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Logistics and Supply Chain Management (SCM) Key Performance Indicators (KPI) Analysis

A Canada/United States Perspective



October 2006

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Executive Summary

As competition becomes more global, innovation is moving from a firm-to-firm level to a supply chain versus supply chain perspective. In order to compete against low cost countries (such as China), Canadian firms must develop supply chain agility in a Just-In-Time (JIT) and mass customisation mode.

Measurement of logistics and supply chain management (SCM) key performance indicators (KPI) is an essential part of the agile supply chain concept. It is estimated that 37 percent of North American (NA) firms that have put in place logistics and SCM KPI corporate wide measurement applications have achieved a decrease of 15 percent or more in shipment delays compared to only 7 percent of firms that do not measure those KPI consistently¹.

While inventory turns is the main KPI for evaluating supply chain agility, logistics cost KPI allow firms to evaluate the efficiency of their logistics and SCM operations. The combination of supply chain agility and efficient SCM practices is key to long term competitiveness and prosperity of Canadian firms in a global supply chain (GSC) context.

In terms of productivity and competitiveness KPI, Canada is not as efficient as the U.S. in most inventory turns KPI sub groups, and in all key sectors in terms of total logistics cost. For the Manufacturing, Wholesale and Retail sectors, the average logistics cost gap with the U.S. is 11 percent².

Inventory Turns

In terms of supply chain agility KPI, Canada's 2005 raw material inventory turns ratio was still below the United States level of 1992, although it increased 20.77 percent during the 1992-2005 period. Canada has a productivity gap of 35 percent in that specific KPI.

For the same period, the finished goods inventory turns ratio increased 23.91 percent in Canada. Both countries started at about the same level in 1992, and the U.S. is currently only about 4.3 percent behind Canada in terms of finished goods inventory turns.

The wholesale and retail sectors also have a supply chain agility gap. Their respective inventory turns remained 17 to 41 percent behind their U.S. counterparts.

In regards to productivity growth, the fact that the retail and wholesale inventory turns were levelled or growing for the 1992-2005 period means that in the whole supply chain the inventory was not solely transferred from the manufacturers to the wholesaler or from the wholesalers to the retailers; there was a real productivity growth in inventory management in Canada and in the U.S. for that specific period².

Logistics Costs

Canadian Manufacturing, Wholesale and Retail sectors have logistics costs 2 percent, 22 percent and 16 percent higher respectively than in the U.S.. Comparing the manufacturing sector for Canada and the U.S. shows that costs related to logistics outsourcing are higher in the U.S. than in Canada and that in the retail sector, costs associated with logistics outsourcing are higher in the U.S.. In the case of the wholesale sector, internal logistics costs are slightly lower in Canada as a percentage of total logistics costs².

There is not much difference between Canada and the U.S. with respect to internal logistics costs in the wholesale and retail sectors. Nevertheless, Canada has an internal logistics cost in manufacturing that is higher than that of the U.S.

Canada's inventory carrying costs are slightly higher for manufacturing and wholesale (11 percent and 17 percent respectively). However, inventory carrying costs for retail in Canada are 31 percent higher than in the US².

Technology

In order for firms to achieve the benefits of their respective logistics and SCM business drivers, the adoption of logistics and SCM technology across supply chains is a key component for developing efficient collaboration networks.

It is estimated that North American Small and Medium Sized Enterprises (SMEs) that will deploy logistics and SCM collaboration applications will enjoy a 5 percent to 25 percent decrease in logistics costs and a 15 percent to 40 percent increase in quality and time-to-market over competitors that fail to make these investments through 2010³.

As an example, 90 percent of NA companies that embrace leading edge logistics and SCM collaboration applications achieve an increase of at least 15 percent of order fill rate accuracy compared to only 40 percent of low technology adopters⁴.

SCM technology adoption is still at an infancy stage in Canada. Close to 54 percent of Canadian firms still have no SCM solutions in place and do not plan to implement a solution shortly⁵.

Although the logistics and SCM technology investment level has been low in Canada, all key sectors are starting to respond to the increase in complexity of logistics and SCM by starting to dramatically increase their investment into value added distribution centers and freight terminal infrastructure⁶. Canadian Manufacturing and retail annual investments in warehousing and freight terminals increased by more than 200 percent from 2001 to 2003⁶.

In order to benefit from the productivity of logistics and SCM, individual firms must develop their own personal roadmap. It would consist of documenting the long-term perspective into specific action items linked to deliverables, performance indicators objectives, return on investment and a project time frame.

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Introduction

Global supply chains (GSC) are driven by a customer-centric reality, global sourcing from low cost countries, smart border requirements, logistics mandates (such as Radio frequency identification (RFID)) from large corporations and mass customisation in a Just-In-Time (JIT) manner. Logistics and supply chain management (SCM) are thus expected to play a key role in GSC and contribute dramatically to productivity growth of Canadian firms within the next few years.

Although Canadian firms have used logistics performance indicators internally for decades, there has never been any tool for Canadian firms to benchmark themselves to their supply chain partners, competitors, sectors and U.S. counterparts.

Manufacturers, retailers, wholesalers and logistics service providers need quality information on logistics and SCM costs as well as performance indicators in order to provide best practices and benchmarks, justify investment and innovation, and monitor industry performance.

Industry Canada has partnered with Supply Chain and Logistics Association of Canada (SCL) Research Committee to launch a national logistics and SCM performance indicators initiative.

The objective of this study is to propose a Logistics and SCM key performance indicators (KPI) analysis that can be used as a benchmarking tool for firms and policy makers. This analysis will help firms understand where they are located with respect to leading enterprises, as well as firms within their own sector and the U.S. and what steps they must undertake in order to become more competitive.

Logistics and SCM functions can either be performed from internal activities or outsourced to a third party logistics (3PL) service provider, via wholesale distribution, or in a combination. The following report will guide supply chain managers through these different key components in order to provide them with a global view of their supply chain KPI.

Analysis is initiated by a general section on industry productivity and competitiveness indicators via logistics and SCM. This will be followed by specific sections on inventory management and Just-in-Time KPI, and a logistics and SCM cost KPI analysis that includes three components: internal logistics cost, outsourced logistics cost and inventory carrying cost.

Finally, sector specific KPI, complete with methodology, calculations and definitions will be tabled in Annexes in order to provide details to help individual firms' policy makers develop applicable benchmarking tools.

I - Industry Productivity and Competitiveness via Logistics and SCM

As competition becomes more global, innovation is moving from a firm-to-firm level to a supply chain versus supply chain perspective. In order to compete against low cost countries (such as China), Canadian firms must develop supply chain agility in a JIT and mass customisation mode.

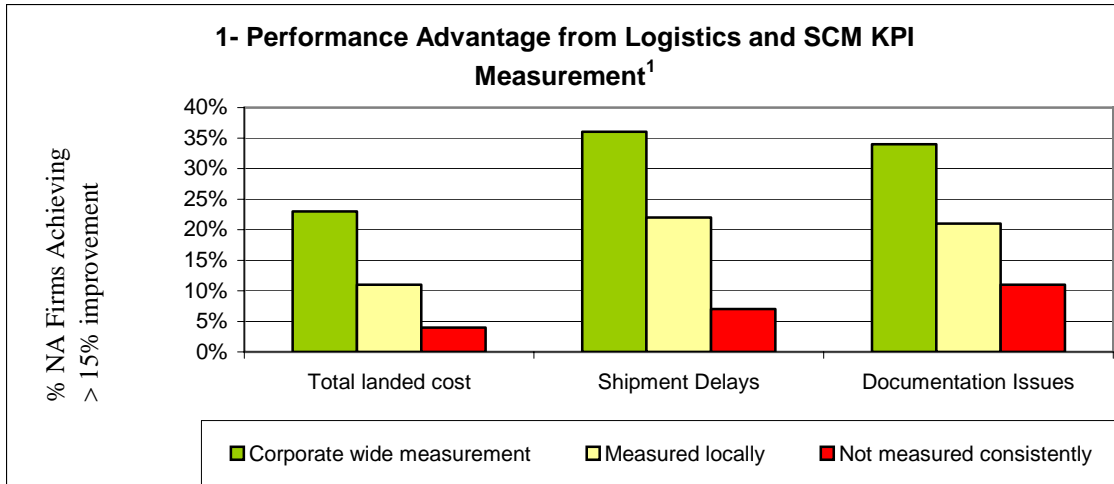
Supply chain agility is an operational strategy focused on inducing velocity and flexibility in the supply chain. A supply chain is the process of moving goods from the customer order through the raw materials stage, supply, production, and distribution of products to the customer.

All organizations have supply chains of varying degrees, depending upon the size of the organization and the type of product manufactured. These networks obtain supplies and components, change these materials into finished products and then distribute them to the customer. Included in this supply chain process are customer orders, order processing, inventory, scheduling, transportation, storage, and customer service.

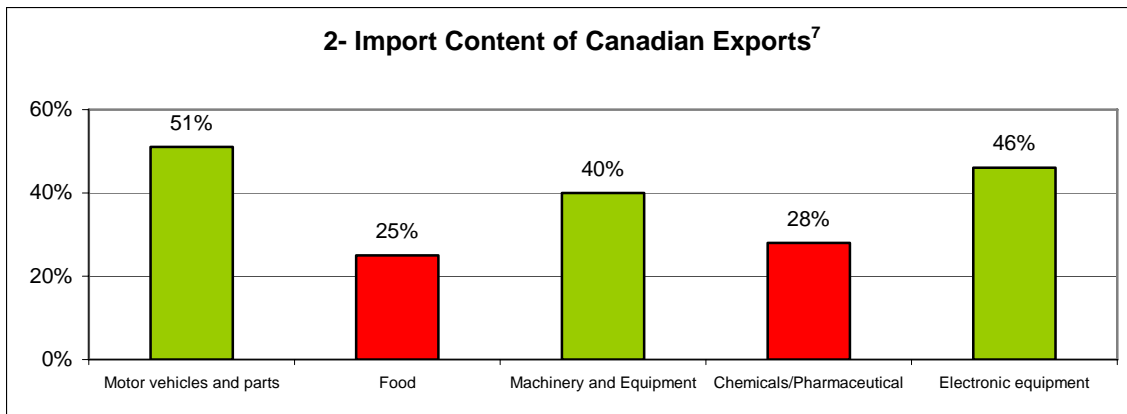
Agile supply chains responds to market pressures that revolutionise the way goods and services are produced and delivered:

- √ Customers are driving the demand and product/service levels by requesting at the same time complex customised products and lower prices, thus creating price/margin pressures.
- √ Competition between firms is not solely based on price/cost anymore but on the ability to bring and close product/service lines and the ability to recover rapidly from supply chain disruptions and supply/demand imbalances.
- √ Competition within global supply chains is creating numerous logistics and SCM critical factors such as:
 - Managing a distributed operating environment with supply chain partners around the globe
 - Outsourcing and off-shoring production and services into low cost countries
 - Integrating a new international dynamic business model

Measurement of logistics and SCM KPI is an essential part of the agile supply chain concept. It is estimated that 37 percent of North American firms that have put in place logistics and SCM KPI corporate wide measurement achieved a decrease of 15 percent or more in shipment delays compared to only 7 percent of firms that do not measure those KPI consistently. NA firms that measure logistics and SCM KPI also outperformed their industry counterparts on document issues by a ratio of 3.5 times, which is a key component of Smart Border solutions in JIT¹.



In order to take advantage of logistics and SCM KPI measurement, supply chain managers must also take into factor their sector specific focus into their strategy. As an example, the Automotive sector focuses on JIT and continuous flow of product and information under the Lean principles. Retail and Consumer product goods (CPG) sectors concentrate on total delivered cost and in-store stock-outs ratios. The Pharmaceutical sector is pushing for item level traceability and supply chain visibility for governmental requirements and product recall issues, while the Aerospace sector emphasises total supply chain quality ratios such as Six Sigma processes and standards.

