technology and government regulations are creating a wealth of opportunities. Logistics services providers are adapting their service offerings to help clients respond to new challenges. This changed environment raises the profile of logisticians and also creates new business opportunities.

Logistics managers in the past concentrated on the internal logistics functions including warehousing, transportation, etc. Logistics managers now focus more on external functions, especially those that collectively satisfy customers (see James S. Keebler, Karl B. Manrodt, David A. Durtsche and D. Michael Ledyard, "Keeping Score: Measuring the Business Value of Logistics in the Supply Chain," Council of Logistics Management, 1999).

Globalization of markets and the emergence of e-business are rapidly changing the nature and structure of the logistics function, because the firms with the best distribution system are the ones that win. Dell Computers, for example, uses the Internet and the telephone to communicate directly with its customers, bypassing wholesalers and retailers. Other companies such as Wal-Mart and Home Depot use superior logistics systems to provide lower prices and better availability than the competition.

Technologies to better communicate logistics data to trading partners such as orders, shipment dates, deliveries, invoices, are critical. While electronic data interchange (EDI) has been widely used in many industries for some time, its high cost has acted as a barrier to many smaller companies. The rapid growth of the Internet, however, is changing the ground rules and is allowing smaller companies to electronically check and transmit orders and communicate with other suppliers and customers.

Logistics industry
is reaping benefits
of globalization,
computer technologies

Fastest distribution
system wins

The international market, especially the export segment, has been experiencing annual growth of about 7% since 1991

3.1 Trade

Governments around the world are increasingly lowering tariff and non-tariff barriers, bringing strong international trade growth. The economic benefits of trade liberalization are substantial. From 1954 to 1994, the World Trade Organization, formerly the General Agreement on Tariffs and Trade, reported that world merchandise trade grew by more than 6 percent a year, compared with an annual growth in output of 4 percent. In North America, the Canada–United States Free Trade Agreement (FTA) of 1989, followed by the North American Free Trade Agreement (NAFTA) five years later, provided the impetus for major changes in the orientation of Canadian supply chains and in the performance of storage and distribution functions. The strategic focus of many Canadian firms began to change from a country-specific, east-west supply strategy to one that increasingly involved a north-south flow of goods. As a result, Canada–United States merchandise trade more than doubled in a decade, from \$198 billion in 1988 to \$503 billion in 1998. Today, over one third of Canada’s production is sold in the U.S. market.

International trade has a major impact on logistics requirements, as indicated by transborder traffic data (*Canadian Transportation and Logistics*, February 1999). For instance, Canada’s exports and imports of freight land transportation services (trucking and rail) tripled between 1989 and 1997. In the latter year, freight land transportation services exports were valued at \$2.9 billion, while imports reached \$2.3 billion. The transborder market has been the engine of growth since the signing of the Free Trade Agreement. Rail carriers also benefit from increased trade between Canada and the U.S. Exports to the U.S. by rail increased at an annual average rate of 6.9 percent between 1992 and 1997. Increasing international trade has also had a positive impact on freight forwarders.

International trade raises logistics challenges beyond transportation requirements and puts upward pressure on costs. For instance, in addition to increasing the complexity of transport optimization, it complicates supply chain integration. This is due to the multiplicity of business cultures, customs procedures, foreign regulatory regimes and related compliance, which must be dealt with. This increased complexity coupled with the ever increasing importance of international trade represent opportunities for logistics services firms, provided that they are able to deploy an international network. Logistics providers are positioning themselves as the facilitators of international trade and the ideal partners to penetrate new markets. They must capitalize on their expertise in supply chain optimization that will contribute to keep costs under control despite the upward pressures related to international trade. Growth in international trade contributes to the growing trade in logistics services and the related rise of 3PL firms globally.

Increase in trade
and rise of logistics
complement each other

3.2 Technology

The logistics industry is going through a massive transformation due to the globalization, the Internet and advances in information and communication technologies. Logisticians now have access to increasingly sophisticated equipment and powerful software to support each function in the supply chain. For example, innovations in transportation equipment have brought about cheaper and more reliable transportation, and warehouses are equipped with increasingly advanced material handling devices. Figure 14 identifies many of the technologies used in supply chain management.

