LOGISTICS/SUPPLY CHAIN MANAGEMENT IN CANADA

Joseph Monteiro and Gerald Robertson*

I. Introduction

The logistics service sector is becoming a key industrial sector as well as an enabler for innovation, competitiveness and commercialisation of technology and processes across all industrial sectors.[1] It plays a vital role in Canada's competitiveness and is causing competition to become more global and innovation to move from a firm-to-firm level to a supply chain level. To be internationally competitive, businesses are organizing strategic worldwide networks that can deliver an efficient and high quality demand from any segment of the world. The former Minister of Transport in Transport Canada's Annual Report for 2005 stated in the foreword "In a global supply-chain environment, our country's transportation system has to rapidly adjust to global integration forces requiring integrated efficiencies to sustain competitiveness."[2]

This paper examines the structure of the logistics industry in Canada. Part II includes the definition, a description of the industry in Canada, logistic revenues and employment by subsector, and major North American firms in this industry. Part III examines the role of transportation in logistics. Part IV briefly reviews the regulations that affect the logistics industry in Canada. Parts V and VI then review the benefits/importance of logistics and the underlying rationale/theory for logistics. Finally, a few recommendations and concluding remarks are provided.

II. Structure of the Logistics Industry

1) Definition

The Oxford English dictionary defines *logistics* as: *"The branch of military science having to do with procuring, maintaining and transporting material, personnel and facilities."* Its origin can be traced to the word 'Logistikas' a title given to military officers who were responsible for financial and supply distribution in ancient Greek, Roman and Byzantine empires. In other words, its origin has a military connotation. Since the 1950s, logistics as a business concept, has evolved to deal with the increasing complexity of supplying one's business with materials and shipping out products. It is the science of process that incorporates all industry sectors managing their project life cycles and supply chains with their resultant efficiencies. In other words, it has an *internal focus* coordinating a sequence of resources efficiently to carry out some project; and an *external focus* optimizing a steady flow of material through a network of

---

* *The views expressed here are those of the authors and are not purported to be those of the Commissioner or the Competition Bureau or Industry Canada.*

transport links and storage nodes.[3] Other terms are commonly used with logistics such as third party logistics, fourth party logistics, and logistics management. In brief, these terms are described as follows. Third party logistics (3PL) are logistic services provided by a third party or services that are outsourced, it is asset based. They typically specialize in integrated warehousing and transporting services. Fourth party logistics (4PL) are logistic services provided by a fourth party or outsourced services that involves integrating or assembling the resources, capabilities, and technology of its own organization and other organizations to design, build and run comprehensive supply chain solutions, it is not asset based. Logistics management (LM) or supply chain management (SCM) is the process of planning, implementing, and controlling the operations of the supply chain to satisfy customer requirements as efficiently as possible. It spans all movement and storage of raw materials, work-in-process inventory, and finished goods from point-of-origin to point-of-consumption. Specialists distinguish between LM and SCM, the former being part of the latter and the latter being bounded on the supply side by your supplier's suppliers and on the customer side by your customer's customers.[4] Recent research focuses on portraying SCM as a 'strategic' level concept, whose objective is the creation of strategic differential advantage obtained by total value delivered to end-customers. LM on the other hand is not a strategy but rather contributes as a core competence to strategy as determined by business unit orientation.[5]

The following activities are commonly included in the industry description of logistics and supply chain management functions: purchasing; scheduling producing and controlling inventory (i.e., forecasting demand, managing inventory, planning production and scheduling); distributing (i.e., warehousing, handling materials, packaging, shipping and loading, storing, processing orders, picking, and servicing customers); transporting; clearing customs; and forwarding international freight. Since its functions cut across several industries, the logistics industry is not recognized as an official industry by Statistics Canada.[6] This is reflected in the fact that when the size of the industry is estimated it relies basically on certain sectors.

2) The Logistics Industry in Canada

During the post-war years through to the 1980s, transportation, storage and distribution activities were managed separately, the logistics industry as we know it today did not exist. Deregulation of transport industries in the mid 1980s, the rapid spread of information technology and related technologies in the mid 1990s, and a reduction in trade barriers through the FTA and NAFTA agreements led to increasing demands to reduce cost while maintaining quality of customer service. This ultimately led to an increasing integration of production and distribution across national boundaries and to the development of a new industry or service,

the logistics industry.