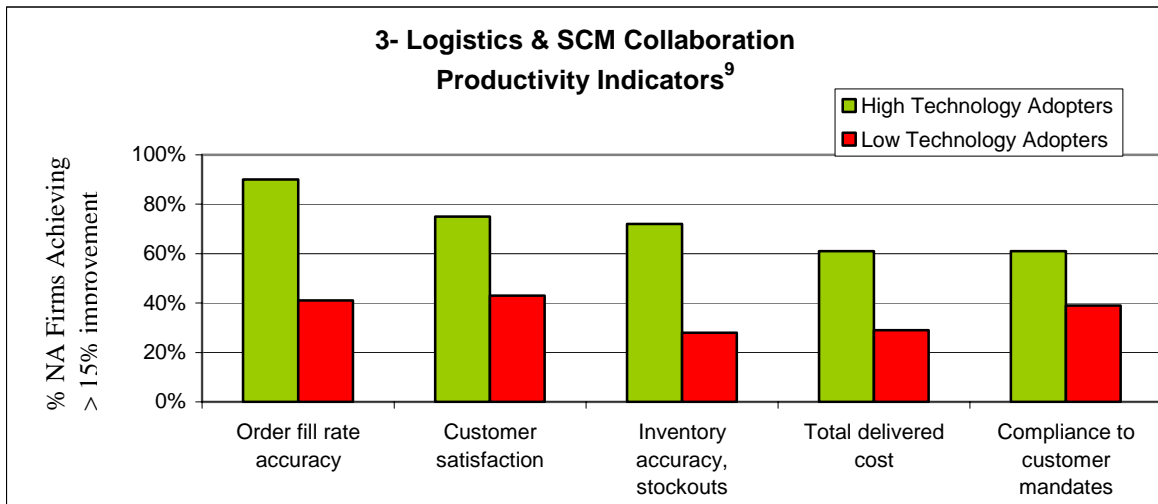


Import content has a major impact on sector logistics and SCM indicators. A high level of imported inbound goods makes the supply chain management more complex, especially if the imported content is from low cost countries such as China, versus JIT related countries such as the U.S.⁷.

In order for firms to achieve the benefits of their respective logistics and SCM business drivers, the adoption of logistics and SCM technology across supply chains is a key component for developing efficient collaboration networks.

It is estimated that North American Small and Medium Sized Enterprises (SMEs) that will deploy logistics and SCM collaboration applications will enjoy a 5 to 25 percent decrease in logistics costs and a 15 to 40 percent increase in quality and time-to-market over competitors that fail to make these investments through 2010⁸.

Also, 90 percent of NA companies that embrace leading edge logistics and SCM collaboration applications achieved an increase of at least 15 percent of order fill rate accuracy compared to only 40 percent of low technology adopters. High technology adopters in SCM collaboration also achieved comparative advantage in logistics and SCM KPI such as total delivered cost, lead time reduction, increase in perfect orders and increase compliance to customer mandates such as RFID and JIT⁹.



SCM technology adoption is still at an infancy stage in Canada. Close to 54 percent of Canadian firms still have no SCM solution in place and do not plan to implement a solution shortly¹⁰.

Although the logistics and SCM technology investment level has been low in Canada, all key sectors are starting to respond to the increase in complexity of logistics and SCM by starting to increase dramatically their investments into value added distribution centers and freight terminal infrastructure¹¹. Canadian Manufacturing and Retail annual investments in warehousing and freight terminals increased by more than 200 percent from 2001 to 2003.



II-Inventory Management and Just-in-Time Key Performance Indicators

Key to the success of an agile supply chain is the speed and flexibility with which these activities can be accomplished and the realization that customer needs and customer satisfaction are the very reasons for the network itself to exist. Achieving agility starts with the physical flow of parts, from the point of supply, through the factory, and shipment through agile distribution channels.

The main logistics and SCM KPI to measure supply chain agility is inventory turns. Inventory turns can be defined as how many times a year the average inventory for a firm changes, or is sold. This ratio is a common industry standard KPI in inventory management performance analysis.

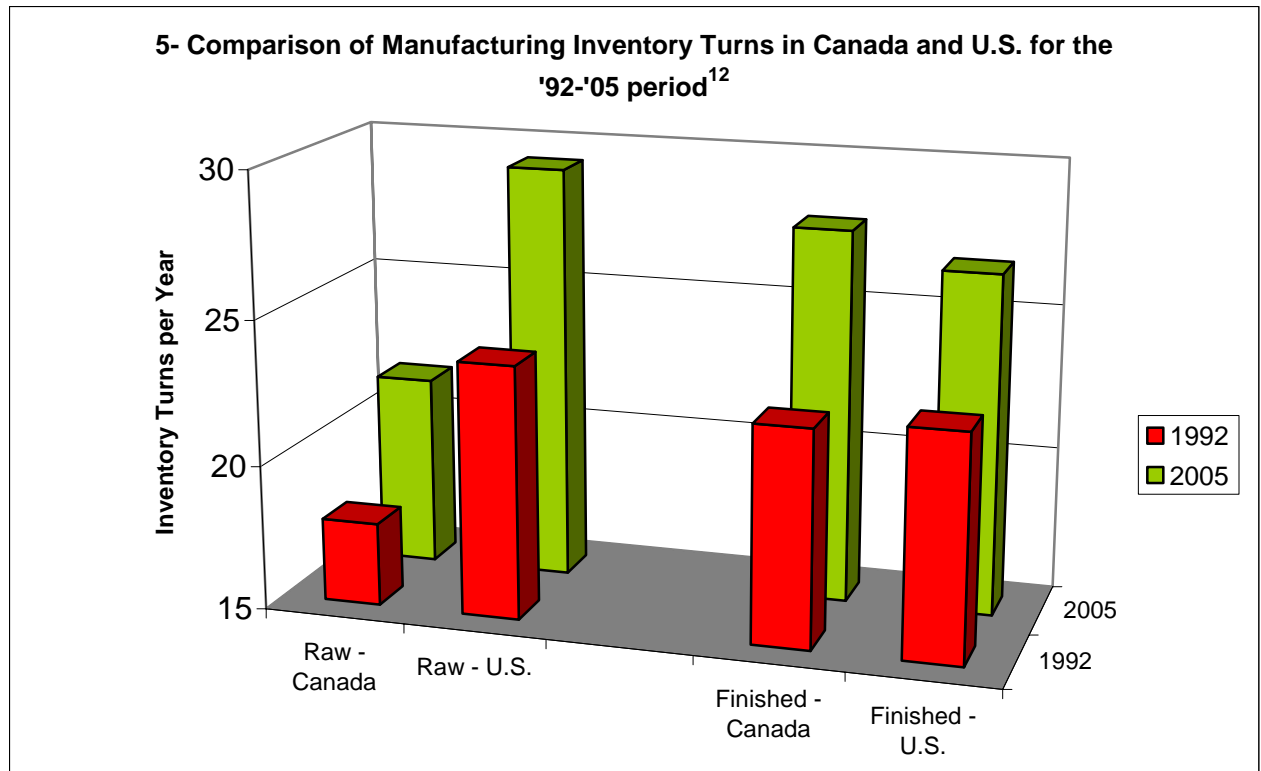
This section will first compare the evolution of the inventory turns ratio in Canada and in the U.S. for three main industry sectors: Manufacturing, Wholesale and Retail. A brief comparison of the three Canadian sectors will follow.

A. Manufacturing

This sector comprises establishments primarily engaged in the physical or chemical transformation of materials or substances into new products. In manufacturing, it is important to distinguish between raw materials ratios (the inventory of products coming from suppliers), and finished goods ratios (the inventory of products ready to be expedited).

On the raw materials side, the manufacturing inventory turns ratio increased 20.77 percent in Canada and 23.51 percent in the United States between 1992 and 2005. While the increase in percentage is similar between both countries, Canada would still need to increase its numbers by about 35 percent in order to reach the current U.S. standards in inventory turns.

For the same period, the finished goods inventory turns ratio increased 23.91 percent in Canada, while increasing 17.22 percent in the U.S. Both countries started at about the same level in 1992, and the U.S. are currently about 4.3 percent behind Canada in terms of finished goods inventory turns.



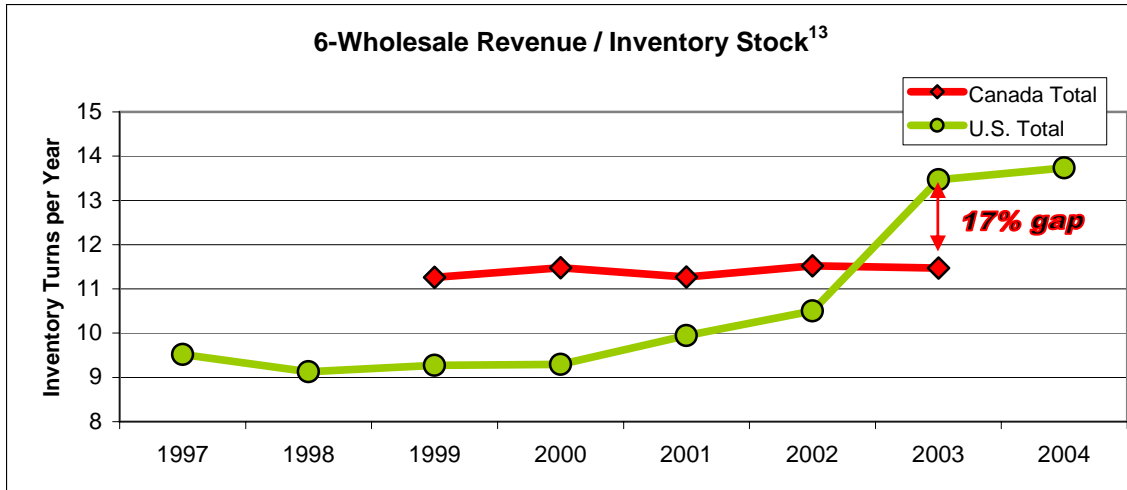
Canadian firms are in fact slightly better at shipping finished goods than they are at handling raw materials, in relative terms. An important conclusion from Figure 4 is, on the raw materials side, that Canada's 2005 inventory turns ratio was still below the United States level of 1992, although it increased by 20.77 percent during the period¹².

B. Wholesale

This sector comprises establishments primarily engaged in wholesaling merchandise and providing related logistics, marketing and support services. Wholesale establishments are often controlled by enterprises from other industries, which often creates links between wholesale and manufacturing or retailing.

As shown in Figure 6, while the inventory stock ratio was levelled in Canada between 1999 and 2003, there was a noticeable increase in the U.S. since 2000¹³.

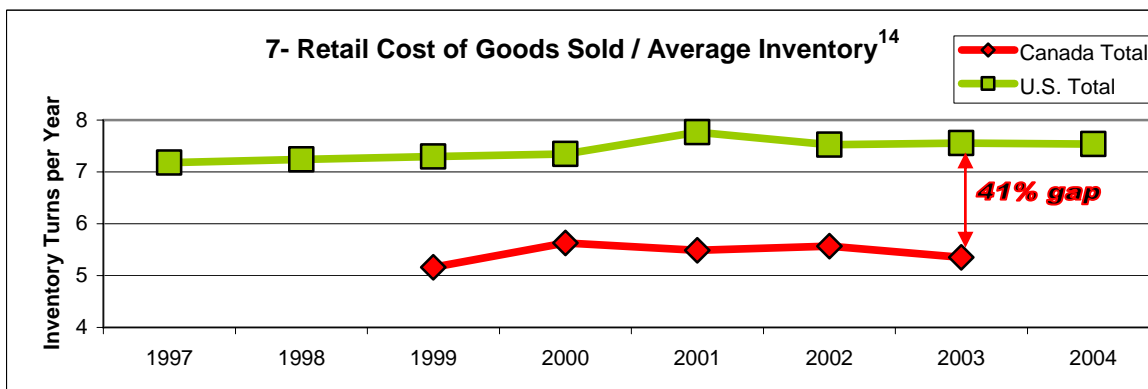
The really good news in both countries is that since the ratios are either flat or increasing in the whole sector for the period displayed in Figure 5, the increase in inventory turns from the manufacturing sector was not simply due to moving inventory ahead in the supply chain to the wholesale level.



C. Retail

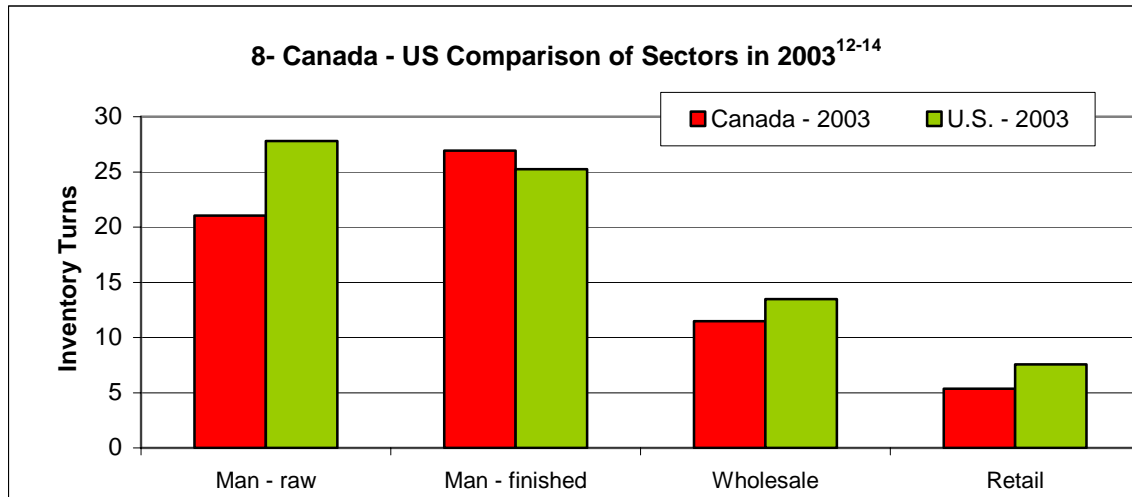
The retail trade sector comprises establishments primarily engaged in retailing merchandise, generally without transformation, and rendering services incidental to the sale of merchandise.

