

E-commerce Logistics in Canada

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Introduction

E-commerce, both B2B and B2C, has increased significantly over the last decade. Some research also includes C2X (consumer to all parties) as part of e-commerce (Allen et al., 2017). However, given that the biggest change has been in B2B and B2C, most studies focus on B2B and B2C only. For B2B, the impact of e-commerce is twofold: online purchases and services. A study in Malaysia showed that 70% of B2B buyers now purchase goods online (Ministry of International Trade and Industry (MITI), 2016). Services are now also benefiting from the online option (also referred to as modernization or digitalization) (USPS, 2017). Examples range from a request for proposals, submitting tender documents and providing responses electronically, to Governments' providing online services to the public (MITI 2016; USPS, 2017).

For B2C e-commerce, the focus is on online purchases of customers and their potential impacts on different players in the supply chain. With global B2C e-commerce sales exceeding \$1 trillion (Figure 1), all studies report a double-digit growth in the B2C e-commerce sales over the last decade (MITI 2016; Rodrigue, 2017). A major part of the B2C e-commerce is comprised of the "Parcel Delivery". The parcel delivery market, also referred to as CEP (Courier, Express, and Parcel), is defined as "time sensitive shipments with consignments usually less than 32 kg, delivered on a door to door basis" (Rodrigue, 2017). Some of the factors influencing this growth have been identified as stated below (Allen, Piecyk, & Pietrowska, 2017; Rodrigue, 2017; USPS, 2017).

- Favorable demographics (people's ability to use the technology and internet),
- Infrastructure (both roads and digital), and
- Government interventions.

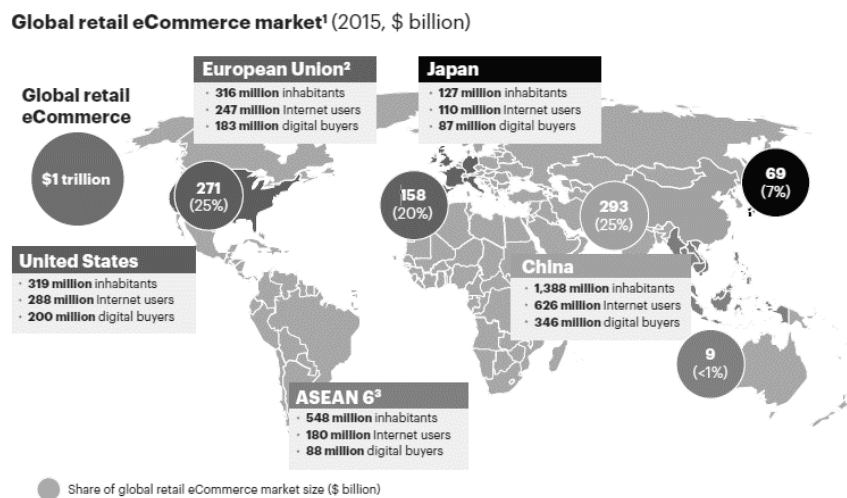


Figure 1 Worldwide Growth of E-commerce (Source:(MITI 2016))

The remainder of the paper is organized as follows. First, a review of how the e-commerce supply chain is different from the traditional supply chain is presented, followed by what potential implications this could have on the first-, middle-, and last mile operations along with a review of existing or potential policies that could be considered by different levels of government to manage the impact of e-commerce. The paper concludes with an initial thought on data needs for understanding e-commerce, and potential next steps for this study.

Impact on Supply Chain Operations

Before the boom of e-commerce, the distribution channel from production to the customer, also referred to as the traditional supply chain (Figure 2) could be summarized as:

- Production/Make: The goods being produced by the manufacturer
- Inventory/Move: Goods being transported to and stored at warehouses and distribution centers
- Retailers/Sell: Goods being transported to retailers or the points of sale where end users (customers) would then travel to and purchase their goods.

Another way of categorizing the supply chain stages is through the first, middle, and last mile operations, as defined below.