Given the fact that it is a relatively new industry, it is not surprising that there are no official statistics and widely differing estimates of its size exist, ranging from as low as $1 billion to as high as $100 billion per year. In addition, the gathering of statistics is hampered by both technical and conceptual problems. Nevertheless, attempts have been made to provide estimates including one by Industry Canada. According to their report,[7] in 2003 the Canadian logistics industry generated $50 billion in revenues and $75 billion in additional activity done in-house across sectors. It generates exports of $7.6 b., representing 12% of total service exports. The Canadian logistics service sector can be segmented into three sub categories: 1) Asset-Based Transportation Services; 2) Asset-Based Non-Transportation Services; and 3) Non-Asset Based Logistics Services.

The asset-based transportation services sub sector is composed of transportation service providers focussing on transport of goods only. Transportation accounts for 85% (or $42.5 billion) of the logistics industry revenues. Canadian firms outsourced 73% of their inbound transportation and outsourced 68% of their outbound transportation.[8]

The asset-based non-transportation services / Third party logistics (3PL) carries out physical logistics operations and manages systems to track shipments on behalf of their clients. The 3PL sub-sector is a value added sector accounting for 14 % (or $7 billion) of total industry revenues. Most common services provided by 3PLs in Canada are warehousing, in and outbound transportation, consulting services, shipment consolidation, cross docking and carrier selection.

The non-asset based logistics parties integrate the services of different sub-contracting companies (transport, storage, operations…) and coordinate and control them through management of the associated information flows. Most common services provided by 4PLs in Canada include management consulting in supply chain and logistics, fleet management, supply chain and logistics information systems, shipment consolidation, carriers selection and logistics procurement services, rate negotiation, inventory management applications, distribution control, freight forwarding and customs clearance and brokerage.

3) Logistic employment by subsector

In 2001, there were approximately 635, 530 individuals employed in the logistics and supply chain management field in Canada (excluding truck drivers). This number was expected to increase to 701, 880 by 2004. The employees by major function and by occupation are shown in Tables 1 and 2. It is worthwhile observing that most of these individuals are employed in warehousing and transportation with more than half of them in operations. The logistics revenues

Table 1- Supply Chain Sector Employees by Function (2001)

Function	Senior Management	Logistics Information Systems	Ware-housing	Trans-portation	Inventory/ Material Management	Purchasing	Marketing and Sales	**All**
Number	6, 620	34, 260	314, 805	143, 805	73, 635	59, 270	3, 135	635, 530

Source: Compiled from *Strategic Human Resources Study of the Supply chain Sector*, Fall 2005, p. 59.

Table 2- Supply Chain Sector Employees by Occupation (2001)

Function	Senior Management	Logistics Info. Systems	Ware-housing	Trans-portation	Inventory/Mat. Management	Purchasing	Marketing and Sales	**All**
Managerial	6, 620	9, 240	37, 535	26, 135	34, 160	9, 055	3, 135	125, 880
Tactical	-	25, 020	-	11, 305	39, 475	50, 215	-	126, 015
Operational	-	-	277, 270	106, 365	-	-	-	383, 635
TOTAL	6, 620	34, 260	314, 805	143, 805	73, 635	59, 270	3, 135	635, 530

Source: Compiled from *Strategic Human Resources Study of the Supply chain Sector*, Fall 2005, p. 59.

and employment in Canada by subsector are shown in terms of percent in Table 3. Trucking and rail account for the major shares 42-43% and 14-15%, respectively.

Table 3 - Logistics revenues and employment by subsector

Logistics Sub-sectors	Rail	Marine	Trucking	Air Cargo	Couriers and messengers	Storage	Others
1998 Revenue (%)	15	10	42	2	9	14	6
2000 Employment (%)	14	5	43	2	10	5	21

Source: Industry Canada

4) Firms in the Logistics Industry in Canada

Logistics firms are located across the country but are basically concentrated in the provinces of Ontario and Quebec. The relative importance of these two provinces compared to the other provinces in this industry in 2001 are shown in the following table accounting for 50% and 17.3%, respectively. The importance appears more pronounced when indicated by employment, 54.7% and 20.3%. Other sources show that these logistics and supply chain

Table 4 - Logistics firms by Province in Canada in 2001

	B.C.	Manitoba	Nfld	N.S	NWT	Ontario	Quebec	Saskatchewan	Alberta
Firms	24 (9.9%)	13 (5.4%)	7 (2.9%)	5 (2.1%)	1 (.04%)	121 (50%)	42 (17.3%)	8 (3.3%)	21 (8.6%)
Emp.	2344 (2.9%)	1089 (1.3%)	107 (0.1%)	112 (0.1)	- -	44275 (54.7%)	16477 (20.3%)	5680 (7.0%)	10870 (13.4%)

Source: *Strategic Human Resources Study of the Supply chain Sector*, Fall 2005, p. 29.

firms are clustered in large cities such as Toronto, Montreal and Calgary.