Like in the Wholesale sector, inventory turns remained levelled in the Retail sector as per Figure 7, both in Canada and the United States. On the other hand, as shown in Figure 6, Canada was behind its neighbour by 30 percent to 40 percent for the period between 1999 and 2003¹⁴.



This means again that in the whole supply chain the inventory was not solely transferred from wholesalers to retailers, just like it was displayed earlier that it had not shifted from manufacturers to wholesalers.

D. Sectors Comparison – Canada Vs. U.S.



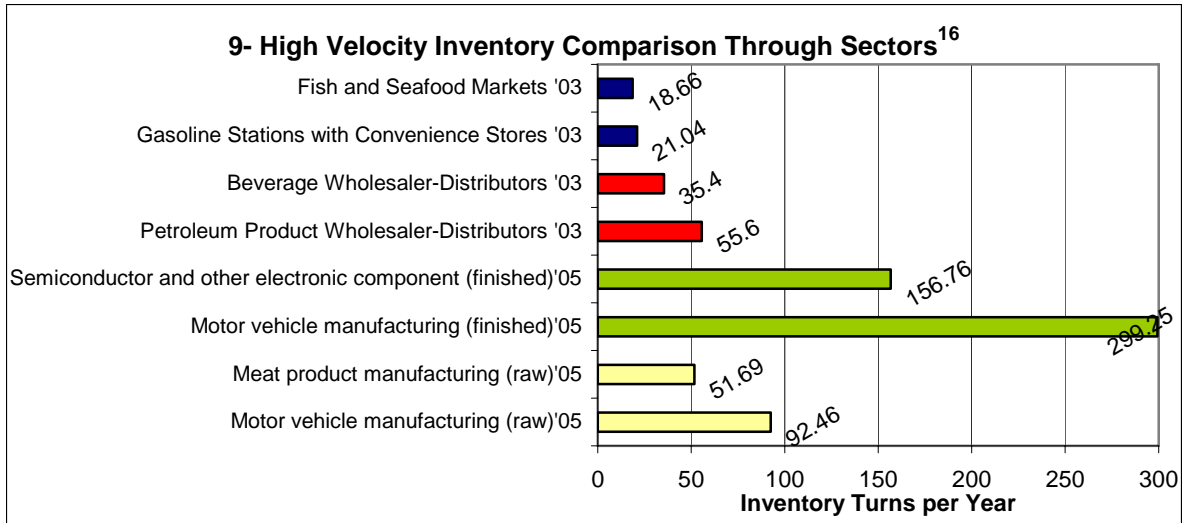
Comparing the 2003 inventory turns ratios data between Canada and the U.S. leads to two main conclusions. First, Canada is not as efficient as the U.S. in three out of the four sectors. As can be seen in Figure 8, Canada is slightly more efficient than the U.S. in the Manufacturing-Finished sector, but lags in Manufacturing-Raw, Wholesale and Retail sectors¹⁵. The second conclusion is that, although the ratios of manufacturing, wholesale and retail are not directly comparable because their basis is slightly different, it can still be assumed in both countries that there is much more inventory in retail than in wholesale, and much more inventory in wholesale than in manufacturing.

This last situation suggests that the principles of JIT benefit primarily manufacturing firms, when compared to wholesale and retail sectors, since they are moving their inventories faster than in the other two sectors. Although most gains in efficiency were realized in the manufacturing sector, this should still influence positively the whole supply chain for the future.

E. High Velocity Vs. Low Velocity sector analysis

This section presents an overview of the inventory turns high and low velocity sub classes velocity in each Canadian sector.

Figure 8 displays the two fastest moving sub classes for each of the main sectors, namely Manufacturing-raw, Manufacturing Finished, Wholesale and Retail. Then, Figure 9 displays the same information, but for low velocity sub classes.



The best inventory turns ratio is by far in the sub class Motor Vehicle Manufacturing (finished goods) with a ratio of 299.3. Manufacturers in this class keep in average a little more than a day's worth of finished goods.

This seems to be a typical example of JIT principles where a manufacturer tries to produce exactly what is needed, no more or no less. Still, the obvious remarks about high inventory turns ratios are that: 1) they will drive down warehousing costs, 2) they will provide additional agility and flexibility into the supply chain, 3) deliveries are more frequent and therefore 4) distribution costs may increase while total product cost may decrease.

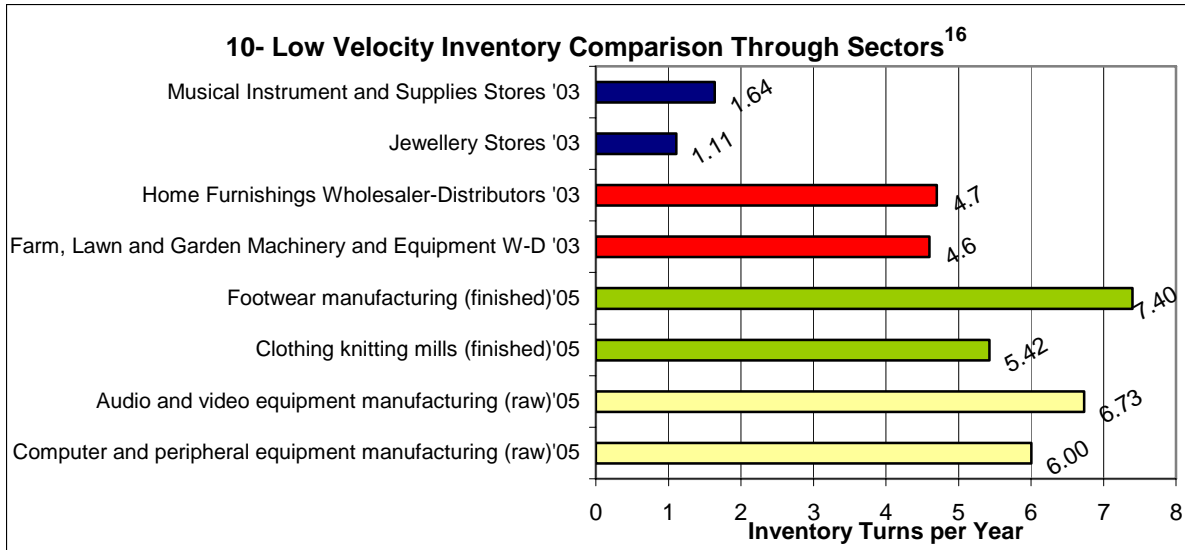
In the Wholesale sector, the best inventory turns ratios are found in the Petroleum Products sub-class, with a ratio of 55.6, and in the Beverage Wholesalers that arrives second with 35.4.

In the retail sector, Gasoline stations with Convenience Stores score 21.04, followed by Fish and Seafood Markets with an inventory turn ratio of 18.66¹⁶.

On the low velocity side, Musical Instruments and Jewellery Stores carry respectively between half-a-year and almost a year worth of inventory, which is in average three to four times more inventory than the average for the Retail sector.

Footwear Manufacturers and Clothing knitting mills carry in average forty times more inventory than Motor Vehicles Manufacturers for their finished goods. Audio & Video Equipment and Computer & Peripherals Manufacturers carry about fifteen times more inventory than Motor Vehicles Manufacturers for their raw materials, in relative terms.

For the wholesale sector, Home Furnishing, and Farm, Lawn and Garden Machinery and Equipment are at the bottom of the list, which is explained by highly cyclical and seasonal products.



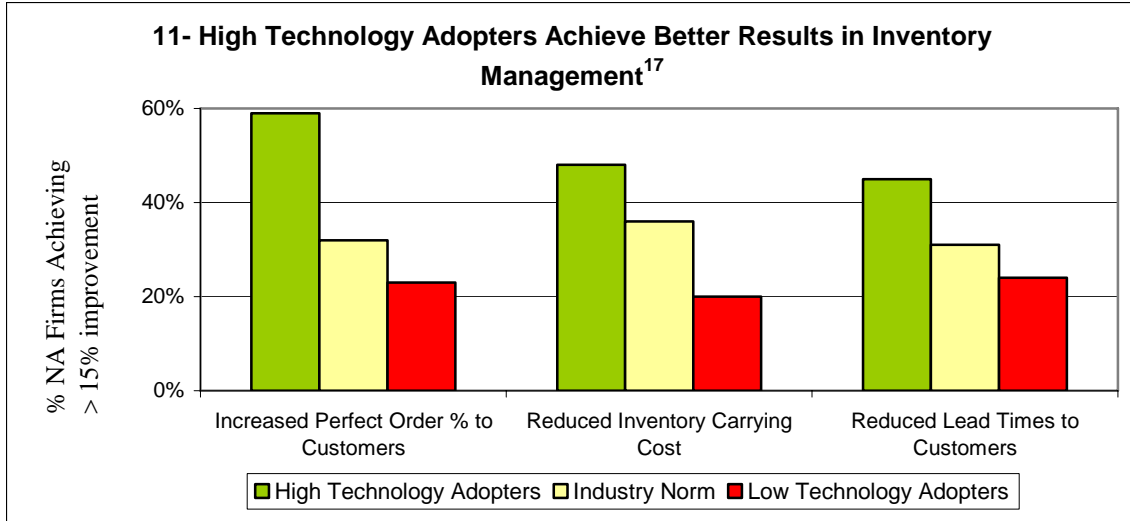
It is clear from Figures 9 and 10 that there is an important gap between sectors in terms of inventory turns. The highest turnover ratios are usually found in Manufacturing-Finished, followed by Manufacturing Raw, then by Wholesale, and finally by the Retail sector. Furthermore, this is consistent with the figures presented earlier.

The type of industry, its fabrication processes, its distribution processes, the corporate strategies adopted internally and the global supply chain strategy, will all have an impact on the quantity of inventory that is deemed required. The above comparisons in terms of inventory turns do not suggest one sub class is better than another, but shows that they are indeed quite different since driven by different market pressures.

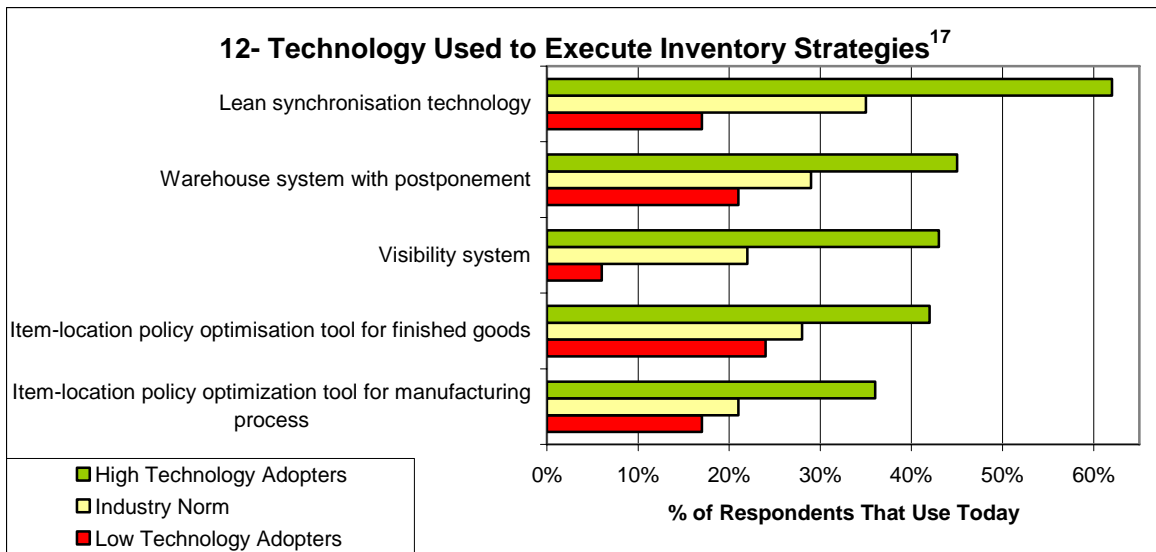
F. Benefits of indicators to productivity and competitiveness

Technology and best practices are important factors in inventory management. It is clear that technology-enabled companies in North America achieved higher improvement rates than other firms, as displayed in Figure 11¹⁷. The concept of high technology/process adopters vs. low technology/process adopters is used to explain the difference between NA companies having better than average technologies and best-practices, and their opposites.