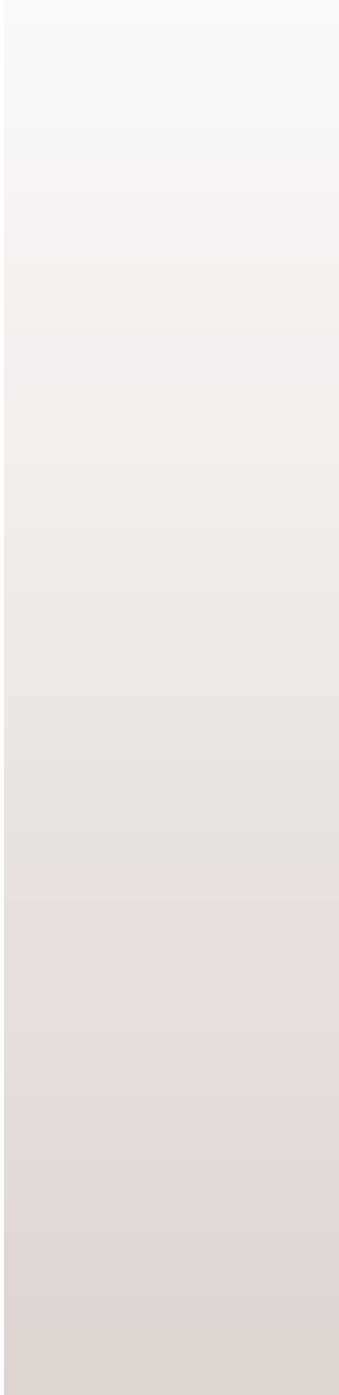
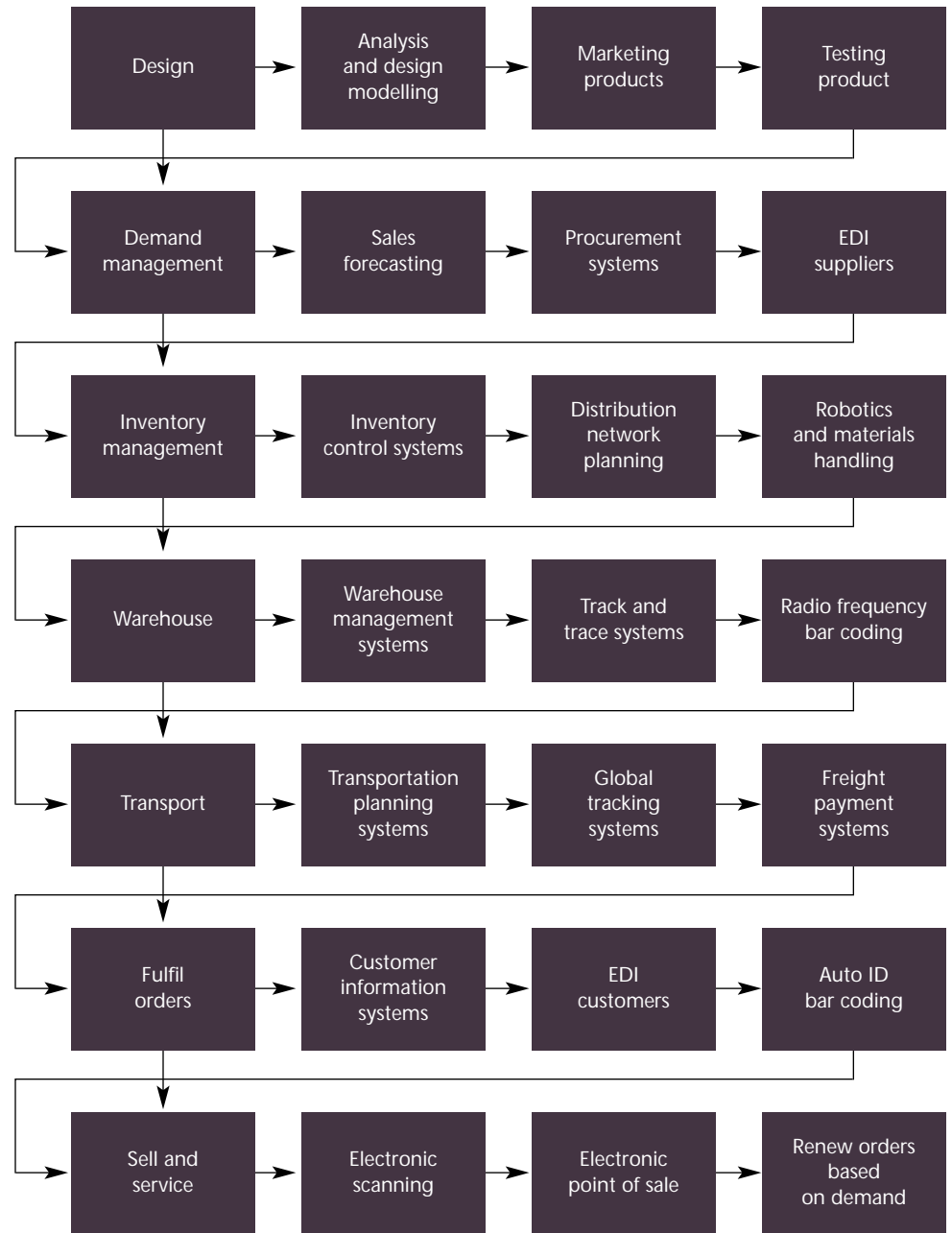


Figure 14. The Supply Management Chain and Technology



The nature of competition in a given industry is changing. Instead of direct competition between firms, the emphasis now is on who best manages the time between when the data are captured in one place and when they become available and actionable elsewhere. Electronic commerce allows supply chains of both customers and suppliers to respond in real time to actual sales.

E-business changes the nature of logistics from being a packaging and moving function into an information business. It integrates carriers with shippers via electronic tendering, inventory confirmation and delivery tracking. Third-party logistics firms are encouraging customers to access their information systems through the Internet.

More businesses are moving toward build-to-order models and low inventories. Greater value is thus being placed on fast and accurate inbound and outbound logistics information. Many web-based businesses outsource their order management, warehousing, packaging and customer support function to major courier and logistics firms.

E-business is changing the basic cost structure of sales, procurement, supply chains and distribution channels. The historical barriers to entry (size and infrastructure) are diminishing in importance. The emphasis now is based on speed rather than on size.

Communication systems such as EDI have been utilized for some time. The EDI system, however has several drawbacks. It is limited and inflexible. It cannot adapt to rapidly changing markets. It is expensive and is based on proprietary technology.

Many EDI operations are moving toward lower-cost Internet applications based on open standards, universal reach and a powerful browser interface. A company can access the system 24 hours a day. The complexity of connecting proprietary and dissimilar computer systems in the older EDI mode is removed. The result is improved customer service, reduced inventory and transportation costs, improved cycle time, improved market share, and improved financial performance and productivity.

The Internet platform boosts demand among small and medium-sized enterprises for business-to-business applications. It offers vendors, suppliers and customers a truly seamless supply chain management. It enables inter-enterprise collaboration through real-time financial and strategic information sharing, which culminates in a virtual corporation that integrates product information and financial flows for decision-making purposes.

The ultimate goal is to coordinate data gathered from customers, employees, suppliers and even competitors with internal, mission-critical corporate data.

–PriceWaterhouseCoopers,
“E-Business Technology
Forecast,” April 1999

Emphasis is on speed rather than size

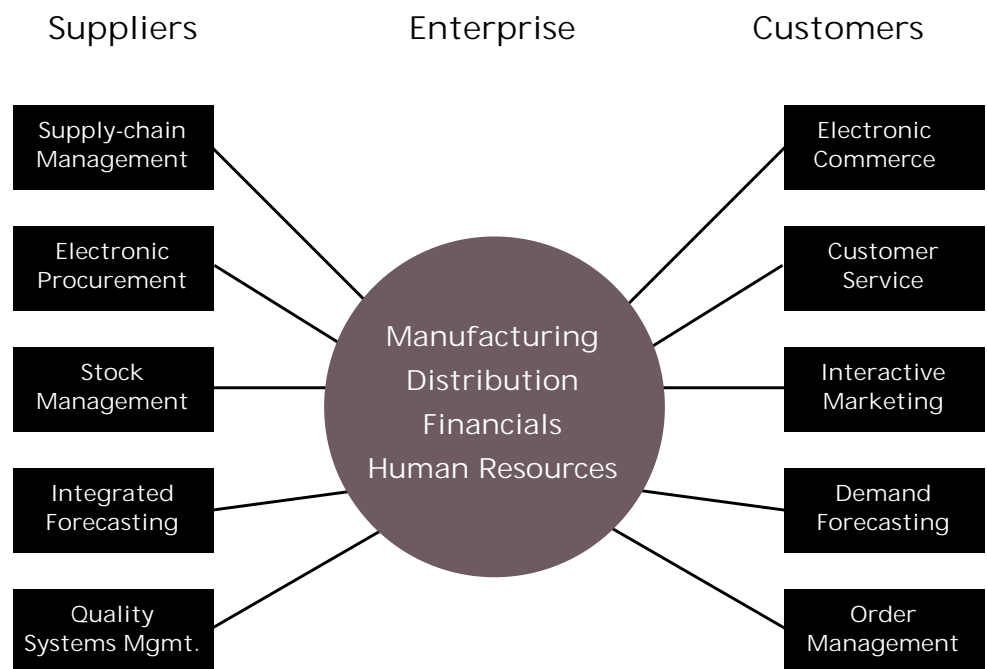
Many organizations use the Internet to share critical information, including product availability, order status, production and delivery of goods and services.