The largest ten logistics and supply chain firms in North America according to Armstrong Associates, Inc. are: DHL Americas Logistics, UPS Supply Chain Solutions, BAX Global Supply Chain Management, Ryder System, Inc., Caterpillar Logistics Services, Inc., Schneider Dedicated Operations, Expeditors Int'l of Washington, Inc., UTi Worldwide Inc., EGL Eagle Global Logistics and Penske Logistics.

III. Transportation and Logistics - Trends in logistical related transportation

One of the most obvious manifestations of logistics activities is the growth in freight transport due to the worldwide expansion of trade. The globalization of industry, including planning, sourcing, manufacturing and marketing activities has resulted in more complex trading and much more developed transport networks. This has resulted in certain noticeable trends in transportation which are described hereafter.

Restructuring of transportation networks - Companies have expanded the geographical scale of their sourcing and distribution due to the growth of supply-chains beyond national borders. Outsourcing to foreign countries has increased with globalization and the move to freer trade. This together with the use of 3Pls have led to restructuring of transportation networks. In addition, extra links to the supply chain have led to a re-configuration of transportation networks, modal shifts and intermodal opportunities.

Increasing transport intensity - Companies have been concentrating production and inventory capacity in few locations due to emphasis on core competencies and subcontracting of non-core activities. This has made logistical systems transport intensive. As a result, it is becoming increasingly concentrated at fewer hub ports and airports in order to enjoy economies of scale. A striking example of this development is the courier and mail delivery systems which have centralized their activity in key satellite systems.

Increasing demand for freight transport, modal shifts and infrastructure- The additional freight traffic generated by wider sourcing of supply is expected to increase the demand for freight transport and to outweigh any reduction in the volume of freight movement resulting from the de-materialization and electronic distribution of 'info-products'. Modal shifts are expected due to developments in logistics and transport technology which have the potential to increase the competitiveness of intermodal transport. These new developments have the capacity of reducing operating costs of different modes that bring a change in the pattern of traffic flows. These improvements all increase the efficiency of intermodal transport encouraging shifts to intermodal transportation. Increased demand for transportation infrastructure between various modes to provide for a seamless transportation network will

be inevitable with the increased demand for intermodal transport.

Rescheduling freight movement - Rescheduling freight movement by operating nominated-day delivery to customers and introducing time-delivery at factories is one of the consequences of the need to reschedule product flow. The lengthened supply chains has created increased pressure to compress order lead-times.

Refining of transport and warehousing management - The optimal use of different transport modes by increasing use of ICT will lead to a refinement of transport and warehousing management. For example, selective use of different international transportation modes is now common for different industries. Similarly, developments in vehicle and handling technology not only offer the potential to change operating costs of different modes but also affect patterns of traffic flow.

In sum, developments in trade networks will have an impact not only on trends in transport but also on logistics. Besides the trends in transport, the most noticeable in logistics are: restructuring of logistical systems, realignment of supply chains, rescheduling of product flow, refinement of transport and warehousing management, changes in product design, integration of logistics and outsourcing of logistic activities.[9]

IV. Regulations that affect the Logistics Industry

1) The Important Regulations that Affect the Logistics Industry.

Regulations affecting transportation, warehousing and the international movement of goods have a profound impact on supply chain management. To obtain an idea of regulations that affect the logistics industry, respondents were queried in *the Strategic Human Resources Study of the Supply Chain Sector*. Over 50% of respondents indicated that environmental and border-crossing requirements are currently having an impact on their business. The most common regulatory areas having a major impact over the past 3 years include: a) International regulations governing border crossing, customs, U.S. import security, and international trade; b) Provincial regulations (e.g., inter-provincial trade barriers, labour, and occupational health and safety); c) Financial oversight regulations (e.g., Sarbanes-Oxley); d) Environmental regulations (e.g., Kyoto Protocol); e) Food regulations (e.g., U.S. Food and Drug Administration and Canadian Food Inspection Agency regulations); f) Municipal regulations; and g) Transportation regulations (e.g., hours of service, weights, material storage and dangerous goods).