Figure 11 displays the percentage of NA respondents that achieved a greater than ten percent improvement in three logistics and SCM KPIs, namely: increase in the perfect order percentage to the customers; reduction in inventory carrying cost; and reduction in lead times to the customers. This figure shows that companies that use best practices in inventory management technology and processes in their industry achieved significantly better JIT KPI results than their peers.



As displayed in Figure 12, the focus of high technology adopters in inventory management is in Lean synchronization technologies and in the use of Visibility systems¹⁷.

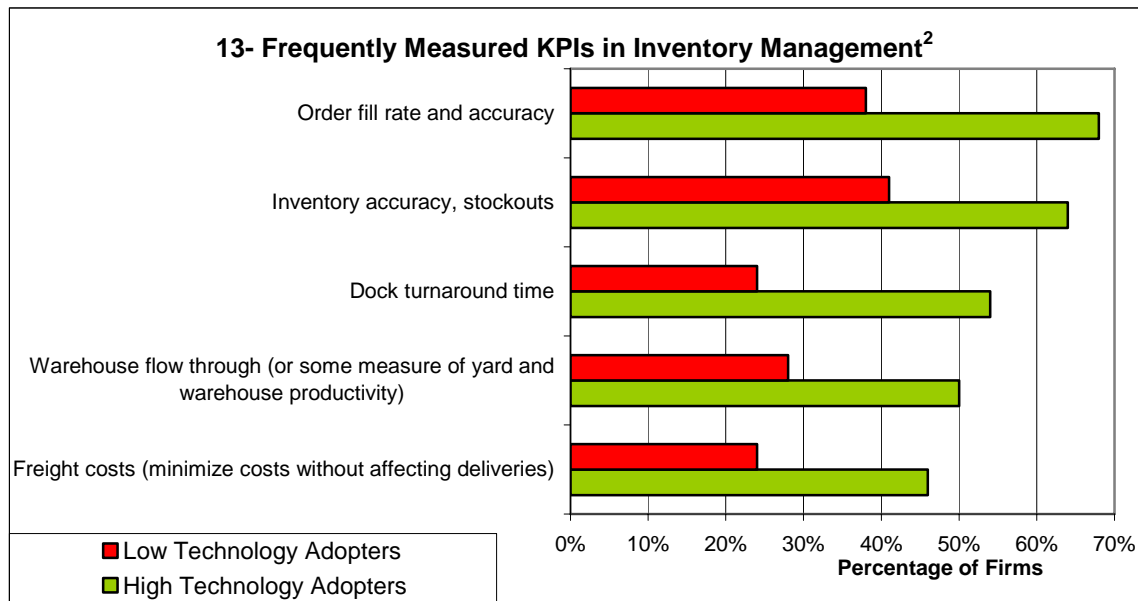


Most companies today exchange information with their partners. This information could be related to any of the following: demand forecasts; inventory; sales; shipments; schedules; capacity; supply chain best practices; etc. The interesting point is that not all that information is being shared with all partners.

Actually, less than 20 percent of the information in NA supply chains is shared with all partners of a company, whether it is the information shared by a company with its suppliers, or the information shared by the suppliers with a company¹⁸.

Monitoring and measuring are also important parts in best practices of NA firms, since it is difficult to improve what is not measured. It is interesting to compare the percentage

of high technology/process adopters versus low technology/process adopters NA companies that frequently measure inventory management KPIs⁴.



When comparing high technology/process adopters versus low technology/process adopters, it appears clearly now that high technology/process adopters make a better use of the technology available to them, and put in place stronger best practices in-house and with their partners, and monitor them more often.

It is also vital for firms to learn their own capabilities. Whether firms are manufacturing, distributing or selling planes, automobiles or soap will influence the necessary fabrication and distribution processes; different strategies are indispensable for each. In the end, firms must not forget that inventory management has gone global, and that the location and the nature of the inventory, and of the partners, will also influence the JIT strategy that winning firms adopt.

III-Logistics and SCM cost KPI analysis

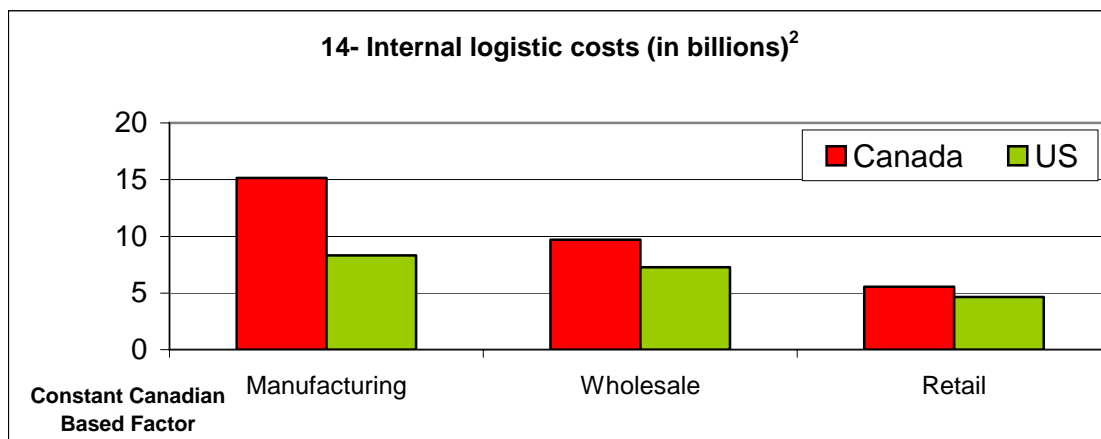
While inventory turns is the main KPI for evaluating supply chain agility, logistics cost KPI allow firms to evaluate the efficiency of their logistics and SCM operations. The combination of supply chain agility and efficient SCM practices is key to long term competitiveness and prosperity of Canadian firms in the emerging GSC context.

Logistics costs occur internally within firms, are outsourced to logistics service providers and occur via inventory carrying cost. The sum of these three components will enable firms to evaluate their sector total costs and benchmark themselves against their own industry, their U.S. counterparts and other key sectors that share similar logistics and SCM processes.

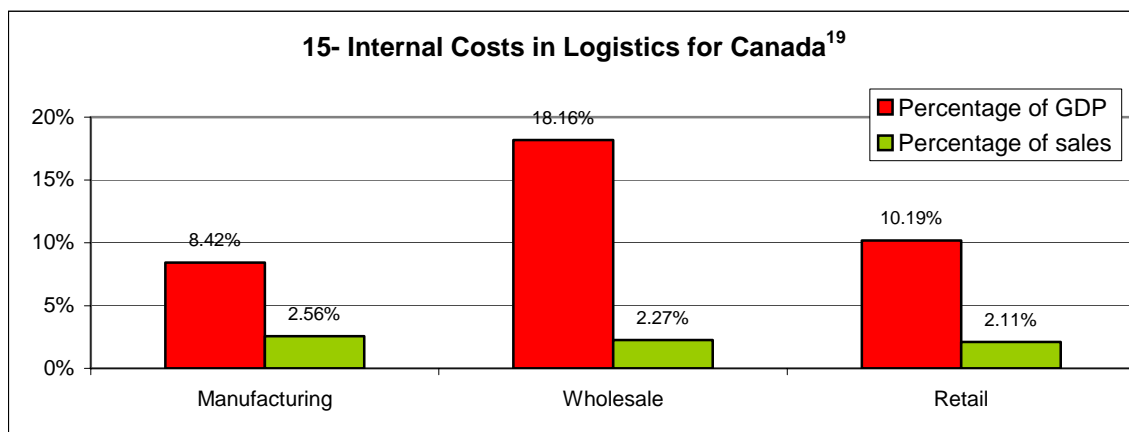
The mix of internal, outsourced and inventory carrying cost will also allow firms to evaluate their own logistics and SCM cost structure while enabling them to rethink their business model, if deemed necessary.

G. Internal costs

Internal SCM and logistics costs encompass all logistics activities that occur within a firm. It excludes all outsourced logistics activities and all production processes. Comparisons between Canada and the U.S. were done in constant Canadian based factor: by bringing the U.S. economy to a comparable level with Canada, which meant downsizing the U.S. economy so that when comparing both countries, it is done for two economies of similar characteristics and size.



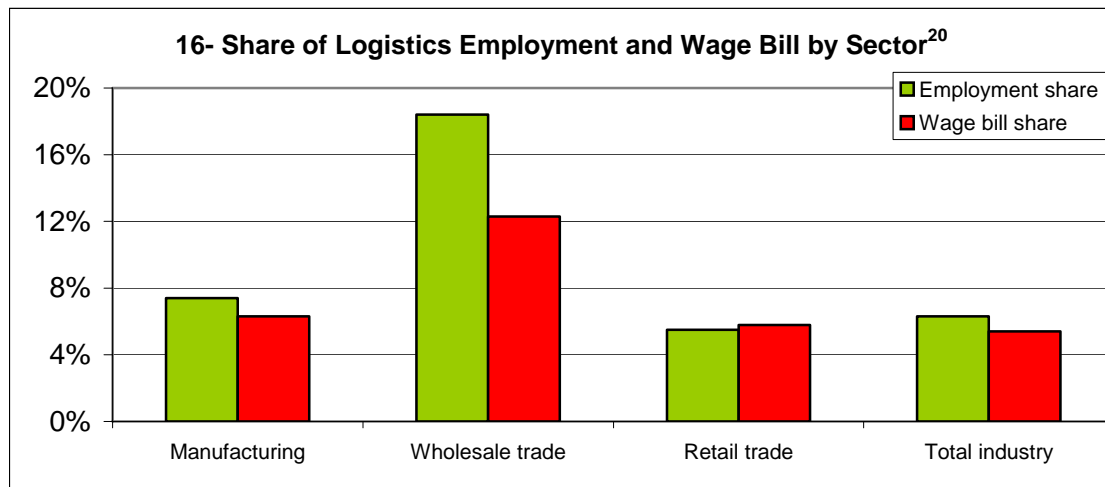
Internal logistic costs differ widely by sector, being smaller for the U.S. in all of them¹⁹. With respect to Manufacturing; Non-metallic, Beverage and Tobacco, and Food Manufacturing are the top three sectors regarding internal logistics cost as a percentage of total internal activity and margin cost in Canada; while Petroleum and Coal, Printing and Related support activities and Machinery Manufacturing are the bottom three.



The analysis of logistics costs is done in percentage of sector's Gross Domestic Product (GDP) and by percentage of sales. Internal cost in percentage of GDP represents the logistics activity that occurs within a firm compared to all internal value added activities. It excludes all service and product sourcing costs. It is the most precise indicator of the size of the logistics activity that occurs within a firm.

On the other hand, the percentage of sales ratio allows firms to benchmark themselves more easily. The percentage of sales ratio includes all the internal costs in addition to service and product sourcing; this often creates some multiple counting issues, which explains why the ratios displayed are quite smaller than the percentage of GDP.

It is estimated that the internal logistics activity represents 8 to 10 percent of the total internal value added activity in the Manufacturing and the Retail sectors while the Wholesale ratio reach over 19 percent. This demonstrates clearly the important role that Wholesale plays into the logistics activity in Canada.