–PriceWaterhouseCoopers,
“E-Business Technology
Forecast,” April 1999

End customers ultimately benefit

The Internet allows many companies to become integrated into a virtual collaborative network, which includes manufacturers, customers, carriers, brokers, agents, distributors, suppliers and wholesalers. It is the end customer who ultimately benefits. The result is improved customer service, improved cycle time, improved productivity, reduced rework and returns, and improved financial performance (Figure 15).

Figure 15. The Extended Enterprise



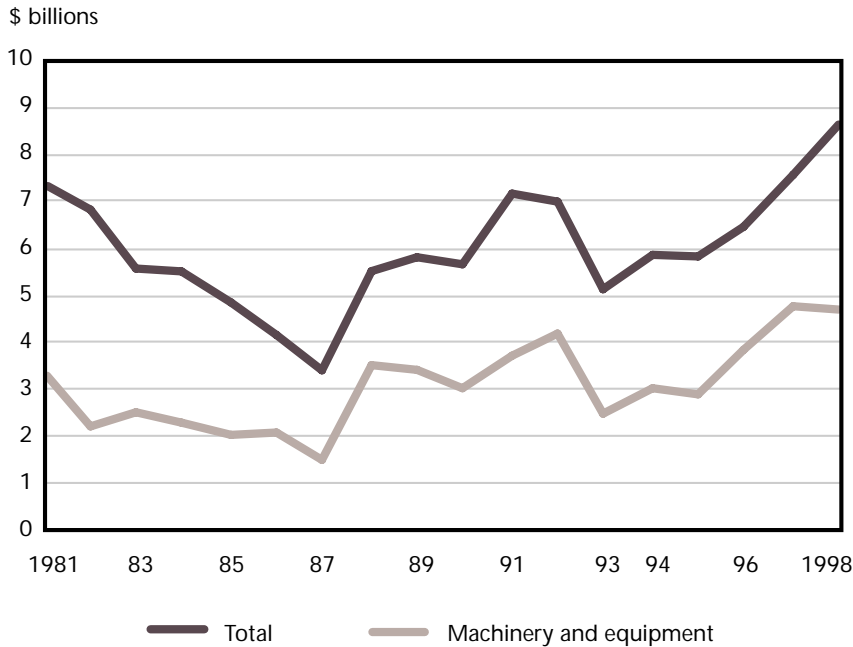
Source: *The Economist*, "Survey on Business and Internet," July 1999.

3.3 Investment

Investment:
\$10B in 1998

Given the pace of technological change, firms must renew their capital equipment and software regularly to stay competitive. The transportation and storage industry invested almost \$10 billion in equipment and structures in 1998. Capital formation in this industry has been rising steadily since 1993 (Figure 16). Investment in machinery and equipment accounted for over half of this amount, while investment in buildings and facilities accounted for the rest.

Figure 16. Gross Fixed Capital Formation, Transportation and Storage (1992 constant dollars)



Source: Statistics Canada, Catalogue 13-568, CANSIM, D994569 and D994572.

These investments contributed to building modern warehouses and equipping them with sophisticated material handling, inventory control and communication equipment. Information technology (IT) is one of the key elements of their investment strategy. State-of-the-art technology is essential to successfully integrate the different components of the supply chain and facilitate information flows.

In addition to the transportation and storage sector, those industries employing the majority of logisticians (i.e. in-house logistics in wholesale trade, retail trade and manufacturing) have been investing large sums of money in machinery and equipment to operate more efficiently and improve their productivity. For example, they have acquired warehouses, transportation equipment and information technology, which provide their logisticians with the necessary tools to automate the supply chain.

Investment in IT is key to logistics success

Logistics firms are beginning to allow their information systems to be accessed directly by shippers.

–PriceWaterhouseCoopers,
“E-Business Technology
Forecast,” April 1999

Information flows
are as important
as material flows

While traditional service providers invest heavily in warehouses and transportation equipment, 3PL firms usually take a different approach. A majority of these firms are non-asset-based, meaning that they do not invest large sums in transportation equipment acquisition. Alternatively, they make strategic investments in information technology, which they complement with alliances involving carriers and other suppliers. Therefore, effectively deploying information technology and managing relationships with business partners is essential for the success of 3PLs.

3.4 Human Resources

Logistics employees are key assets in the logistics industry’s ability to adapt to changing conditions and seize new market opportunities. The logistics profession and the skill sets required for excellence are evolving, confirming the importance of logistics and supply chain management in the knowledge-based economy. Logisticians are adapting to a challenging new environment, driven by globalization, information and communication technologies, and corporate restructuring.

Globalization has increased the complexity of supply chain management, thereby increasing the importance of dealing with supply chain partners around the world. Logisticians must understand international business and logistics systems, foreign regulatory regimes and ethical standards as well as possess language and “cultural” skills. Logisticians are key partners in rethinking firms’ supply chain strategies and ensuring success on international markets by controlling logistics costs, despite upward pressures brought about by the multiplicity of foreign regulatory regimes and other special requirements.

It is often said that information flows in the supply chain are as important as material flows. New information and communication technologies (ICTs) facilitate information flows and provide a competitive edge in transportation and warehousing as they improve customer service and satisfaction. Logisticians must be sophisticated users of ICT and must be capable of developing strategies to deploy technology for competitive advantage and integration with client systems. In the future, ICT skills will continue to be pervasive throughout organizations and logistics occupations.

Corporate downsizing and related changes in organizational structures have fostered a movement toward team-based approaches. With more flattened organizational structure, tasks and processes that traditionally have been the domain of higher levels in business hierarchies are being increasingly pushed down to lower levels. As a result, logisticians at all levels face an increased load of decision making. Consequently, logistics jobs are increasingly characterized by their demanding skill sets across traditional logistics functions, including integration skills, a sound knowledge of the corporate culture and the ability to work in multidisciplinary teams.

The trends identified above have an impact on the type of logistics jobs that are in demand. The logistics jobs that are on the rise are higher-end knowledge jobs, or jobs requiring information management skills, as well as analytical and multi-logistics functional skills. For that reason, logisticians are often highly trained through university or college courses in logistics, transportation, information technology and business administration. In addition, a number of logisticians have earned the PLog (Professional Logistician) designation awarded by the Canadian Professional Logistics Institute and/or professional certifications in transportation, customs brokerage or purchasing management, among others. The PLog designation provides an independent certification of a high level of professional competence and a strong commitment to excellence in the logistics function.