The specific regulations most commonly cited in the above query as having an impact on the sector were the Customs-Trade Partnership Against

Terrorism (CT-TPAT) and the North American Free Trade Agreement.

2) Regulations that are a Barrier

Customs-Trade Partnership Against Terrorism (CT-TPAT): CT-TPAT is a government-industry 'voluntary program' designed to increase security at U.S. borders. To realize advantages under this program: a carrier, a warehouse or a shipper must certify themselves through a demonstration that their process, operation and facilities are secure from being targeted by terrorists or unknowingly used as a covert base to execute a terrorist act. "This certification requires both time and investment to secure equipment and buildings. This regulation creates a tangible barrier to entry to exporting to the US and thus favours those carriers that can meet these requirements."[10]

The Free and Secure Trade (FAST) Program: FAST is a joint Canada-US initiative designed to pre-approve eligible goods across the border quickly and to verify trade compliance prior to the border crossing. To obtain advantages under this program: importers, carriers and registered drivers must satisfy certain principles of protocol to get pre-approval. For example under the protocol, shippers (manufacturers, exporters, etc.) must consider documenting goods before contemplating shipment to the US and carriers must make an effort of scrutinizing their drivers before sending them across the border. This adds to the time needed by shippers and adds to the complexity of hiring cross border truck drivers. "While this is not an issue for most medium and large Canadian operations, it is an added burden for small Canadian business."[11]

Advance Electronic Cargo Regulations: These regulations require advance transmission of electronic cargo information to the US Bureau of Customs and Border Protection. It requires all shippers to ensure that cargo documentation is fully compliant and is transmitted electronically within prescribed time frames. This protocol adds an additional procedural burden for the small Canadian business sector in the form of accurately and quickly reporting what is in each shipment.[12] Regulations that provide similar advantages to sophisticated logistics operators also exist such as *G7 Import One Step Release on Full Documentation.*

Besides the above regulations that act as a barrier to smaller firms other recent regulations that have an effect in general on the industry are: the ISPS Code which establishes processes and equipment to increase security (this adds to maritime costs); United States Hours of Service for motor carriers (this places requirements on cumulative off-duty and on-duty time and increases cost and demand for drivers); Canadian Hours of Service Regulations for extraprovincial commercial vehicles (this will reduce maximum daily time for truckers and increases cost and demand for drivers); and the US *Bioterrorism Act* (this requires prior notification of imported food products and registration of foreign facilities) and Medical Device Tracking Regulation

(this requires manufacturers track certain devices from manufacture through the distribution chain). "The fact that organizations must consider all of these regulatory constraints adds complexity to the supply chain sector."[13]

3) Regulations that Provide a Competitive Advantage

Operation Safe Commerce (OSC): OSC is a program which offers three container load centres (Ports of: LA/LB; NY/NJ; and Seattle/Tacoma) advanced technologies and processes to enhance the security of the international supply chain. It provides these US ports of entry a competitive advantage over other ports. "For US bound shipments, this program provides an advantage to these ports over Canadian port entry."[14]

In addition to the above, the Human Resources study states "Numerous and complex transportation regulations and policies in Canada have created a niche for Canadian transportation companies by virtue of the fact that "barriers to entry" face non-Canadian service providers. It should be noted, however, that similar complexities exist for American carriers based in the United States; as a result, very few transportation companies offer complete services on both sides of the border. This complexity is compounded by the fact that regulations reducing the hours of operations for trucking industry drivers have increased the planning, routing and scheduling functions for cross border shipments."[15]

In sum, the most cited regulations that affect the logistics industry are the NAFTA and CT-TPAT. The latter and a few regulations relating to security act as a barrier to trade, particularly affecting entry of small firms. In addition, a few regulations were also found to provide a competitive advantage to the US or Canadian transportation industry.

V. Benefits or Importance of Logistic-Supply Chains

The benefits or importance of logistics for supply chains have been documented in Bowersox [16] and Zacharia [17]. In brief logistics:

1. Provides the supply chain with a competitive profit edge (Heskett 1977) enabling firms to improve or maintain its competitive position (Fawcett and Gloss 1993; Lynch, Keller, and Ozment 2000) and ultimately providing them with a competitive advantage (Bowersox, Mentzer, and Speh 1995; Morash, Droge, and Vickery 1996a). This is achieved through competence in delivery speed, reliability, responsiveness and low cost distribution which is especially so in time-based competition where product availability and fast product delivery are more critical (Stalk, Evans, and Shulman 1992), especially for global manufacturing (Fawcett and Gloss 1993).