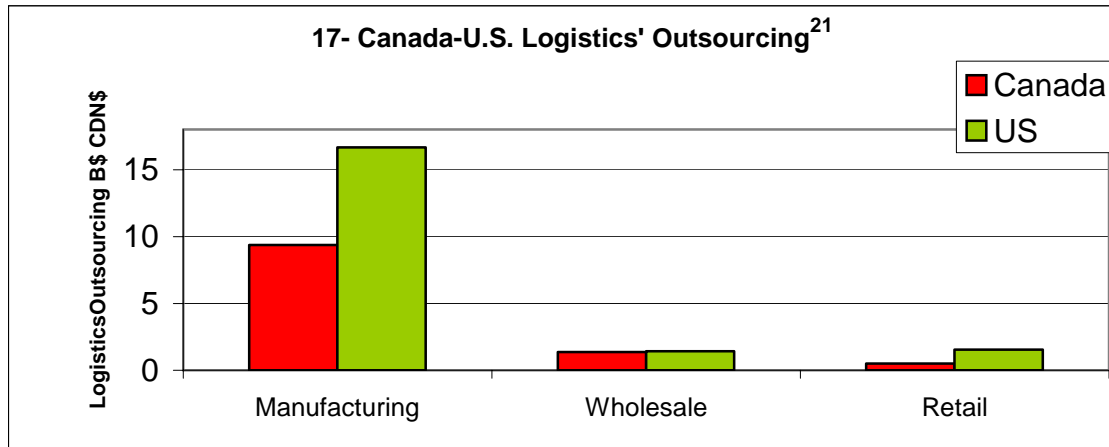
While Retail and Manufacturing are only slightly above the industry average with respect to both the employment share and the wage bill associated to logistics, Wholesale trade is greatly above average in both cases, showing a higher use of logistics in this sector²⁰.

Verifying the initial results, the top three logistics' using sectors in Manufacturing (with respect to both employment and wage bill) are Non-metallic, Beverage and Tobacco and Food Manufacturing. However, the bottom three are Computer and Electronic products, Printing and Related Support activities and Petroleum and Coal Manufacturing.

Canada has a wage bill that is larger in most sub-sectors of Manufacturing than the U.S., which would indicate that the U.S. either outsource more than Canada or is more efficient in logistics processes. However, it is the reverse situation for the Non-metallic products, Petroleum and Coal Products, Printing and Related Support activities, Computer Electronic and Electrical Equipment and Appliance and Component Manufacturing.

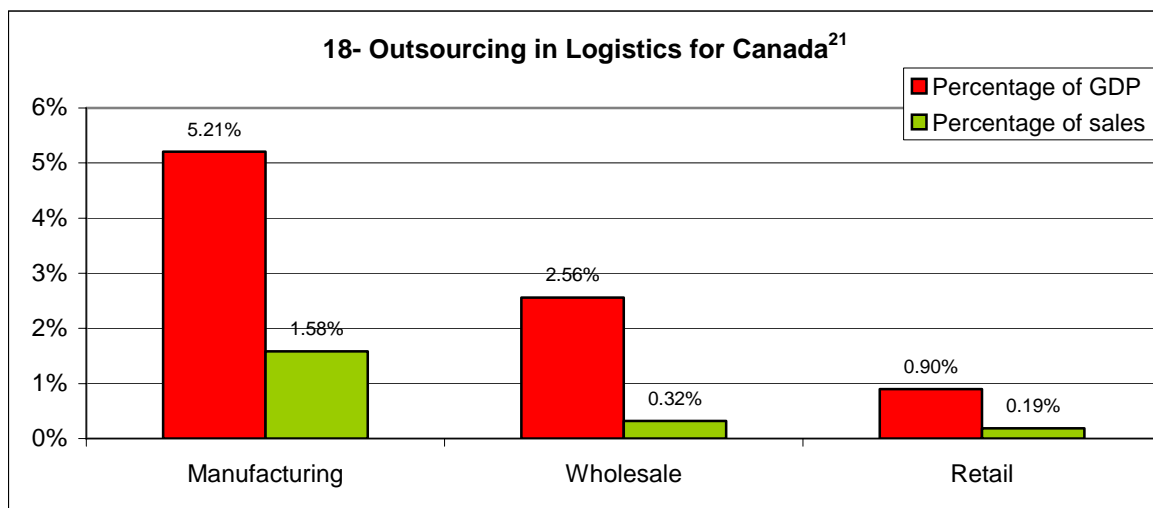
H. Logistics Outsourcing Cost

Outsourcing costs encompass activities assigned to a logistics service provider. Using the purchases that originate from the users (such as Manufacturing, Wholesale and Retail sectors) as part of logistics activities is appropriate, instead of using the sales, because it avoids multiple counting.



Generally speaking, the U.S. outsources more logistics activities in both the Manufacturing and the Retail sector (however, outsourcing in this sector is extremely limited in both Canada and the U.S.). Although the difference is not as pronounced for Wholesale, the U.S. still outsources more than Canada in this sector.

Once again, the use of outsourcing costs as percentage of GDP should be compared to that of outsourcing as percentage of sales.



Manufacturing's purchase of logistics services in Canada have been steadily decreasing since the early nineties, showing an average annual growth rate of -2 percent. However,

this trend was reversed in 2001, when an increase of 8 percent was recorded²¹. This could be explained by the decrease of 10.75 percent of the Manufacturing inventory turns of finished goods for the same period mainly due to September 11, 2001 events and border issues.

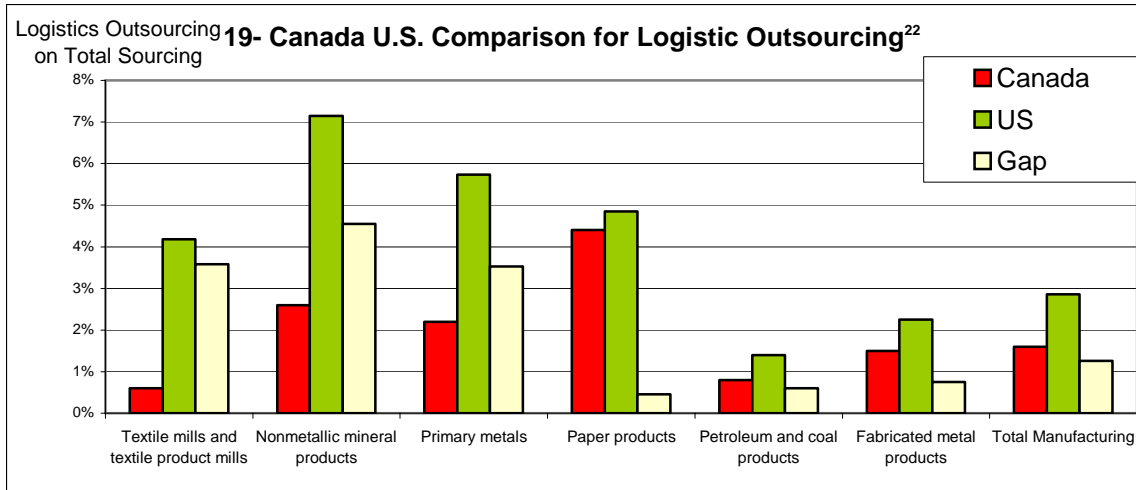
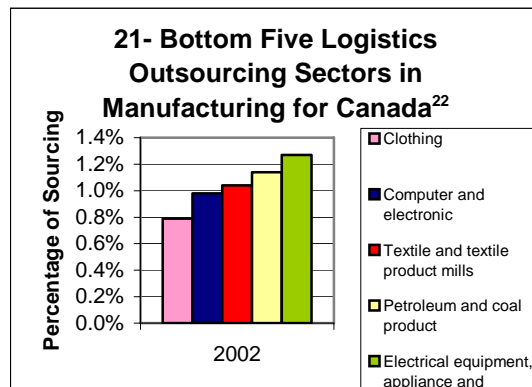
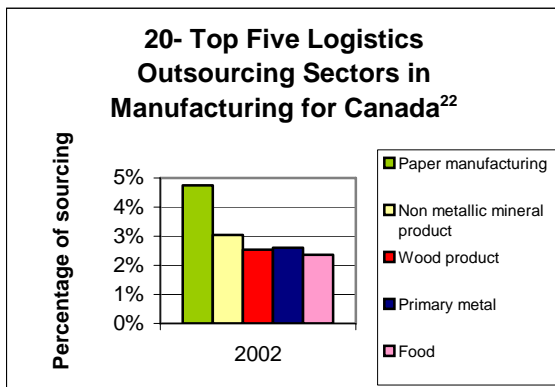


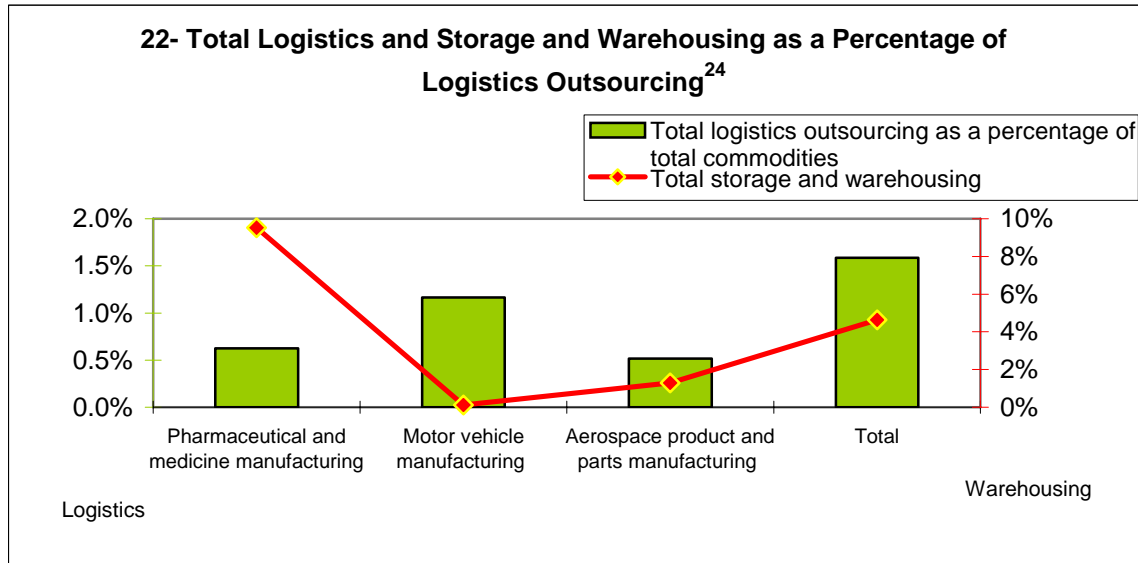
Figure 19 shows the top and bottom three sub-sectors related to purchase of logistics services by the manufacturing sector for the U.S. and Canada. Of these six cases, five are either primary resources oriented or serve as suppliers of primary resources.

Furthermore, in the top three sectors, the gap between the U.S. and Canada is larger than the actual Canadian percentage purchase of logistics. The highest gaps are reached for the Non-metallic Mineral products, Textile Mills and Textile product and Primary Metals, in which cases the U.S. purchases respectively 2.75, 7 and 2.6 times more logistics outsourcing than Canada²².



Interestingly enough, of the top five logistics outsourcing sectors in Manufacturing, four are part of the five sectors that have the lowest logistics outsourcing growth rate, with the exception of Paper Product Manufacturing.

There are also some worthwhile results for certain specific sub-sectors as Figure 22 shows. The first result to appear is that Pharmaceutical and Medicine Manufacturing outsourcing of logistics is below the manufacturing industry average (seen as total in the graph), yet its use of storage and warehousing is above average²³. This can be explained by the fact that the pharmaceutical manufacturing sector carries more inventory than the industry average.

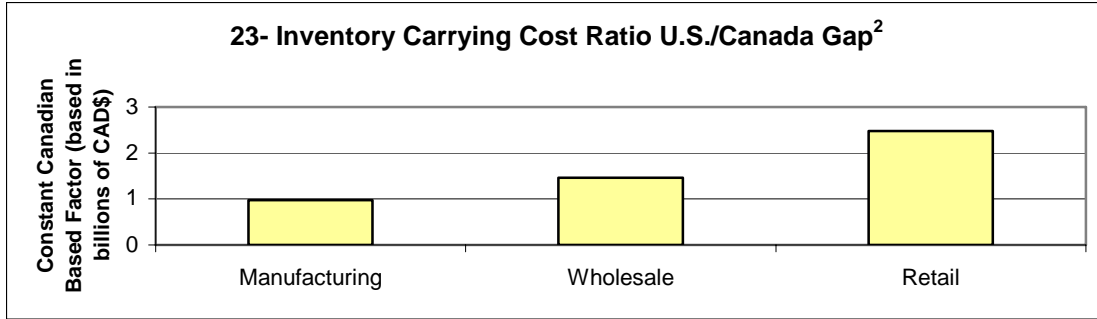


Motor Vehicle Manufacturing exhibits a lower than industry average outsourcing in logistics, and very low storage and warehousing cost. However, in the motor vehicles sector, manufacturers control 69.8 percent²⁴ of Wholesale, explaining in part the zero storage and warehousing usage as well as its extremely high inventory turns.