However, there are concerns over a potential shortage of individuals that will fill the senior logistics positions of tomorrow. Human resources shortages are the main problem area identified by 3PL firms. It is estimated that approximately 25 percent of current logistics personnel are under-educated for their jobs. This is particularly true for older workers who do, however, have field experience. Given the rapid evolution and sophistication of the logistics profession, the recruitment of qualified individuals is critically important. In order to meet the challenges of the future, universities and community colleges must offer courses that meet the needs and challenges unique to the logistics and supply management industries and activities. In response to this need, community colleges and universities are getting more involved in logistics and supply chain management, which should increase the number of post-secondary students exposed to logistics.

There is a strong demand for qualified college or university graduates

3.5 Government and Regulation

Logistics services providers must have knowledge of and comply with an extended set of regulations affecting transportation, warehousing and the international movement of goods. Logisticians must be knowledgeable of such regulations in all the countries reached by the supply chain. Regulations have a profound impact on supply chain management. For example, regulations in some Asian countries prevent the integration of warehousing and transportation services into a single entity (Conference Board of Canada, “Meeting the Challenges of Global Logistics,” Ottawa, 1998). The changing regulated environment requires that logisticians adapt quickly to new environments.

Transportation

In Canada, the federal government is responsible for regulating most aviation, railway and marine transportation activities. The main federal legislation is the *Canada Transportation Act* of 1996. Provincial and territorial governments are responsible for intra-provincial railways and trucking regulation. The *Transportation of Dangerous Goods Act* regulates movement of hazardous and dangerous material. However, governments’ role today is different from what it was in the past. For the past decade, for instance, a revolutionary deregulation of commercial transportation has taken place as governments move away from economic regulation such as controls on market entry and price setting. Moreover, a recently completed review of the *Motor Vehicle Transport Act*, which covers trucking operations, should result in the elimination of the remaining economic regulation in trucking.

Transportation
deregulation stimulates
creativity in trucking,
rail services

The deregulation of transportation services combined with advances in information and communication technologies have resulted in improved logistics systems and greater productivity. For example, changes in the 1987 *Motor Vehicle Transport Act* and the *National Transportation Act* brought on both lower transportation costs and improved services for shippers. As a result of deregulation, carriers no longer have to obtain government approval before offering new services. The improved regulatory environment also has an impact on rail transportation. The elimination of transportation subsidies, for example, provides financial incentives for the rail industry to meet capital and infrastructure costs, and improve services. In addition, railways are allowed to enter into confidential agreements with shippers.

As economic regulation disappears, governments are placing more and more emphasis on safety regulations and environmental protection requirements. For example, federal responsibility for road safety, carried out under the *Motor Vehicle Safety Act*, establishes national standards for the design and construction of motor vehicles and addresses motor vehicle emissions. While the federal government is responsible for regulating the safe operation of extra-provincial carriers, this responsibility has been delegated to the provinces. The *National Safety Code* is a joint responsibility between all levels of government, as they all share responsibility for ensuring the safe operation of commercial vehicles. Aspects of the Code are still being implemented but, when fully in place, it will cover 15 standards including such things as hours of service, load security, compliance review and a variety of driver-related activities.

Vehicle weights and dimensions regulations have a profound effect on trucking cost, productivity and competitiveness. As a result, an inter-jurisdictional task force has been set up to coordinate federal-provincial activity in this regard. As well, a trilateral working group is examining the standards governing weights and dimensions of vehicles in Canada, the United States and Mexico. Compatibility of vehicle size characteristics presents a major challenge for the NAFTA partners, given the wide range of technical, economic and policy issues that underlie regulations in each country. This issue is of particular importance in the current context of increasing trade volumes.

Customs and Warehousing

The regulations governing the customs industry are the *Canada Customs Act* and related regulations such as the Sufferance Warehouse Program and the Customs Bonded Warehouses Regulations. The Canada Customs and Revenue Agency and U.S. Customs recently introduced the requirement for “informed compliance,” which replaces on-the-spot inspection at border crossings with a post-entry audit system. As part of their new approach, importers must make sure they have excellent record-keeping systems, and they must keep on top of and comply with changes in customs regulations.

Harmonization of truck limits is sought throughout NAFTA

E-business transforms logistics from simply packaging and moving goods and turns it into an information business.

–PriceWaterhouseCoopers,
“E-Business Technology
Forecast,” April 1999

Transportation
sector contributes
one quarter of
greenhouse gases

International negotiations are currently under way to harmonize customs procedures. The G-7 countries in 1996 started an initiative to standardize and simplify the data required for imports and exports. The data set, which used to have around 800 data elements, will be reduced to some 140 elements. The United Nations Edifact standardized electronic messaging for import and export data sets will be used for the automation of documentation. A similar project is under way with the Asia-Pacific Economic Cooperation customs administrations. While there is general commitment to simplification, the mix of developed and developing nations complicates the process, and the number of customs administrations involved. Greater harmonization is desirable, as it reduces the costs related to customs compliance and enables a better-integrated supply chain.

3.6 Sustainable Development

The logistics industry contributes to sustainable development by implementing efficiencies that reduce transport requirements. More sophisticated logistics software and improvements in transportation efficiency that contribute to a reduction over time in the transport to GDP ratio are beneficial to the environment.

Transport Canada (“Transportation in Canada: 1998 Annual Report,” Ottawa, 1999) notes that transportation sector was responsible for about 27 percent of total 1995 greenhouse emissions that year. Passenger gasoline vehicles, mainly automobiles, accounted for 62.2 percent of transportation emissions, while freight transportation accounted for 28.4 percent (road diesel, rail diesel and marine fuels). Aviation fuels accounted for 9.4 percent.

Logistics plays a vital role in Canada’s competitiveness. Likewise, reverse logistics, a growing component of logistics, plays an important role in sustainable development. Reverse logistics refers to the increasing trend for goods and materials to move in a reverse direction in the supply chain.

There is a prevailing thinking that reverse logistics will quickly become a key logistics service early in the 21st century. For instance, U.S. businesses already spend about US\$35 billion on reverse logistics (see Brian Gillooly, “Cost Savings: A Matter of Logistics,” *Information Week Online*, April 12, 1999). The importance of reverse logistics is twofold: in managing the flow of returned goods, and in managing the recycling function.

First, the management of the return goods function will become more important with the increase in business-to-consumer electronic transactions. It has already been demonstrated that the proportion of returned goods is higher for goods bought through the Internet. The flow of returned goods has to be managed efficiently. Thus, the receiving and put-away functions will gain importance and will likely require sophisticated approaches to keep costs under control, including implementation of electronic commerce solutions.