- First Mile: Transportation from the country of origin to the first point of entry in the country of destination for products made outside of a country. For products manufactured in a country, this will be the point products depart production facilities.
- Middle Mile: Transportation from the port of entry (or manufacturer if product is made in the same country) to the regional hubs, or warehouses/distribution centres.
- Last Mile: The portion of supply chain where products are delivered to end stores or customers.

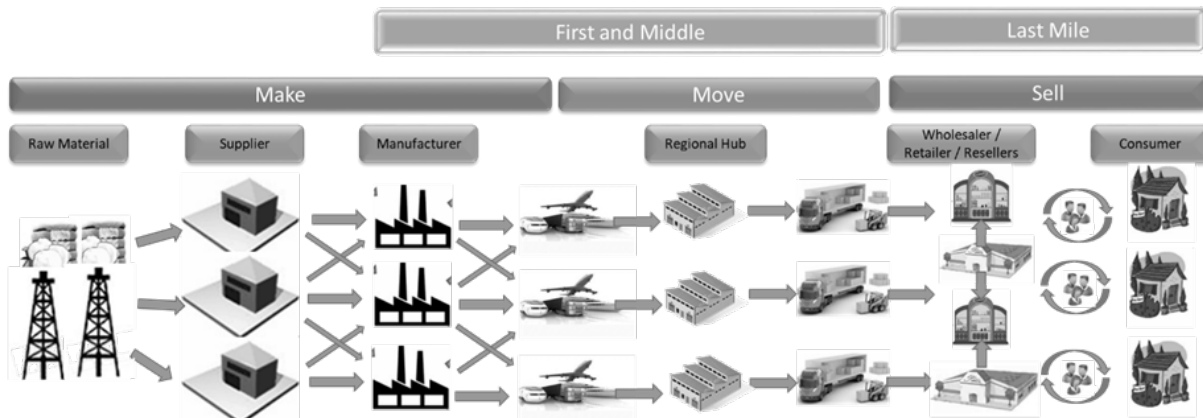


Figure 2- Traditional Supply Chain

From a transportation perspective, in the traditional supply chain, truck traffic was driven by the needs of the retail store, and shopping trips would be generated by customers traveling to the stores. With the birth of e-commerce, the demand for trucks is being replaced by “people in their homes and apartments ordering smaller amounts of goods with higher frequency”. This has implications on all aspects of the supply chain. Examples include: products being shipped to customers directly from the manufacturer (affecting where warehouses should be located), impact on the number of shopping trips (has it really decreased or not?), small truck demand (required to make the door-to-door deliveries), the risk of unsuccessful deliveries (failed delivery attempts), and product returns and its impacts. With the introduction of express delivery (or prime service), having an easy and effective return process is vital for the success of any retail company entering e-commerce. Customer surveys show that having a complicated, costly return process to an online retailer would make it less likely for customers to continue using that retailer.

Figure 3 shows schematics of how e-commerce has impacted the traditional supply chain that were found through our review, and personal communications. For each of the schematics, company examples are provided as well. As shown in Figure 3 (and supported by the review of literature and studies available, and personal communication) the major impact of e-commerce is on the last mile.

It should be noted, however, that even with the significant increase in on-line retail over the last decade, on-line retail still only accounts for approximately 8-10% of the entire retail in the US (Goodchild & Ivanov, 2018), which means most people still do their day-to-day retail in regular stores. Some of the recent surveys reviewed show that online shopping is not expected to replace in-store shopping but it will

supplement it. The next section present more discussion on the impact of e-commerce on the first, middle, and last mile and potential policies for addressing each of those impacts (found through this review and in discussion with different stakeholders).