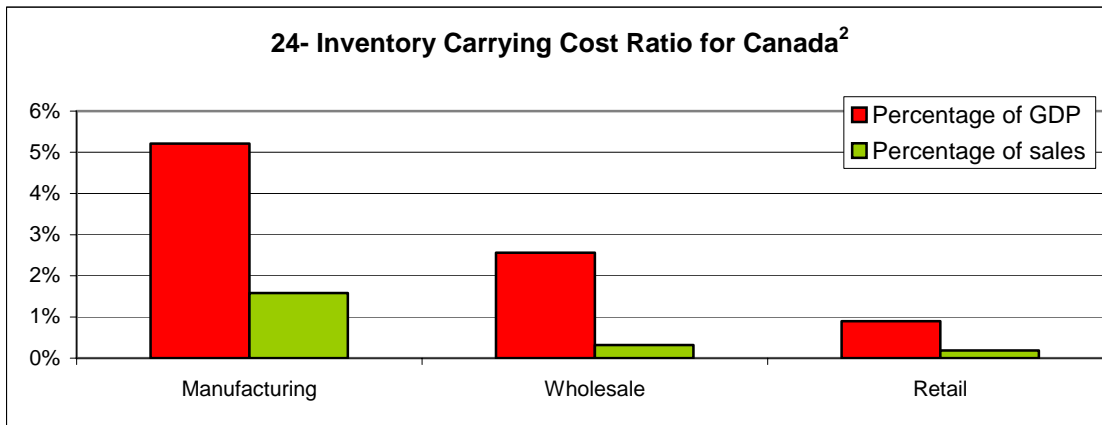
I. Inventory Carrying Cost

Inventory carrying costs are defined as a series of costs that compose a company’s supply chain management costs. They include opportunity costs, shrinkage, insurance and taxes, total obsolescence (for raw materials, work in process (WIP), and finished good inventory), channel obsolescence and field service parts obsolescence. It excludes all distribution cost related to warehousing, which are captured in the internal and outsourced logistics costs.

However, it is important to keep in mind that inventory carrying costs cannot be used to compare the size of the economic activity of a sector since it mainly represents accounting based costs, therefore it should not be calculated in percentage of sector GDP.



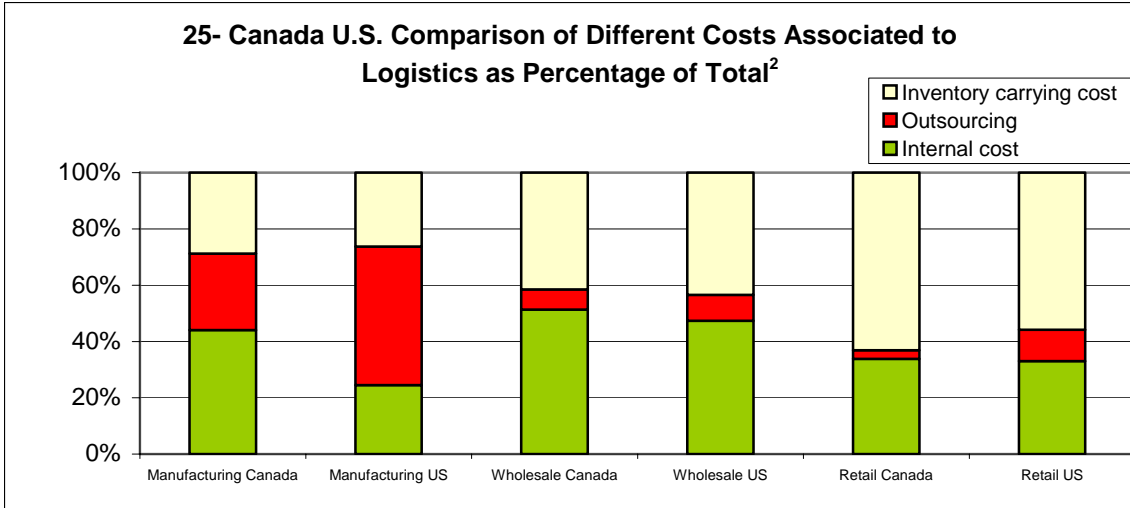
The previous figure implies that in the three sectors represented in this graphic, Canada has a larger inventory carrying cost than the U.S., the difference being largest for the retail sector. This is explained by the fact that Canadian firms have lower inventory turns compared to their U.S. counterparts.



As in the case of logistics outsourcing costs, the largest difference between GDP and sales indicators is seen in the case of the Wholesale sector where the inventory carrying cost ratio as percentage of sales represents only 12 percent of the inventory carrying cost as percentage of GDP (21 percent and 30 percent for Retail and Manufacturing respectively).

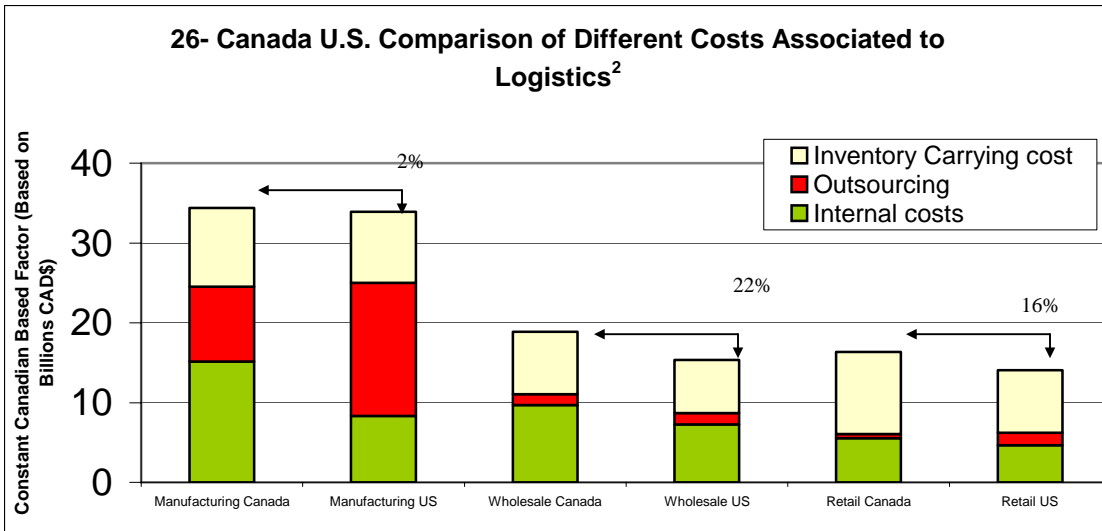
J. Global Logistics Comparisons

Comparing both the manufacturing and retail sectors for Canada and the U.S. shows that, in both cases, costs related to logistics outsourcing are higher in the U.S. than in Canada. In the case of the wholesale sector, internal logistics costs are slightly smaller in Canada as a percentage of total logistics costs.



There is not too much difference between Canada and the U.S. with respect to internal logistics costs in the wholesale and retail sector. Nevertheless, Canada has an internal logistics cost in manufacturing higher than that of the U.S.

Canada's inventory carrying costs are slightly higher for Manufacturing and Wholesale (11 percent and 17 percent respectively). However, inventory carrying costs for Retail in Canada are 31 percent higher than in the U.S.².



Compared to the U.S., Canada total logistics costs are higher in all three studied sectors, being largest for wholesale and retail (22 percent and 16 percent respectively) and smallest for manufacturing (2 percent).

Overall, Canadian logistics costs for the Manufacturing, Wholesale and Retail sectors amount to 70 billion CAD\$ compared to 63 billion CAD\$ for the U.S. This corresponds

to a difference of 11 percent (The value for the U.S. is calculated using a constant Canadian base, based in billions of CAD\$)².

IV- Final Remarks

In order to benefit from the productivity of logistics and SCM, individual firms must develop their own personal action plan. The final step in a business case is to make recommendations and develop a roadmap for implementing the proposed action plan. The roadmap exercise consists of documenting the long-term perspective into specific action items linked to deliverables, performance indicators objectives, return on investment and a project time frame.

For some firms, the first roadmap action item could be an internal evaluation of their logistics KPI with some participation in associations and networking activities. For others, it could be implementing a pilot project with a customer and a supplier. In all cases, a well-documented roadmap allows firms to gain the support of all their stakeholders for their logistics and SCM competitiveness strategy and to solicit their involvement in the implementation phases of the firm's logistics and SCM action plan.

Proposed Action Plan:

- 1- Evaluate internal firm logistics and SCM KPI based on the indicators listed in this document.
- 2- Map out business processes, global supply chain and technology adoption.
- 3- Benchmark your firm's KPI to your industry KPI in Canada and in the U.S..
- 4- Assess firm's performance KPI to industry taking into consideration supply chain processes.
- 5- Benchmark firm's KPI to other industries KPI in Canada and in the U.S. that share the same logistics and SCM processes and drivers.
- 6- Create a multi-function project team. Senior management buy-in could determine the success rate of this initiative, as will a champion at the initial stage.
- 7- Develop a logistics and SCM competitiveness roadmap.
- 8- Develop performance measurements of the roadmap initiatives.
- 9- Educate your company executives across departments, supply chain partners and service providers on the value of the roadmap for each specific stakeholder.
- 10- Increase supply chain collaboration initiatives that drive value in your specific sector.
- 11- Partner with supply chain partners to develop with you the technology, processes and information solutions needed to manage the process.
- 12- Implement KPI program with frequent use of measures focused on cost-effective customer-driven satisfaction issues with supply chain partners.

Annex I - Methodology

SCM & Logistics Costs Methodology

Every company measures its costs related to marketing, human resources, research and development, etc. Interestingly, very few know how much their logistics costs really are. The last decade saw a growth in interest for concepts such as JIT, Lean manufacturing and Efficient Consumer Response, all of which, in addition with the globalization of the supply chains, brought the importance of Logistics and Supply Chain Management (SCM) from an operational status, often to a strategic status for the company and its partners.

It is for this reason that Supply Chain & Logistics Canada's (SCL) Research Committee and Industry Canada have partnered with Jacobson Consulting to launch a logistics cost methodology research initiative. By combining the industry know-how of SCL with the supply chain research experience of Industry Canada and the economical modeling specific expertise of Paul Jacobson, a former director at Infometrica, the partners have developed an optimal research team for this initiative.

One of the main sources of logistics costs' data available until now is the *Annual State of Logistics Report*, published in the U.S., which is sponsored by the Council of Supply Chain Management Professionals (CSCMP). This report provides annual data on the cost of the U.S. business logistics system in relation to their Gross Domestic Product (GDP). The data provided goes back to 1984 and is mainly available on a macro level, with categories available such as Inventory Carrying Costs, Transportation Costs and Administrative Costs, but does not look at the sector-level data.

It is important for a company to understand the nature and the costs of its logistics and SCM operations. Furthermore, companies should be able to access that type of information on each industrial sector for comparison purposes. Comparing the information to GDP is essential to understanding the importance of logistics on a given sector, while comparing the information to the Gross margin allows companies to benchmark their logistics and SCM costs to their sector, their partners and their competitors.

Gross margin = total operating revenue - cost of goods sold

Total operating revenue = sales of goods purchased for resale + commission revenue + sales of goods produced + repair and maintenance revenue + revenue from rental and leasing + other operating revenue.

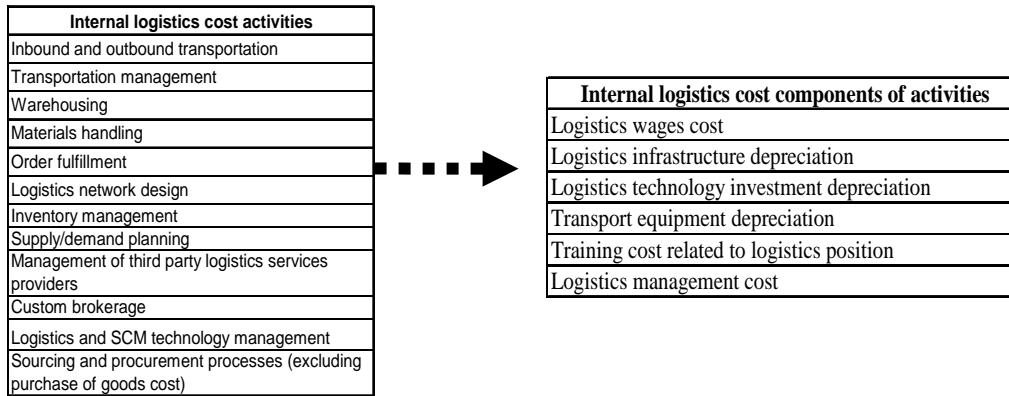
Cost of goods sold = Opening inventory + Purchases - Closing inventory.