Second, environmental regulation and the benefits associated with projecting an environmentally friendly or “green” image put pressure on firms to establish recycling programs. For example, logisticians already play a critical role in organizing the cost-effective return and reuse of packaging, according to the Packaging Association of Canada. Logistics services providers have played an important role in the 51.4 percent reduction in the amount of packaging that goes to waste. The annual consumption of packaging is nearly 9 million tonnes, of which 45.6 percent is reused and 24.7 percent is recycled.

Life cycle product management is gaining importance through the increasing international acceptance of the ISO 14000 standards. These environmental standards deal with the environmental impacts of products over their life cycle and provide a common international framework for managing environmental issues. If indeed the trend continues and the practice catches on, as did ISO 9000, some customers may require that their suppliers be certified before doing business with them. However, registration is costly and may be out of reach for smaller firms. This represents opportunities for logistics firms who could assist small firms in establishing these types of programs and help them meet the criteria for registration.

Logistics takes key role
in packaging waste
reduction, reuse

4 GROWTH PROSPECTS

The demand for solutions provided by logistics firms will continue to accelerate, to the benefit of traditional service providers as well as 3PL firms. Traditional service providers will continue to join the ranks of 3PLs in response to the need for integration of the various processes in the supply chain. They will accomplish this by offering a more extended set of services or by forming alliances with other service providers. The prospects for logistics are very strong, with demand being fueled by two leading trends: the increasing importance of logistics and supply chain management in overall business strategies, and the increasing acceptance of outsourcing as a business practice.

4.1 Demand Outlook

The first positive growth factor is the higher profile of logistics and supply chain management. Efficient logistics and supply chain management can lead to considerable cost savings, greater flexibility and better customer service, which in turn can lead to increased sales and profits. As a result, organizations are bringing their logistics department out of the backroom and into the boardroom. For instance, a KPMG global supply chain survey (*Materials Management & Distribution*, January 1998) of 200 companies, mostly manufacturers across North America, revealed that over 97 percent of respondents viewed supply chain management as important to the long-term success of their company. However, only 25 percent were fully satisfied with their supply chain management systems, and over 62 percent saw alliances with logistics services providers as essential to optimizing their supply chain performance. Only 8 percent of the survey respondents felt that outsourcing would not reduce costs or improve service.

Another growth factor is related to the increasing acceptance of outsourcing as a sound business practice. Firms are increasingly relying on 3PL partners to integrate these services in the supply chain system.

However, the current focus remains on selected logistics services. Functions such as production planning, purchasing, customer service, order management, and vendor administration are not currently outsourced extensively. The KPMG global supply chain survey mentioned above revealed that transportation was by far the most commonly outsourced logistics service, followed by warehouse management and manufacturing/assembly. Results also suggested that the areas with the most potential for outsourcing in the future were warehouse management, distribution network management and information systems management. Third-party logistics providers will continue to make inroads into those areas now largely served by in-house logisticians.

Future growth in the 3PL market will depend on the extent to which firms continue to outsource their logistics activities

A survey of logistics professionals in the United States and abroad (James S. Keebler, Karl B. Manrodt, David A. Durtsche and D. Michael Ledyard, “Keeping Score: Measuring the Business Value of Logistics in the Supply Chain,” Council of Logistics Management, 1999) found that cost control was rated as the highest priority for logistics plans in the near future, followed closely by information technology and improving customer service.

4.2 Current Industry Strengths

Because of the country’s size and difficult geography, Canadians have long faced the challenge of how to transport goods efficiently. In the process of responding to this challenge, Canada has developed world-class logistics capabilities. Traditional service providers and 3PL firms provide important support for Canadian firms serving both domestic and foreign markets. Efficient logistics is particularly important in international trade, where Canadian firms face potentially high transport costs and also face complex transportation and custom clearance procedures with which they must comply. Canadian logistics firms have a strong base of knowledge, skills and expertise, along with some of the most sophisticated communications systems in the world, which they can bring to service the needs of Canadian firms.

Industry associations
help monitor,
market, coordinate
service providers

Concomitant with the development of the logistics industry is the development of a dynamic network of industry and professional associations. Several active industry associations represent traditional service providers, 3PL firms and individuals working in the in-house logistics component. There are associations representing the logistics profession at large and associations in each individual function in the supply chain, such as purchasing, warehousing, transportation, freight forwarding and customs brokering. These associations provide a variety of benefits to their members, such as industry information, training and a representative voice with various levels of government and in international circles. These numerous associations often work collaboratively, and many firms or individuals belong to several associations. They are increasingly marketing the importance of logistics and supply chain management as well as raising awareness of the changing nature of the profession. Many also promote the multidisciplinary nature of their members and the integrated services they offer. Furthermore, the clients of logistics services providers are often members of active industry associations (e.g. shippers, importers, exporters, manufacturers, wholesalers, retailers). These associations interface regularly with the associations of the logistics services providers, and together they look for solutions to improve the overall flow of goods, services and information in the supply chain.

4.3 Competitiveness Challenges

The growth of e-business in a business-to-business model is radically transforming supply chain integration between primary and secondary businesses. Canadian companies are streamlining the supply chain and are switching to more efficient models based on Internet connectivity. The challenge facing the logistics industry is the need to be agile and lean enough to be able to adapt to new developments which are emerging. Logistics companies cannot rely on older technologies. They must provide customers with supplies on a real-time basis, as demands dictate, in an Internet-connected, business-to-business environment.

Paradoxically, the rapid growth of leading 3PL firms is at the origin of the logistics industry's potential problems and competitiveness challenges. First, the rapid growth of leading logistics suppliers in North America has resulted in a shortage of logistics specialists, especially in Canada. A number of major players in the 3PL business are finding it difficult to obtain qualified individuals at a variety of skill levels. Until recently, there has been a void in opportunities for training and preparing the logistics work force, particularly with regard to hands-on skills required to perform day-to-day operations. The situation is less of a problem at the executive level, where organizations such as the Canadian Association of Logistics Management have organized a number of educational events. In addition, other industry associations are providing training to their members to help them adapt to the new environment and evolving business conditions.

Second, strong growth in the 3PL industry has attracted a large number of new entrants in the industry, many of which lack the capabilities to truly integrate and optimize supply chains. As a result, "oversold capabilities," some unfavourable stories on poor performance and the presence of less qualified suppliers are leading to an unclear or even negative vision of 3PL firms (Garland Chow, "Logistics in Canada: Survey Results," Annual Conference Proceedings, Council of Logistics Management, San Diego, CA, October 8–11, 1995).