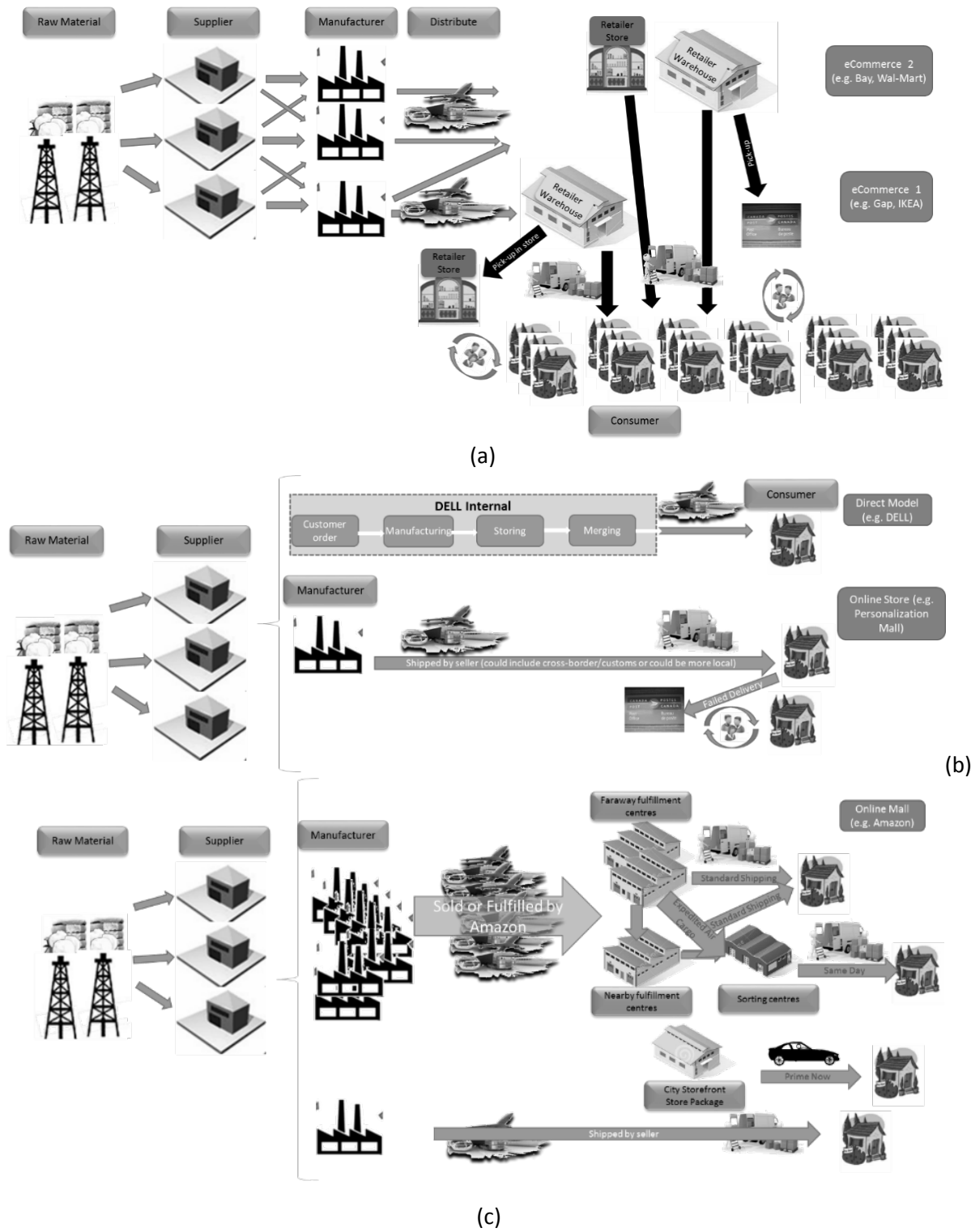


Figure 3 E-commerce Schematic Where the Seller Offers a) in-Store and Online Served; b) Online Only; 3) Online Mall (Source: Developed by Authors)

Potential Impacts and Policies on Segments of the Supply Chain

First Mile

According to some estimates, “international e-retail shipments could account for 20% of global air cargo volumes” (Hylton & Ross, 2018). In other words, with the growth of international e-commerce, more and more people are ordering things from another country.

The mode of transportation used for the first mile is mostly either sea or air. The major impact on the first mile is believed to be on cross-border shipments. The term cross-border e-commerce (CBEC) is defined as the buyer and seller are not located in the same country and are often not ruled by the same jurisdiction, and would use different import methods, currencies, and languages. As such, dealing with different cultures and regulations, along with longer distances and waiting times make the CBEC management more critical and associated with more risk compared to the middle mile (Giuffrida, Mangiaracina, Perego, & Tumino, 2017). In almost all cases there is a longer wait and higher cost associated with receiving those items.