2. Leads to cost reduction and a boost in productivity making the industry more efficient and thus more competitive (Williams et al. 1997). This could enable firms in the supply chain to enter new markets. The cost reduction and boost in productivity is achieved through economies of scale, specialization through a dedicated resource base, inventory reduction, just in time delivery and in the general use of resources more efficiently.

3. Leads to innovation that benefits all parties and enables firms to enter

new markets (Williams 1997). This is achieved by a better understanding of the entire distribution channel which enables the service providers to better cater to the needs of the firms in the supply chain. An example is where a transport provider designed trailers with fabric walls from the sides as well as the rear enabling loading and unloading where standard trailers could not.

4. Generates cooperation that sometimes replaces an adversarial stance between buyers and sellers. That is it brings synergies of working together. One reason for the synergy is the focus generated by a reduction in suppliers by the product marketer and a limit on the service provider's number of customers. Once focused, the two organizations often begin to seek growth opportunities for each other-to their mutual benefit. Since each views the logistics process from a different view it inspires creativity (Bowersox, p. 41).

5. Leads to less risk and spreads risk. This is because the chance of error is much less as each party in the supply chain is focusing on its speciality and as the parties in the supply chain share the consequences of failure.

6. Offers opportunities to dramatically improve the quality of customer service (Langley and Holcomb 1992), improved reliability and the provision of customized service (Williams et al. 1997) or customer satisfaction (Bienstock, Mentzer, and Bird 1997; Mentzer, Flint, and Huit 2001).

7. Adds value for customers by providing 'responsiveness' services (eg. store-built pallets, customer pick-up options, and special material handling options) that go beyond the traditional logistics services (i.e., order fill, JIT, zero damage, and accurate invoicing). They go beyond the basic logistics product and can actually increase a firm's market share if done well (Andraski and Novack 1996) by synchronization of activities and meshing of tasks.

8. Seeks to gain and retain customer loyalty by building trust between various partners of the supply chain. This is done by their willingness to offer extra, value added services and providing speed, consistency, and reasonable but effective standards. By developing a high level of standard performance, the number of less-than-standard situations are reduced enabling them to become preferred suppliers of key customers (Bowersox, p. 40).

These benefits can vary in different industries - eg. in investment banking / accounting / research and development industries - where it may be less important than industries that are affected by time-based competition.

VI. Theory of Logistic /Supply Chain Management

In light of the benefits/importance of logistics-supply chain management described above, it is not surprising that theories explaining the rationale for it have emerged. Logistics research focuses on two basic approaches: economic and behavioural. The two entirely different approaches have led to concerns and attempts to unify the two different approaches.

1) Theory of Logistic /Supply Chain Management

a) The Economic Approach

This approach focuses on cost minimization and profit maximization aspects or the quantitative side (i.e., the positivist paradigm or analytical school). The supply chain design and analysis models have been divided into four basic categories by modelling approach. The four categories are: 1) deterministic analytical models; 2) stochastic analytical models; 3) economic models; and 4) simulation models.[18] The modelling approach is driven by the nature of the inputs and the objective of the study. An important component of supply chain design and analysis is the establishment of appropriate performance measures:[19] quantitative (usually cost; and customer responsiveness/ backorders) and qualitative. The performance measures are typically expressed as functions of one or more decision variables (usually production/ distribution scheduling; inventory levels; and number of stages).[20] These decision variables are then chosen in such a way as to optimize one or more performance measures to determine how an effective supply chain design is achieved. Studies generally provide empirical support for the strategy-structure-process-performance hypothesis.