Logistics services providers will have to overcome a variety of barriers, particularly the perception that outsourcing and/or partnerships are fraught with a variety of problems such as poor communication and data sharing, the lack of mutual trust, unreliable information systems, confusing roles and responsibilities, union and human resources issues and cultural incompatibility. Similarly, some firms consider that logistics is too strategic a function to be carried out by a third party and, over time, have built a substantial in-house logistics department.

Growth of 3PLs creates opportunities plus challenges

Industry needs to address image problems

Logistics is becoming
indispensable element
in trade growth

Awareness of supply
chain integration
sparks demand
increase for logistics

Persuading potential client firms of the benefits of outsourcing the management of their supply chain is a top challenge for the marketing department of logistics services providers. Further complicating the issue is the lack of meaningful measurement of the performance of some of the services provided.

4.4 Future Opportunities

Given that the market for logistics services is determined by business cycles, growth in the goods and the primary sectors of the economy will have a beneficial impact on the logistics industry. The industry will also benefit from the continuing trend of using third-party logistics providers. The logistics industry, its potential for growth and future evolution will also be influenced by the following related trends.

International Trade – Globalization of business raises numerous challenges. For example, globalization of the supply chain puts upward pressure on costs as management of transactions with supply chain partners becomes increasingly complex. The exchange of goods and related information is becoming more complex due to regulatory differences between countries. Expanding international trade is an opportunity for logistics services providers to position themselves as indispensable partners in the successful export of goods and services. Their international networks of alliances and their expertise in managing international supply chains play a crucial role in controlling the costs incurred by their clients when pursuing opportunities in foreign markets. For example, expanding international opportunities for manufacturing firms means more business for logistics providers.

Supply Chain Integration – The role of supply chain management and logistics excellence in the quest for lower costs, better service and increased productivity is of prime importance. Experience has shown that cost reductions and greater efficiency in the supply chain can be achieved through integration. Integration minimizes the friction between various functions and processes in the supply chain and maximizes speed as well as efficiency. The successful deployment of information and communication technologies enables such an integration. This increased awareness of the role of supply chain integration creates opportunities for growth in the 3PL market, as the integration of the supply chain is a complex task and firms increasingly rely on 3PL firms' expertise in this area.

Information and Communication Technologies (ICTs) – The availability of ICTs is closely related to the recent improvements and growth in supply chain integration. Traditional service providers have long been successfully using ICTs such as software applications and increasingly sophisticated equipment to reduce costs, improve service and increase productivity. What is new is the increasing availability of ICTs that enable supply chain integration and that generate increased flows of strategic business information. As a result, logistics services providers are trading more and more information such as inventory levels and data related to the production or consumption of their products with their suppliers and customers. The availability, often in real time, of this strategic business information enables supply chain integration, resulting in significant service improvements. As such, information and communication technologies and their various uses have enabled the rise of the 3PL market and will continue to provide growth prospects. Technology is becoming the primary tool to solve logistics problems and seize business opportunities. The KPMG global supply chain survey (*Materials Management & Distribution*, January 1998) found that over 75 percent of respondents were planning to increase their supply chain technology budget. One growth area mentioned was inventory management based on technological solutions, as opposed to intuition and traditional ways of forecasting inventory requirements.

Electronic Commerce – Efficient logistics and transportation systems are essential for keeping costs under control in order to provide goods and services at competitive prices. Competitive prices and excellent customer service are of prime importance in an environment where comparative information on competitors' products is so easily accessible. Logistics services providers must position themselves as partners in reviewing operations and delivery systems of firms that want to compete in the electronic commerce arena. The performance of a firm's supply chain will be a key determinant of its success in this new environment.

Electronic commerce and the Internet promise to transform the conduct of business, offering the benefits of more efficient supply chains, greater convenience and choice, and lower cost. The Internet links all parts of a distribution chain together, from product concept, design, testing and manufacturing to distribution, marketing and after-sales service. Companies are turning to the Internet for a competitive advantage through increased efficiency and productivity, reduced processing errors, reduced inventories and faster times to market. These trends and issues provide substantial market opportunities for 3PL firms.

Quality certification
may raise industry
reputation, weed out
poor performers

Strategic Alliances and Partnerships – Many service providers enter the 3PL market initially by entering into a partnership or an alliance with another logistics services provider. If a public warehouse, for example, wishes to compete more broadly as an integrated service provider, one of the easiest ways to accomplish this is to form a business alliance with selected other service providers and jointly offer integrated logistics services. An alliance allows them to offer services without owning the required assets, hence avoiding substantial capital costs. Consequently, service providers may enter alliances to create systems that can lower costs and improve service. The most common practice by major 3PLs and traditional services providers today is having in-house capability supplemented by outsourcing alliances, as required, for surge capacity or special uses. This hybrid approach frees up some of the assets that normally would be required to buy transportation or warehousing assets.

Quality Standards – In the service industries, standards certifications such as ISO 9000 and ISO 14000 are a relatively new development, but their importance is growing. In the United States, there is an increasing trend toward gaining ISO certification, and a number of prominent 3PL firms in Canada have been ISO certified. ISO certification makes it easier for prospective customers to appraise the ability of a firm as a supply chain manager. The customer is in a better position to judge the competence of a logistics services provider if it is certified to a quality standard involving roles and responsibilities, technical resources and competence of staff. Logistics services providers may benefit from the standards certification process in other ways as well. First, benefits flow from enhanced competitiveness and improved operating efficiency, including reduced costs, higher quality, better defect prevention and better customer orientation. Internally, employees gain an increased understanding of customer needs, thus raising overall quality awareness within the organization. It has been demonstrated repeatedly that, for logistics companies using standards to streamline or integrate internal processes, business has increased. Second, the existence of industry standards may also help eliminate poor service providers by better defining the services to be carried out, raising the bar for all industry participants, and promoting overall competition as clients make comparisons on a level playing field with minimal influence from misleading advertising. Third, certification can spark aggressive marketing strategies; standards certification often means international credibility, leading to improved chances for attracting foreign clients.

4.5 The Bottom Line

Logistics and supply chain management strongly contribute to the efficient functioning of firms and to higher profit levels. This contribution is gaining importance as a result of technological advances, the business revolution brought about by electronic commerce, and the increasingly global nature of business operations. These trends, combined with the growing acceptance of outsourcing as a sound business practice, have resulted in rapid growth of traditional service providers as well as third-party logistics firms.

The emergence of 3PL firms is largely due to their clients' need to integrate the supply chain, which contributes to productivity improvements and success on the global marketplace. Technological progress has enabled the integration of logistics services into seamless supply chain systems. The trend toward integrating supply chain systems is encouraging traditional service providers to move toward becoming third-party logistics firms that provide an integrated set of logistics and supply chain management services. For example, many transportation and warehousing firms have diversified the services they provide to enter the 3PL market.