A study in the Asian Journal of Shipping and Logistics reported that “relative to maritime network, air transport network is negatively associated with the degree of Overseas Direct Purchase (ODP)”. In other words, air shipment (for OPDs) is more expensive than other surface transportation modes. This means that although the number of OPDs has increased, these shipments can rarely be delivered under express (prime) or 1 to 2 days, and are usually given a 1-month window for delivery transported through sea (Cho & Lee, 2017). As such, some research suggest that air will only be used when “demand was not predicted far enough ahead” (Hylton & Ross, 2018). There are some cases of CBEC where the parcel will be shipped by other modes such as truck or rail (potentially for very close distances). These items will still impact require to go through customs.

From an operational perspective, the growth of cross-border e-commerce can have the following impacts.

- The more international shipments arrive at a country, the more resources are required to clear those items for border crossings.
- In many cases of C2X, the sellers will not identify the package as being commercial, and will ship it as a gift. This could have security implications as the receiving country will not know who is shipping what in many cases.
- The more CBEC, there more resources would be required for duty collection as well. This is also impacted by a country’s de minimis. This is discussed in more detail under NAFTA. But there are studies (such as McDaniel et al. (2016)) that suggest that in some cases it could cost the government more money to collect duties on items than the duties it will collect.
- Lastly, and on a more general level, a few recent studies suggest that the growth of e-commerce (and commerce in general) could lead to changing the general distribution patterns. For example, smaller airports that currently do not see a huge cargo movement could become good candidate for large e-retailers as they invest in their own distribution network.

Middle Mile

As the result of growing e-commerce, two (2) impacts have been identified on the middle mile of the supply chain: 1) shift from truckload to less than truckload (LTL); and 2) changes in origin and destination pairs. In other words, more and more companies are relocating their warehouses to more accessible locations (accessibility to airport, city centre, etc.), or have added to the number of warehouses/fulfillment centres they own. Data related to 127 airports in the US showed that 32% of brick-and-mortar facility floor area is within 25 km of the 127 airports, while just over half (52%) of the e-retail facility floor area is within 25 km of the airports (Hylton & Ross, 2018).

One recent research by Hylton and Ross (2018) suggests that the growth of e-retail may have impacts on the general distribution pattern of cargo in a country which “may reshuffle cargo volumes among airports”. This would result in the need for better access to what is now a local mostly passenger airport to serve more cargo planes land and also may require more loading docks to serve the growing truck demand.

In addition, the following two changes were identified through personal communication with different stakeholders.

- In most cases distribution centers and warehouses have been replaced by fulfillment centres and now have dual usage. In short, they not only serve as the last point in the middle mile and the point of delivery to local stores, but many online orders can be directly shipped from these fulfillment centres to the final customer (as shown in Figure 3).
- In terms of a large online retail company (e.g. Amazon), their significant growth and investment in the logistics operations could result in reducing the visibility of the network operations for network operators.

Last Mile

As stated previously, with the available data, the main impact of e-commerce has been identified on the last mile. As the result of growing B2C e-commerce, factors impacting the last mile delivery have been identified as follows.

- Growing demand during peak periods
- Complexity of the growing demand (need for a fast, reliable, and convenient delivery)
- Product return which represents a sizeable proportion
- Failed deliveries which have to be rescheduled.
- The introduction of free/prime delivery by many e-retailers to attract customers.

As the result of the above factors, potential impacts on the last mile have been identified as: increase in curbside parking activity (double-parked vehicles), and increased congestion and pollution. Given the significant changes in the last mile delivery, major couriers are implementing strategies to improve their last mile delivery. Examples of such strategies are: Specifically designed vehicles (such as e-bikes), Use of Big Data and better software management, delivery lockers & customer pick-up and drop-off points, and crowdshipping.