Here, the research initiative will focus on providing sector level information of logistics and SCM costs that occur internally through firms (such as in the manufacturing, wholesale and retail sectors), as well as evaluating supply chain's functions that are outsourced by sectors, and their relative inventory carrying costs. By combining these three categories, individual firms will have the opportunity to have a global view of supply chain management costs by sectors and of the outsourcing trends, thus allowing them to benchmark themselves to their competitors, partners and other sectors in Canada and in the U.S..

SCM and logistics costs can be broken down in three separate, but complementary pieces: internal costs, outsourcing costs and inventory carrying costs. Each one is described below, with its methodology and an example when appropriate.

Internal SCM and logistics costs:

Internal SCM and logistics cost encompass all logistics activities that occur within a firm, such as a manufacturer, wholesaler or retailer. It excludes all outsourced logistics activities and all production process. Individual firms can evaluate their internal logistics cost by adding their respective logistics cost activities and their components as stated in the table below.



Internal SCM and logistics costs are the most complex to calculate since no organization accounts for these. The estimates of internal logistics costs in this report were compiled via the following methodology:

- 1- Determine the occupational types related to logistics, and link those to logistical activities. In total, twenty-one occupations were found and assigned to one of the four logistics activities namely: Distribution Centers (DC), Office work, Truck transportation and Other transportation (rail, etc.). For example, material handlers are linked to DC activities, while customs & ships brokers and industrial engineering and manufacturing are part of office related activities.
- 2- Find for each industrial sub sector the number or persons in each occupational sub category. There are sixty sub sectors in manufacturing, thirty in wholesale and thirty in retail.
- 3- Find the logistics’ suppliers equivalent to the four logistics’ activities from above. For example, under Office work were included the consulting services’ and support to transportation and warehousing’ personnel.
- 4- Calculate the wage bill of the four logistics activities after occupations were linked to them. The ratio of the total costs divided by the wage bill is then charged to the sixty sub sectors in manufacturing, to the thirty sub sectors in wholesale and to the thirty sub sectors in retail. For example, for each dollar spent in salaries, it is known that in average 2\$ are spent on infrastructures, technologies and management costs.

All this allows the estimation of the logistics and SCM costs for each industrial sub sector.

Outsourcing costs:

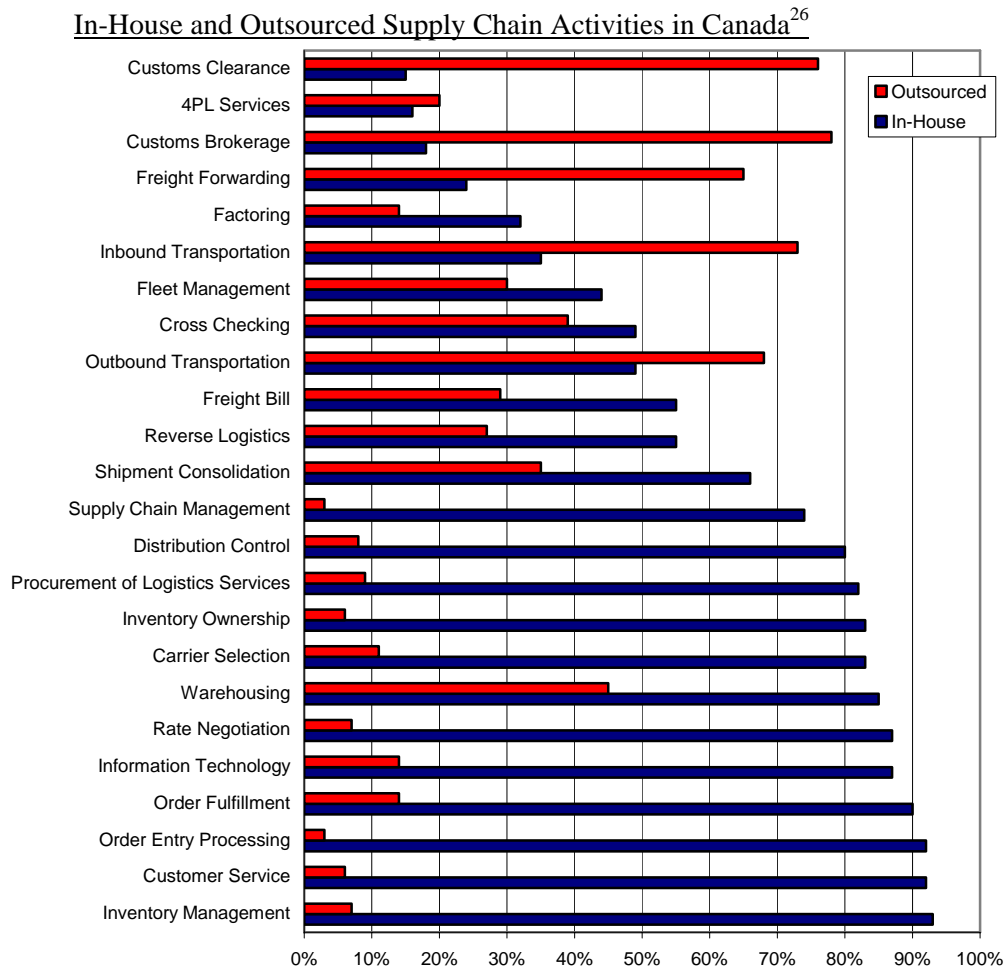
Outsourcing costs encompass activities assigned to a third-party. Outsourcing costs come from input-output tables from Statistics Canada that indicate how much each industry requires of the production of each other industry in order to produce each dollar of its own output by compiling the purchases of logistics services by users.

Using the purchases that originate as part of logistics activities is appropriate, instead of using the sales, because it avoids multiple counting.

Example

A manufacturing firm writes a check for \$10 million to a 3PL to assume all its distribution activities for the current year. That 3PL does not actually own trucks, and hire a transportation broker to actually contract the required vehicles as necessary, for that same amount. The transportation broker will sign multiple deals during that year with transportation companies, again totaling \$10 million. By looking at the sales figures in the input-output tables, the logistics activity in that scenario would now total \$30 million. Utilizing instead the purchases of logistics services allows isolating the real logistics activity, which is indeed \$10 million.

An example of the activities that are outsourced and/or done inside a company is displayed in the chart below.



As can be seen, outsourcing differs largely according to the type of activity. Certain activities are largely outsourced, such as Customs Clearance or Customs Brokerage, and others are mainly done in-house, such as Inventory Management and Customer Service.

Inventory Carrying Cost:

Lexi-Com's *Glossary of Logistics Terms* defines inventory carrying cost as follows. One of the elements comprising a company's total supply chain-management costs. These costs consist of the following :

- 1) Opportunity Cost : The opportunity costs of holding inventory. This should be based on your company`s own cost of capital standards using the following formula. Calculation : Cost of Capital x Average Net Value of Inventory
- 2) Shrinkage : The costs associated with breakage, pilferage, and deterioration of inventories. Usually pertains to the loss of material through handling damage, theft, or neglect.
- 3) Insurance and Taxes : The cost of insuring inventories and taxes associated with the holding of inventory.
- 4) Total Obsolescence for Raw Material, WIP, and Finished Goods Inventory : Inventory reserves taken due to obsolescence and scrap and includes products exceeding the shelf life, i.e. spoils and is no good for use in its original purpose (do not include reserves taken for Field Service Parts).
- 5) Channel Obsolescence: Aging allowances paid to channel partners, provisions for buy-back agreements, etc. Includes all material that goes obsolete while in a distribution channel. Usually, a distributor will demand a refund on material that goes bad (shelf life) or is no longer needed because of changing needs.
- 6) Field Service Parts Obsolescence : Reserves taken due to obsolescence and scrap. Field Service Parts are those inventory kept at location outside the four walls of the manufacturing plant i.e., distribution center or warehouse.

What inventory carrying costs do not consist of :

- all the necessary handling of the goods and/or materials,
- the depreciation of the goods and/or materials.

Those are actually already included in the internal logistics costs above.

Inventory Carrying Cost Rate: The inventory carrying cost rate is applied on the average annual inventory in order to estimate the cost of having inventory into a specific firm or industry. The average industry accepted and used rate is estimated at 20 percent²⁰.

$$\frac{\text{TOTAL SCM \& LOGISTICS COSTS}}{\text{INTERNAL COSTS + OUTSOURCING COSTS + INVENTORY CARRYING COSTS}} =$$

Inventory carrying costs and outsourcing costs cannot be put in terms of GDP, since they are accounting-based, and not a real economic activity. Both are compared to gross margins. On the other hand, internal costs can be compared both to GDP and to gross margin.

Logistics and SCM costs vary widely by sector. The proportion of internal costs, outsourcing costs and inventory carrying costs is also different between sectors. For example, in a JiT mode, internal costs tend to increase, but this is balanced by a reduction in the inventory carrying costs; this happens in volatile sectors, such as upscale clothing, computers and perishable goods.

Annex II - Definitions

Collaborative Planning Forecasting and Replenishment (CPFR): Trademark registered by the VICS (Voluntary Interindustry Commerce Standards) in 1996 designating an approach of collaboration and integration of the forecasting and planning processes between customers and suppliers. A certain number of test operations have been conducted between manufacturers and distributors in the area of mass consumer products, but it is also starting to be used between manufacturing companies. Partner companies (distributors, manufacturers, suppliers, etc.) exchange information on product sales and forecasts in order to synchronize their operational plans. This approach also integrates the downstream information flow to take account of manufacturing constraints.

Fill Rate: The percentage of order items that the picking operation actually fills within a given period of time.

Forecast: An estimate of future demand. A forecast can be determined by mathematical means using historical data; it can be created subjectively by using estimates from informal sources; or it can represent a combination of both techniques.

Gross margin: This value is obtained by calculating: total operating revenue- cost of goods sold.

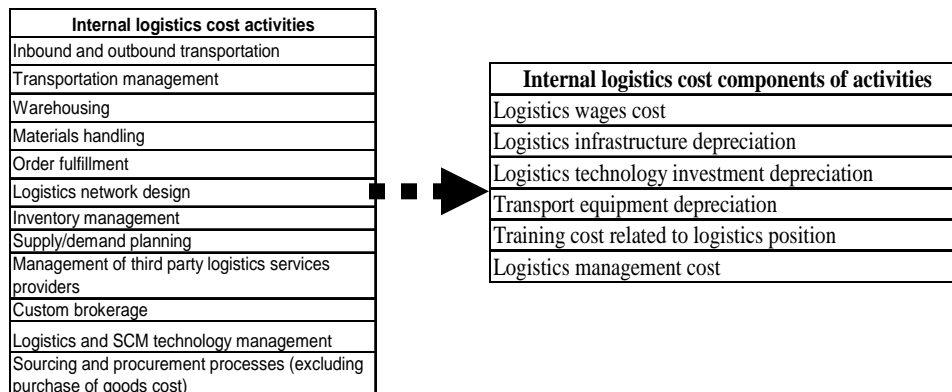
Total operating revenue: The sum of sales of goods purchased for resale, commission revenue, sales of goods produced, repair and maintenance revenue, revenue from rental and leasing and other operating revenue.

Cost of goods sold: This value represents the cost value of goods sold and recognized in revenue, during the reporting period. It is determined by calculating: Opening inventory + Purchases - Closing inventory.

Hub: A reference for a logistics network as in “hub and spoke”, which is common in the airline and the trucking industry.

Input: The sum of all goods and services purchased by a firm or an industrial sector.

Internal logistics cost: Internal logistics cost encompasses all logistics activities that occur within a firm, such as a manufacturer, wholesaler and retailer. It excludes all outsourced logistics activities and all production process. Individual firms can evaluate their internal logistics cost by adding their respective logistics cost activities and their components as stated in the table below.



The estimates of internal logistics cost in this report were compiled via that specific methodology:

- 1- Estimate the selected occupation share of the compensation for the third-party logistics sectors (the components of transportation and storage) at the most detailed sector level for which GDP is available
- 2- Apply this share to sector GDPs to get an aggregate GDP weight for the logistics wage bill
- 3- Calculate the logistics wage bill based on selected occupations for total manufacturing, for the selected level of manufacturing detail, for wholesaling and retailing
- 4- Apply the GDP weight to the estimated logistics wage bill to get an estimate of own-account in each of the required GDP aggregates

Intermodal Transport: Use of two or more different carrier modes in the through movement of a shipment.