This flow of firms from the traditional service providers market to the 3PL market is blurring boundaries. For example, how many and what type of services does a warehousing firm have to provide to be called a 3PL? The shift to 3PL is difficult to measure, given the underlying difficulties in making a practical distinction between traditional service providers and 3PLs. Furthermore, there are few statistics collected on 3PLs and the nature of their business. This definition problem may also have a profound impact on future prospects of the 3PL industry. Recent growth and future prospects attract new entrants that advertise themselves as supply chain management specialists. However, only a limited number of new entrants really possess the expertise required to provide quality supply chain management services.

The 3PL industry will have to address a number of other issues to capitalize on the higher profile of logistics and supply chain management. Governments have a supportive role to play, and this Overview is a step in the right direction. For instance, government departments and agencies can contribute in further understanding the importance of logistics and supply chain management in the competitiveness of Canadian firms. Governments can also work in partnership with the logistics industry to address a number of issues such as electronic commerce and human resources.

Merged services blur traditional industry boundaries

This Overview is a first step in government's supportive role

Logistics industry
also has a strong
role to play

The federal government is promoting electronic commerce and wants to make Canada the most connected country in the world. The logistics industry has a strong role to play in this area. The increasing adoption of electronic commerce is creating tremendous opportunities for the logistics industry. Governments and the industry can work in partnership to promote the importance of logistics issues when adopting electronic commerce solutions, especially with regard to small and medium-sized enterprises.

On the human resources front, the logistics industry must continue its efforts to increase the number of students in post-secondary programs dealing with logistics and supply chain management. The recruitment of university and college graduates who have a logistics background is essential for the long-term growth prospects of this industry. Every effort should be made to support research centres that deal with logistics and supply chain management issues. Making Canada a centre of excellence for logistics research will contribute to increased quality of research and graduates. Similarly, the various associations must continue to provide quality training to make lifelong learning a reality for logistics professionals at every stage in their career. This is especially important in a dynamic industry characterized by rapid technological change.

For further information concerning the subject matter contained in this Overview, please contact:

Service Industries and Capital Projects Branch
Industry Canada
Attention: John Appleby
235 Queen Street
Ottawa ON K1A 0H5

Tel.: (613) 941-6797

Fax: (613) 952-9054

E-mail: appleby.john@ic.gc.ca

Annex A SUPPLEMENTARY TABLES

Table A-1. Manufacturing in Canada, 1997

	Value of shipments (\$ billions)	Establishments (number)	Distribution of establishments, by number of employees per establishment				
			1-49	50-99	100-199	200+	
All	434.2	34 935	77.2	11.2	6.8	4.7	
Food	50.5	3 072	70.1	14.4	8.8	6.7	
Beverages	7.2	199	57.8	18.6	12.1	11.6	
Tobacco products	2.8	18	50.0	16.7	5.6	27.8	
Rubber products	4.4	216	61.1	15.3	10.6	13.0	
Plastic products	9.8	1 294	66.7	18.6	11.7	3.0	
Leather and allied products	1	211	72.5	12.8	10.0	4.7	
Primary textiles	3.8	174	41.4	19.5	25.3	13.8	
Textile products	3.4	757	81.9	10.0	4.6	3.4	
Clothing	7	1 665	74.5	14.2	6.7	4.6	
Wood	26.8	3 019	76.6	10.5	8.9	3.9	
Furniture and fixtures	6.5	1 315	77.9	11.7	7.0	3.4	
Paper and allied products	30.4	691	44.4	17.2	18.5	19.8	
Printing, publishing and allied	15.8	4 748	88.1	6.5	3.5	1.9	
Primary metal products	27.9	453	48.8	15.5	14.1	21.6	
Fabricated metal products	23.8	5 787	84.0	10.9	3.7	1.3	
Machinery	17.9	2 068	73.8	15.0	7.4	3.7	
Transportation equipment	96.1	1 495	57.7	11.8	13.5	17.1	
Electric and electronic products	30	1 516	68.0	13.3	10.0	8.7	
Non-metallic mineral products	8.4	1 631	87.7	7.4	3.7	1.7	
Refined petroleum and coal	21	186	80.6	7.0	3.2	9.1	
Chemicals and chemical products	31	1 365	72.1	13.4	8.4	6.1	
Other manufacturing	8.8	3 055	89.6	6.0	2.7	1.6	

Source: Statistics Canada, Catalogue 31-203.

Table A-2. Wholesaling in Canada, 1996

	Locations	Revenue (\$ billions)	Ratio of sales to inventory	Revenue (%) by class of customer					
				Household	Retailer	Business	Wholesaler	Farmer	Foreign
Food products	4 692	47.1	14.3	0.9	67.5	9	18.9	0.2	3.5
Beverage, drug and tobacco products	1 313	19.5	10.8	1.4	74.7	8.5	14.4	0.1	0.9
Apparel and dry goods	1 953	5.6	5	1.6	62.2	11.8	19.4	0.1	4.9
Household goods	1 868	8	5.6	2.9	62.3	17.9	16.2	0.1	0.6
Motor vehicles, parts and accessories	5 316	50.6	10.3	3.5	36.2	24.9	25.3	0.8	9.3
Metals, hardware, plumbing and heating equipment and supplies	3 582	19.5	6.7	1.4	22.3	59.6	10.8	1	4.9
Lumber and building materials	4 750	23.2	6.9	20.5	21.6	31	9.4	1.4	16.1
Farm machinery, equipment and supplies	2 040	8.4	4	2.8	14.6	9.6	8.3	59	5.7
Industrial and other machinery, equipment and supplies	12 154	40.9	5.4	2.2	13.9	61.9	15.1	1	5.9
Computers, packaged software and other electronic machinery	5 258	25.6	10.7	9.2	13.1	46.6	15.4	0.7	15
Other products	12 166	45.1	8.5	2	22.2	40	13.5	8.2	14.1
Grains	399	18.7	19.1	0.01	1.9	19.2	21.7	12	45.1
Petroleum products	3 965	39.6	26.1	10	19.2	33.1	25.4	5.9	6.4
Total	59 456	351.8	9.1	4.7	31	32.3	17.3	4.4	10.3

Source: Statistics Canada, Catalogue 63-236.