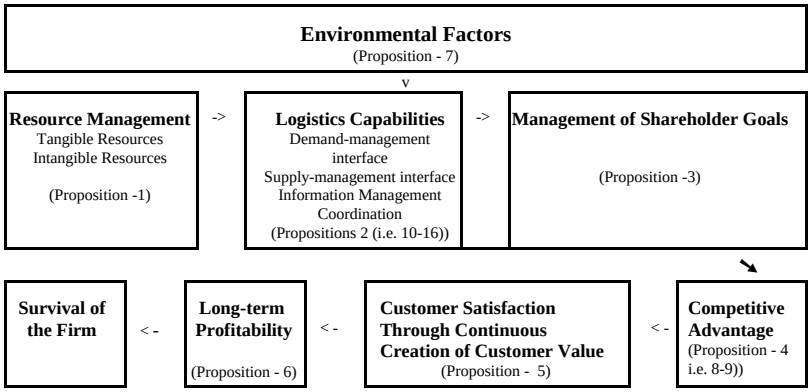
b) The Behavioural/Other Approaches

This approach focuses on psychological and sociological aspects or the qualitative side (i.e., the interpretive or bevahioural school). It maintains that the objective of profit maximization is questionable based on observations of managerial behaviour and that firms exist to achieve satisfactory, rather than maximum profits. One such theory was advanced by Cyert and March who indicate that stakeholders who determine the objectives of the firm have different goals where conflict is resolved through bargaining. Another theory is of sales maximization with a minimum profit constraint as managers view sales dear to their heart according to William Baumol. Other theories focus on resource base (J.T. Mahoney) and comparative institutions (J.F Henart).

c) Unified Theory of Logistics

Mentzer, Min and Bobbitt have attempted to build a unified theory of logistics by adapting various theories of the firm - economic (i.e., neoclassical, market value, and agency cost - all models based on the assumption that the primary objective and rationale of the firm is to maximize profits) and behavioural (i.e., behavioural, resource dependence, resource-based, comparative institutional, knowledge-based, resource-learning, and constituency-based - all models based on the assumption that profit maximization is questionable) - to explain the reasons for logistics activities within the firm. A review of the theories of the firm leads to the conclusion that the role of logistics is to provide the boundary-spanning, demand and supply coordinating, capabilities

the firm needs to create customer value to satisfy customers.[21]
The unified theory can be portrayed by the following diagram. It is based



Source: Towards a unified theory of logistics, *International Journal of Physical Distribution & Logistics Management*, Volume 34, Number 8, 2004, pp. 606-627.

on sixteen propositions in seven inter-related groups which are described in greater detail hereafter.

Internal considerations of the firm: An important goal of the firm is the continuous creation of customer value to satisfy end-users leading to competitive advantage. The achievement of this goal is made possible by resources provided by various stakeholder groups which also satisfy their own goals. Creating customer value requires inter-functional coordination and as a result, the boundaries between functions become blurred. Incidentally, profits and the resulting long-term survival are a reward rather than the goal of the firm. This leads to their initial six propositions (re-numbered to fit the diagram) see the Appendix1.

Environmental considerations: The firm is confronted with many environmental considerations that affects its goals, behaviours and decisions. The more the global competition in an industry the more critical logistics capabilities are to a firm. This leads to the next proposition see Appendix 1.

Logistics capabilities and competitive advantage: Logistics capabilities contribute to a firm's competitiveness through creating economic (cost leadership) and market-based (differentiation) advantages which leads to competitive advantage and to the next propositions (see Appendix 1).

The nature of logistics capabilities: Logistic capabilities can be classified into: Demand-management interface (customer service and logistics quality); Supply-management interface (low cost distribution and lost cost supply); Information Management (information sharing and information technology/connectivity); and Coordination (internal, external and make versus buy) capabilities. Demand-management interface capabilities can be

explained by creating distinctive products or low cost products (resource dependence theory of the firm) and functional speciality that provides unique resources to the firm that produces unique products (constituency-based theory of the firm). Supply-management interface capabilities are operational capabilities that include total cost minimization, efficient logistics cost process and include a firm's ability to find proactive, timely and creative logistics solutions to the situation. Information management capabilities consists of information technology, information sharing and connectivity to meet operational and strategic information needs to balance supply and demand and facilitate chain exchanges. All these three capabilities lead to strategic advantages or competitive advantage. This leads to the next propositions. See Appendix 1.

Internal coordination logistics capabilities: A firm can consist of many departments and functional areas each with their own objectives. Logistics plays a distinctive role in the integrative strategic process (for example, company wide standardization, simplification, compliance and structural adoption) by improving efficiency and effectiveness to obtain competitiveness. This leads to the proposition. See Appendix 1.

External coordination logistics capabilities: A supply chain like a firm involves other parties (suppliers and customers) beyond the firm's structure. Expanding logistics to such parties involves benefits (for example, asset productivity through exploiting asset specificity, operational effectiveness, cost efficiency and enhanced customer value). However, such parties in the supply chain have their own objectives but the ultimate goal of supply chain management is the long term prosperity of the parties as well as the supply chain. Co-ordinating and joint-optimizing can lower costs, enhance differentiation, reduce risks and reduce environmental uncertainties thereby creating competitive advantage. This leads to their next propositions:

Borrowing external coordination logistics capabilities - make versus buy: Firms prefer to outsource logistics activities to other firms (i.e. 3PLs) rather than perform them internally to minimize transaction costs thereby reducing costs and enhancing revenues. This allows firms and 3PLs to concentrate on their core competencies. Thereby enabling the former to generate rents from their resource advantage and the latter to perform logistics activities at higher service levels. This leads to the next proposition. See Appendix 1.