Inventory Carrying Cost: One of the elements comprising a company's total supply chain-management costs. These costs consist of the following :

- 1) Opportunity Cost : The opportunity costs of holding inventory. This should be based on your company's own cost of capital standards using the following formula. Calculation : Cost of Capital x Average Net Value of Inventory
- 2) Shrinkage : The costs associated with breakage, pilferage, and deterioration of inventories. Usually pertains to the loss of material through handling damage, theft, or neglect.
- 3) Insurance and Taxes : The cost of insuring inventories and taxes associated with the holding of inventory.
- 4) Total Obsolescence for Raw Material, WIP, and Finished Goods Inventory : Inventory reserves taken due to obsolescence and scrap and includes products exceeding the shelf life, i.e. spoils and is no good for use in its original purpose (do not include reserves taken for Field Service Parts).
- 5) Channel Obsolescence: Aging allowances paid to channel partners, provisions for buy-back agreements, etc. Includes all material that goes obsolete while in a distribution channel. Usually, a distributor will demand a refund on material that goes bad (shelf life) or is no longer needed because of changing needs.
- 6) Field Service Parts Obsolescence : Reserves taken due to obsolescence and scrap. Field Service Parts are those inventory kept at location outside the four walls of the manufacturing plant i.e., distribution center or warehouse.

Inventory Carrying Cost Rate: The inventory carrying cost rate is applied on average annual inventory in order to estimate the cost of having inventory into a specific firm or industry. The average industry accepted and used rate is estimated at 20 percent²⁵.

Inventory Turns: The cost of goods sold divided by the average level of inventory on hand. This ratio measures how many times a company's inventory has been sold during a period of time. Operationally, inventory turns are measures as total throughput divided by average level of inventory for a given period; how many times a year the average inventory for a firm changes, or is sold.

Just-in-Time (JIT): Lean Manufacturing model developed initially by the engineer Taiichi Ohno at Toyota which consists of monitoring and controlling the production system to eliminate all sources of waste, in particular related to intermediate stocks and poor quality. Production is thus equal to demand at all stages of the process.

Key Performance Indicators (KPI): A measure which is of strategic importance to a company or department. For example, a supply chain flexibility metric is Supplier-On-time Delivery

Performance which indicates the percentage of orders that are fulfilled on or before the original requested date.

Lead Time: Quantitative indicator measuring the time difference between stimulus and response. This indicator can be applied to different levels of the logistics process, for example to measure the actual time taken between the placing of an order and the delivery of a product.

Lean Logistics: Characterized by high frequency replenishment and freight consolidation utilizing networks of crossdocks and milkruns. It promotes continuous flow of products from origin to destination by the pull of actual consumption and thereby eliminates wastes. The results are low inventory, high availability, resource smoothing, and improved asset utilization at low costs.

Lean manufacturing: A management philosophy focusing on reduction of the 7 wastes (Over-production, Waiting time, Transportation, Processing, Inventory, Motion and Scrap) in manufactured products. By eliminating waste (muda), quality is improved, production time is reduced and cost is reduced. Lean "tools" include constant process analysis (kaizen), "pull" production (by means of kanban) and mistake-proofing (poka yoke).

Outsourcing: Corporate decision to assign activities, previously performed internally, to a third-party (for example, a Logistics Service Provider). Initially, the shippers (manufacturing or commercial companies) outsourced transport, and then progressively did the same for more value-added logistics services (Co-packing for example).

Radio Frequency Identification (RFID): RFID is a data collection technology that uses electronic tags to store identification and a wireless transmitter and reader to capture it.

Six Sigma Quality: A term used generally to indicate that a process is well controlled, i.e. tolerance limits are ± 6 sigma (3.4 defects per million events) from the centerline in a control chart.

Supply Chain Management (SCM) Collaboration: Approach to managing and synchronizing all the processes enabling one or more customer / supplier systems to take into account and respond to expectations of the end customers (from the supplier of the supplier to the customer of the customer). This approach is designed to increase the value created for the customer and improve the economic performance of the participating companies.

Warehouse Management System (WMS): Computer application, and component of SCE packages, with the goal of managing and optimizing warehouse operations.

Annex III – Inventory Management Data

Manufacturing Sector - Historical Inventory Turns Ratios					
Raw Materials			Finished Goods		
	Canada	U.S.		Canada	U.S.
1992	17.87	23.73	1992	22.47	22.77
1993	19.31	24.26	1993	25.07	23.63
1994	19.97	24.86	1994	26.62	24.94
1995	19.78	24.38	1995	26.76	24.61
1996	19.59	24.51	1996	26.05	24.41
1997	20.3	25.71	1997	26.24	25.45
1998	19.47	25.25	1998	26.49	25.34
1999	21.24	26.3	1999	29.01	25.61
2000	21.15	25.7	2000	29.31	24.95
2001	20.05	25.05	2001	26.16	23.6
2002	21.18	26.79	2002	27.47	24.87
2003	21.03	27.8	2003	26.94	25.24
2004	22.28	29.44	2004	28.92	26.65
2005	21.57	29.31	2005	27.83	26.69

Wholesale Sector - Inventory Turns ratio - 2003			
Canada		U.S.	
Wholesale Trade Total	11.47	Wholesale Trade Total	13.46
Farm Product Wholesaler-Distributors	19.12	Farm Product Raw Materials	11.46
Petroleum Product Wholesaler-Distributors	55.62	Petroleum and Petroleum Products	47.93
Food, Beverage and Tobacco Wholesaler-Distributors	18.76	Grocery and Related Products	19.00
Personal and Household Goods Wholesaler-Distributors	7.72	Furniture and Home Furnishings	7.93
Motor Vehicle and Parts Wholesaler-Distributors	15.77	Motor Vehicle and Motor Vehicle Parts and Supplies	9.23
Building Material and Supplies Wholesaler-Distributors	7.99	Lumber & Other Construction Materials	10.78
Machinery, Equipment and Supplies Wholesaler-Distributors	7.23	Machinery, Equipment, and Supplies	4.96

Retail Sector - Inventory Turns ratio - 2003			
Canada		U.S.	
Retail Trade Total	5.35	Retail Trade Total	7.55
Motor Vehicle and Parts Dealers	4.47	Motor vehicle and parts dealers	5.75
Furniture and Home Furnishings Stores	3.46	Furniture, home furnishings, electronics, and appliance stores	6.98
Electronics and Appliance Stores	4.19		
Building Material and Garden Equipment Dealers	4.03	Building material and garden equipment and supplies dealers	6.92
Food and Beverage Stores	12.42	Food and beverage stores	14.78
Clothing and Clothing Accessories Stores	2.69	Clothing and clothing accessories stores	4.75
Sporting Goods, Hobby, Book and Music Stores	2.34	Department stores	5.80
General Merchandise Stores	4.81	General merchandise stores	7.04
Convenience Stores	11.27		
Gasoline Stations with Convenience Stores	21.04		
Gasoline Stations	26.99		
Health and Personal Care Stores	5.49		

Annex IV –Logistics Internal Cost Data

Internal costs in Logistics for Canada		
	Share of Gross Output	Share of GDP
Manufacturing	4.4%	7.1%
Food manufacturing	5.5%	10.4%
Textile and textile product mills	5.2%	7.3%
Wood product manufacturing	6.4%	8.9%
Petroleum and coal products manufacturing	0.6%	2.5%
Chemical manufacturing	3.3%	5.3%
Pharmaceutical and medicine manufacturing	2.7%	3.6%
Non-metallic mineral product manufacturing	15.1%	17.1%
Fabricated metal product manufacturing	5.8%	6.8%
Machinery manufacturing	4.2%	4.8%
Computer and electronic product manufacturing	2.8%	6.1%
Motor Vehicle Manufacturing	1.3%	4.0%
Motor Vehicle Body and Trailer Manufacturing	4.9%	7.5%
Motor Vehicle Parts Manufacturing	5.7%	9.7%
Aerospace Product and Parts Manufacturing	3.1%	3.9%
Furniture and related product manufacturing	5.6%	6.5%
Wholesale trade		18.3%
Farm Product Wholesaler-Distributors	10.3%	
Petroleum product Wholesaler-Distributors	17.0%	
Food, Beverage and Tobacco Wholesaler-Distributors	33.7%	
Motor Vehicle and Parts Wholesaler-Distributors	18.2%	
Building Materials and Supply Wholesaler-Distributors	21.1%	
Machinery, Equipment and Supplies Wholesaler-Distributors	11.5%	
Retail trade [4A]		11.5%
Motor Vehicle and Parts Dealers	14.9%	
Furniture and Home Furnishing Stores	15.3%	
Electronics and Appliance Stores	9.2%	
Building Material and Garden Equipment Dealers	29.2%	
Food and Beverage Stores	7.0%	
Clothing and Clothing Accessories Stores	5.8%	
Sporting Goods, Hobby, Book and Music Stores	7.3%	
General Merchandise Stores	18.4%	
Convenience Stores		
Gasoline Station with Convenience Stores		
Gasoline Stations	1.7%	
Health and Personal Care Stores	7.5%	

Source: Statistics Canada, Census, Input-Output Data and Jacobson Consulting Calculations

Annex V – Logistics Outsourcing Data

Outsourcing in logistics (Percentage of inputs)			
	Gap	Canada	US
Food and beverage and tobacco products	60%	2.1%	3.37%
Textile mills and textile product mills	597%	0.6%	4.18%
Apparel and leather and allied products	433%	0.4%	2.13%
Wood products	104%	2.1%	4.29%
Paper products	10%	4.4%	4.85%
Printing and related support activities	124%	1.5%	3.36%
Petroleum and coal products	75%	0.8%	1.40%
Chemical products	74%	1.7%	2.96%
Plastics and rubber products	340%	1.0%	4.40%
Nonmetallic mineral products	175%	2.6%	7.15%
Primary metals	160%	2.2%	5.73%
Fabricated metal products	50%	1.5%	2.25%
Machinery	94%	1.0%	1.94%
Computer and electronic products	135%	0.6%	1.41%
Electrical equipment, appliances, and components	102%	1.0%	2.02%
Pharmaceutical and medicine manufacturing		0.63%	
Motor vehicle manufacturing		1.17%	
Motor vehicle body and trailer manufacturing		1.49%	
Motor vehicle parts manufacturing		1.10%	
Aerospace product and parts manufacturing		0.52%	
Other transportation equipment	193%	0.6%	1.76%
Furniture and related products	145%	1.1%	2.69%
Miscellaneous manufacturing	143%	0.8%	1.94%
Total Manufacturing	79%	1.6%	2.86%
Total Retail	218%	0.51%	1.62%
Total Wholesale	4%	1.44%	1.50%
Notes: Canadian logistics includes transportation margins, both exclude pipelines			
Source: Statistics Canada, BEA, Jacobson Calculation and Author Calculations			

Annex VI - References

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 - ⁷ Industry Canada estimates based on Custom tabulation, Input Output Division, Statistics Canada, 2005
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 - ¹¹ Industry Canada estimates based on Statistics Canada, Cansim II, 2005
 - ¹² Industry Canada estimates based on Statistics Canada, Cansim and Bureau of Census, 2005
 - ¹³ Industry Canada estimates based on Statistics Canada *Annual Wholesale Survey* 2003, U.S. Bureau of the Census *Monthly and Annual Wholesale Trade Surveys* 2005
 - ¹⁴ Industry Canada estimates based on Statistics Canada *Annual Retail Trade Survey* 2003, U.S. Census *Retail Indicators Branch* 2005
 - ¹⁵ Industry Canada estimates based on Statistics Canada, Cansim and Bureau of Census, 2005
 - ¹⁶ Industry Canada estimates based on Statistics Canada, *Statistics Canada Annual Wholesale Data* 2003, *Statistics Canada Annual Retail Trade Survey* 2003
 - ¹⁷ *Supply Chain Inventory Strategies Benchmark Report*, Aberdeen Group, December 2004
 - ¹⁸ The Quiet Revolution in Supplier Management, Aberdeen Group, June 2005
 - ¹⁹ Industry Canada estimates based on Statistics Canada, Cansim, Jacobson Consulting's calculations
 - ²⁰ Industry Canada estimates based on Census 2001 - special tabulation and Jacobson Consulting' calculations
 - ²¹ Industry Canada estimates based on Statistics Canada, BEA, Jacobson Consulting' calculations
 - ²² Industry Canada estimates based on Cansim
 - ²³ Industry Canada estimates based on Cansim and Jacobson Consulting' calculations
 - ²⁴ Industry Canada estimates based on Statistics Canada, special tabulation, *Annual Wholesale Trade Survey*, 2005
 - ²⁵ 16th Annual State of Logistics Report, CSCMP, 2005
 - ²⁶ Strategic HR Study of the Supply Chain Sector, Canadian Logistics Skill Committee and Deloitte Consulting, July 2005