Table A-3. Retailing in Canada, 1996

	Total locations	Chains	Independents	Revenue (\$ billions)	Ratio of sales to inventory
Supermarkets and grocery stores	20 580	4 290	16 290	50.8	19
All other food stores	11 551	777	10 774	4.2	16.3
Drug and patent medicine stores	7 097	788	6 309	12.1	6.5
Shoe stores	3 432	2 016	1 416	1.7	3.6
Men's clothing stores	2 790	1 059	1 731	1.6	4
Women's clothing stores	9 671	5 125	4 546	4.3	5.7
Other clothing stores	8 517	3 734	4 783	5.8	4.6
Household furniture and appliance stores	9 521	1 936	7 585	8.5	4.9
Household furnishing stores	4 297	508	3 789	2.4	4.3
Motor vehicle and recreational vehicle dealers	8 123	37	8 086	54.4	6
Gasoline service stations	15 779	6 496	9 283	18.2	42.1
Automotive parts, accessories and services stores	24 056	988	23 056	12.7	5.4
General merchandise stores	6 563	3 484	3 079	23.2	6
Other semi-durable goods stores	16 893	2 775	14 118	8.2	4
Other durable goods stores	11 431	2 914	8 517	5.8	2.8
Other retail stores	16 860	5 945	10 915	11.8	7.1
Total	177 161	42 872	134 277	225.5	7.2

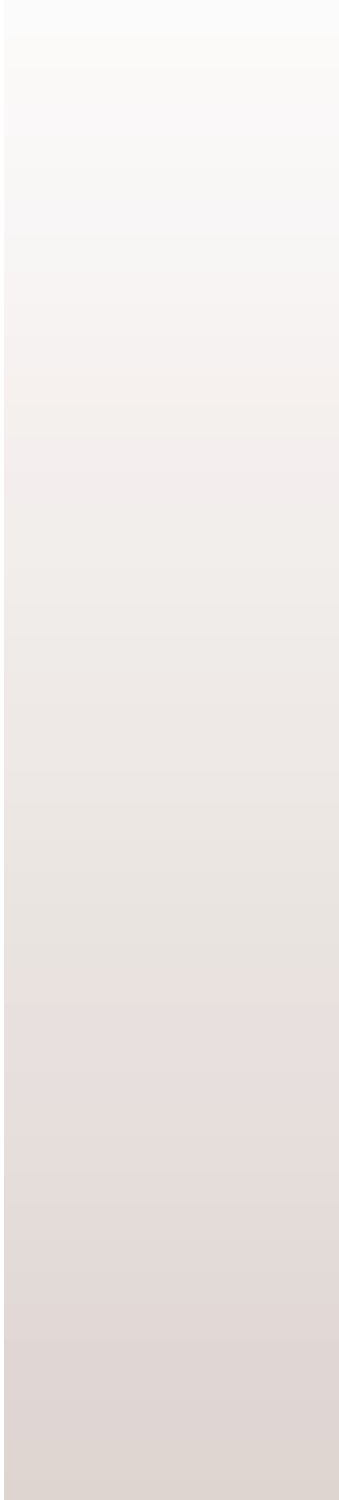
Source: Statistics Canada, Catalogue 63-236.

Table A-4. Logistics-related Occupations (1996 Census)

Airline sales and service agent	Retail and wholesale buyer
Customer service, information and related clerk	Sales, marketing and advertising manager
Customs, ship and other broker	Senior manager – Goods production
Dispatcher and radio operator	Shipper and receiver
Facility operation and maintenance manager	Supervisor, motor transport and other ground transit
Longshore worker and material handler	Supervisor, recording, distributing and scheduling
Other transport equipment operator and related worker	Supervisor, railway transport operations
Other administrative services manager	Supervisor, mail and message distribution
Postal and courier services manager	Ticket and cargo agent (except airline)
Production clerk	Train crew operating occupation
Professional occupation in business services	Transportation manager
Purchasing agent and officer	Transportation route and crew scheduler
Purchasing manager	Truck driver
Purchasing and inventory clerk	

Table A-5. Logistics-related In-house Jobs,
by Industry, 1996 Census

Industry	Number of logistics jobs
Accommodation, food and beverages	3 200
Agricultural, fishing and trapping	2 690
Business service industries	38 550
Communication and other utilities	37 750
Construction industries	16 155
Educational service industries	5 170
Finance and insurance industries	8 930
Government service industries	29 270
Health and social service industries	9 310
Logging and forestry	2 050
Manufacturing industries	158 805
Mining, quarrying and oil wells	9 060
Other service industries	16 640
Real estate and insurance agent	5 080
Retail trade industries	52 725
Wholesale trade industries	121 220
Total	516 605



Annex B TECHNICAL DISCUSSION ON STATISTICAL AND MEASUREMENT ISSUES AND PRODUCTIVITY

Statistical and Measurement Issues

Logistics is not recognized as an official industry by Statistics Canada. Its functions cut across a number of standard industries including transportation, storage, postal and courier and part of business services.

This study examines logistics from two perspectives:

- as an in-house function in manufacturing and distribution industries
- as an emerging but not yet recognized industry (third-party logistics).

The Statistics Canada 1996 Census has been used to estimate the total number of logistics practitioners working in this field both as an in-house function and in the third-party logistics industry.

Because most logistics practitioners work in the transportation and storage industry, this sector is used as a proxy to measure the performance and productivity of logistics in the economy. Where available, data for other logistics functions such as courier services are utilized.

Data from Statistics Canada's input-output matrices are used to measure the costs of logistics relative to factory gate production costs. Statistics Canada allocates the difference between factory gate costs and the costs to the final customer to various "margins," all of which are distribution costs.

The direct transportation and courier costs included in the production process are included in the logistics cost calculation as well as the various outbound margins or embedded distribution costs. These embedded distribution costs for outbound shipments are transportation margins as well as wholesale and retail trade margins.

The total logistics costs for each industry have been calculated from the use matrix of Statistics Canada's input-output matrices for 1981, 1986, 1991 and 1996. The use matrix represents domestic production, and the transportation and other logistics costs are for goods and services consumed in Canada.

Exports are treated by Statistics Canada as a separate line item in final demand. While transportation and other logistics costs are allocated to exports, these costs are not broken out at an industry level. These costs represent only the distribution costs of getting exports to the border. Shipping and other costs beyond the Canadian border are not included in the input-output tables.

While these costs exclude international transport and other logistics costs, they are nevertheless useful for comparing changes in transportation intensities over time.

Productivity Issues

A proxy must be identified that best captures logistics. In this regard, transportation and storage have been identified as an approximation of the entire range of logistics activities included in the supply chain. This category also includes services incidental to transportation, freight traffic and storage. The data also include personal and business travel, which is not necessarily part of the supply chain.

Labour productivity is more often used than multifactor productivity in service industries such as transportation and logistics, as measuring the consumption of real capital presents substantial analytical problems. The emergence of leasing arrangements for equipment and difficulties in measuring quality improvements for high-tech business machines and computer equipment present considerable challenges to productivity measurements.

Annex C

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