The above sixteen propositions in seven inter-related groups offers relevant explanations of different aspects of logistics activities based on the theories of the firm. These theories lead to the conclusion that the role of logistics is to provide the boundary-spanning, demand and supply coordinating, capabilities that the firm needs in order to create customer value to satisfy customers. The logistics contribution to firm competitive advantage is

significant in both efficiency and effectiveness. Further, logistics capabilities play an important role in achieving competitive advantage and boundary spanning interfaces. When coordinated with marketing and production they lead to customer value, competitive advantage, long term profitability and survival of the firm.

In sum, the above theory is a recent (2004) attempt by Mentzer, Min and Bobbitt to build a unified theory of logistics combining the economic and behavioral approaches.

VII. Observations/Recommendations

Observations or recommendations that flow from a review of the previous sections are as follows.

Logistics and Transportation: The following observations largely relate to transportation: i) Need to develop policies to stimulate the trend of globalization, logistics and development of transportation networks; ii) Need to develop transport policies as part of a broader policy framework if it is to have an effect on affecting transport intensity; iii) Need to improve physical transportation and information infrastructure so as to eliminate congestion, delay, and cost to make intermodal services cost effective and to meet increasing demand for transportation service; iv) Need for standardization (intermodal, logistics and physical distribution systems, customs clearance, etc.) to provide seamless service; v) Need to support technological developments to meet shippers' constantly higher demands for efficiency, reliability and timeliness and to make intermodal cost and freight services even more competitive with road transport; and vi) Need to influence demand for intermodal transport and to have intermodal objectives in policy making to achieve environmental goals. Besides these, more general observations include the need for improvement in statistics and co-operation and collaboration (private, government and international organization). Further recommendations on logistics have been provided in the OECD Report.[22]

Regulations: The regulations on security and customs while not intended to act as a barrier to trade, have the unfortunate effect of raising costs and have a differential impact on entry by small firms. To reduce its effect on them special programs to help small firms could be considered.

Quantitative measurements and theoretical developments: To deal with concerns of private vs. social objectives and performance measures, the OECD Report made a few recommendations on: the need to develop multi-criteria performance indicators to enable comprehensive evaluation; the need to develop meso-level indicators so as to enable policy actions to develop competitive supply chains; the need to specify and communicate the strategic policy objectives of developing indicators; the need to enhance

implementation of indicators by the private sector; and the need to collect data and compare costs appropriately.[23] From the theoretical standpoints, the theory presented is one of the first important attempts to unify the theory of logistics. It will likely lead to further refinements and an integration into the larger area of supply chain management.

VIII. Concluding Remarks

Logistics plays a vital role in Canada's competitiveness. Internationally competition is driving businesses to organize strategic worldwide networks that can deliver an efficient and high quality output from any segment of the world. This is particularly so in a global economy.

The Canadian logistics industry generated $50 billion in revenues and $75 billion in additional activity done in-house across sectors in 2003. It also generated exports of $7.6 billion and accounted for a quarter of a million jobs mainly in the warehouse and transport sectors. Most of the logistic firms in this industry are located in Ontario and Quebec. The commonly cited regulations that affect the logistics industry are the NAFTA and CT-TPAT. The latter and a few regulations relating to security act as a barrier to trade, particularly affecting entry of small firms.

The most obvious manifestations of logistics activities and growth of trade are several related trends in transportation. These include: restructuring of transportation networks, increasing transport intensity, increasing demand for freight transport, modal shifts and infrastructure, rescheduling freight movement and refining of transport and warehousing management. The benefits or importance of logistics have been documented in a number of academic studies and these studies generally provide empirical support for the strategy-structure-process-performance hypothesis.

In light of the above, a number of observations or recommendations have been made to facilitate the development of this growing industry.