In addition to the above initiatives (which are well represented in the literature), on difficulty for freight operators is finding affordable local depots” from which to operate the last mile (Allen et al., 2017).

However, one key missing element is understanding the profile of the deliveries, both in terms of scale and frequency (i.e. freight trips generated by each residential unit). ***This missing data has been identified as one of the key challenges in quantifying the impact of e-commerce at all stages.*** Many cities and countries (e.g. Seattle, NY, UK) are addressing this through partnering with universities as a link to obtain data.

Other

The growth of e-commerce could have other impacts as well which were beyond the scope of this study. One that has been identified as “major public issue” by medical sources is the illegal advertisement and selling of drugs such as Performance and Image Enhancing Drugs (PIEDs) on e-commerce.

The following table provides a review of existing or potential policies that could be considered by different levels of government to manage the impact of e-commerce. Given that the main impact of e-commerce is on the last mile, most of the policies are also focused on the last mile. What is clearly shown in the table and has been identified through this research is the lack of clear understanding of the e-commerce flow at different stages.

Table 1- Potential Policies

	Policy	Associated Level of Government
First Mile	Import regulations / Tariffs	
	Free Trade Zones	
	Partnerships with E-sellers	National Post/ CBSA
Middle Mile	Motor Vehicle Safety Act and/or Highway Traffic Act	Provincial/ Territorial
Last Mile	Motor Vehicle Safety Act and/or Highway Traffic Act (Carriage of Goods)	Provincial, Federal
	Partnerships with E-sellers	All
	Modifying zoning codes	Municipal
	Curbside activity law	Municipal
	Allowed time for trucks to use the curbside	Municipal
	Implementation of “package delivery zones”	Municipal
	Cordon-based or Distance- Based freight road pricing	Municipal
	Restricting light truck access (e.g. only LEVs)	Municipal
Crowd deliveries	Private Companies / Carriers	

Survey and Data Needs

The following surveys (specifically designed for understanding different aspects of e-commerce) were identified through this study.

1. Survey of apartment buildings (either residential or business) which can be used for estimating the number of last mile freight trips.
2. Shopping surveys / customer surveys to understand what impacts online shopping decisions.
3. Interviews with key stakeholders in the system (shippers, carriers).

Existing data sources and additional data that could potentially be used for the purposes of understanding e-commerce chain could include the followings.

- Understanding the real cost and benefits of CBEC
- Data on the volume of parcels that enter Canada
- The business directory over the last 10 years could potentially provide insight as to how depot locations have changed over the years
- Warehouse usage (fully e-commerce vs. dual usage), and warehouse location (accessibility to airport, city centre, etc.)
- Mode of transportation (train, truck or airplane) and size of shipment (TL vs LTL) used by different industries for the middle mile
- For the last mile, the important question will be on understanding the adverse impacts of the delivery (congestion, emissions, delay, cost, return rates, etc.). Customer and carrier surveys, field observations are the main source of information for the last mile. Supplementary information could be gathered through existing data such as parking violation records or parking payments.

Conclusions

This study was initiated to answer some key questions related to the growth of online shopping and its impact on the supply chains and more importantly the transportation network. The project looked at available conference/journal papers, reports and studies by different jurisdictions, and personal communications with different stakeholders.

Key research results can be summarized as follows.

- Online shopping is growing rapidly in all countries; however, the total amount of e-commerce is still a very small part of the total retail of a country (about 10%).

- The most impact is on the last mile where significant research has been focused.
- In terms of the first mile, the main challenge has been identified as border crossing challenges associated with the increase in international e-commerce, along with the potential for smaller airports to act as new ports of entry in the future.
- In terms of the middle mile, a couple of recent studies in the US suggest that e-commerce may result in changes in the amount of cargo shipped to each airport.

This report, and other research reviewed by the authors, cannot offer definitive conclusions about the impact of e-commerce on the transportation network. However, all studies do confirm that this industry is still growing, and one of the key challenges is that our forecasting capabilities are limited until (and if) the industry reaches an equilibrium. The need for better data, and gathering of available data along with interviewing carriers and e-retailers is a key requirement for any further analysis.

Acknowledgements

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