Endnotes

1. Logistics/Supply Chain Management, Industry Overview and Statistical Profile, Ind. Canada, 2005, p. 3.
2 See Foreword in Transportation in Canada 2005, Annual Report, 2006.
3. http://en.wikipedia.org/wiki/logistics
4. See Industry Canada for definition.
5. See Stank, T. P et al, A strategic Framework for Supply Chain Oriented Logistics, *JBL*, 2005.
6. Logistics and Supply Chain Management, Overview and Prospects, IC, 2000, p. 9.
7. Id.
8. Logistics/Supply Chain Management, Industry Overview and Statistical Profile, 2005 p. 4.
9. *Transport Logistics*, Shared Solutions to Common Challenges, OECD 2002, pp. 11-13.
10. *Strategic Human Resources Study of the Supply Chain Sector*, Fall 2005, p. 8.

11 - 15. Id; p. 34; p. 36; p. 34; and p. 35.

16. Bowersox, D. J., The Strategic Benefits of Logistics Alliances, *Harvard Business Review*, July-August 1990, pp. 36/45.

17. Zacharia, Zach, G., Logistics Salience in a Changing Environment, *JBL*, 2004.

18. Deterministic analytical models assume that the *variables are known and specified*. Stoachastic analytical models unlike the above deterministic models do not assume that the entire process in deterministic. Economic models have been developed using a game-theoretic framework to capture the buyer-supplier relationship in a supply chain. Simulation models use simulation techniques to evaluate the effects of various supply chain strategies on smoothing demand. See Beamon, B. M., Supply Chain Design and Analysis: Models and Methods, *International Journal of Production Economics*, Vol. 55, No. 3, pp. 281-294, 1998.

19. These measures determine the efficiency and/or effectiveness of an existing system and can be used to compare competing alternative systems. They can also be used to design systems that determine the most desirable level of performance.

20. Others used are: distribution centre-customer assignment; plant-product assignment; buyer-supplier relationships; product differentiation step specification; and number of products held in inventory.

21. J. T. Mentzer, S. Min and L. M. Bobbitt, Towards a unified theory of logistics, *International Journal of Physical Distribution & Logistics Management*, Vol. 34, No. 8, 2004, pp. 606-627.

22. i) Need to develop policies to stimulate the trend of globalization and logistics; ii) Need to recognize negative impacts of globalization and logistics; iii) Need to develop policies based on full understanding of logistics; iv) Need to develop transport policies in a wider context; v) Need to co-operate and collaborate to develop efficient global logistics networks; vi) Need for flexible and swift approach in developing policies; vii) Need for improvements in statistics; and viii) Need to recognize the diversity between countries. See OECD 2002, pp. 16-19.

23. OECD 2002, pp. 48-49.

Appendix 1

1) The management of the overall resources of the firm leads to distinctive logistics capabilities; 2) The relationship between logistics capabilities and firm competitive advantage is mediated by the management of stakeholder goals; 3) Collaboration between each function inside the firm and between each firm in a supply chain is necessary to convert stakeholder goals into firm competitive advantage; 4) The competitive advantage goal of the firm is to continuously create customer value to satisfy end users; 5) Profits are earned as rewards for the firms efforts to create customer satisfaction; 6) Long-term profitability and satisfied customers leads to survival; 7) Environmental intensity and volatility affects the importance of logistics capabilities in accomplishing firm goals; 8) Logistics capabilities help firms achieve the cost leadership component of competitive advantage through efficiency (cost and capital reduction); 9) Logistics capabilities help firms achieve the differentiation component of competitive advantage through effectiveness (customer service); 10) Logistics demand-management interface capabilities are customer-focused, multidimensional (i.e., customer service and logistics quality), longitudinal (i.e., before, during and after sales), and leads to strategic advantage; 11) Logistics supply-management interface capabilities leads to optimization of the total process of logistics activities, which leads to minimization of system-wide total cost, which leads to competitive advantage; 12) Logistics information management capabilities meet the supply chain operational and strategic information needs to balance supply and demand and facilitate supply chain exchanges, which leads to optimization of system-wide capital investment, which leads to competitive advantage; 13) Each subset of logistics plays an important role in the inter-functional coordination process of arriving at an integrative corporate strategy which leads to competitive advantage; 14) Logistics capabilities help firms acquire, analyze, store, and distribute tactical and strategic product/service flow information both inside the firm and across the supply chain for better coordination and collaboration; 15) The boundary-spanning nature of logistics capabilities makes possible coordination of activities inside firms and cooperation of multi-corporate joint activities (efficiency and effectiveness) for the purpose of external coordination of supply chain demand and supply flows; and 16) Logistics activities are such a vital part in implementing corporate strategy that some firms (i.e., 3PLs) specialize in providing distinctive logistics capabilities to other firms to obtain competitive advantage.