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Operating the Transport Function Internally – A Viable Option?

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Abstract

At one point or another, insourcing and outsourcing of transport services becomes a dilemma that companies must deal with in order to stay competitive. It is very common for companies to outsource functions of the supply chain that do not qualify as their 'core competency.' The motivation behind this case study is to provide justification in allowing companies to understand that, although a function may be cheaper to operate internally, theory and experience may prove otherwise.

I have been asked by Company X to act as a consultant in creating a tool that can be used to accumulate the costs involved in operating the transport function of the supply chain internally. In order for the company to stay competitive from insourcing, the outcome, (including cost), must be a positive reflection and also gain value. If determining organic costs of the operation will give the company a perspective on total costs, Company X will determine if they will bring the outsourced function in-house, or keep it as an outsourcing function, but use the results from the model as negotiation material. There are three expected contributions connected to this case study: proposed model, case study, result of applying the model and testing the model, based on empirical material.

After extracting material from industry best practices, interviews with transportation professionals, as well as government sources, the results prove that operating internally will reduce initial costs. However, when aspects like experience and training are taken into consideration, the results may prove otherwise. From a theoretical and experimental perspective, using an external party proves to be the best option.

Key Words: Outsourcing, Insourcing, Transportation, Core Competency, Dedicated Route, Operational Cost Model, Partnership, Less-than-truckload, Cost, Case Study and Greater Toronto Area (GTA)

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1. Introduction

Outsourcing and insourcing of transport services is a dilemma that many companies are currently dealing with, or have dealt with in the past. Based on past case studies, there seems to be a reoccurring trend relating to the outsourcing of transport services and I plan to elaborate on this trend throughout the duration of this research report.

This chapter will present the background of the problem area investigated in this case study, the purpose and the research question, as well as the scope of the thesis.

1.1 Background

Over last decade, the global economy has shifted in a way that is much more complex and competitive than the latter years of the 20th century. There is a constant effort involved in improving the efficiency and effectiveness in all aspects of the way businesses and organizations operate their supply chain. One of the key objectives creating overall flow in the chain is transportation. Special attention must be devoted to this crucial function in order to solidify accurate performance of the over-all supply chain. According to a *White Paper* article, the transport industry employs more than ten million people, accounting for four and a half percent of total employment and represents just over four and a half percent of Gross Domestic Product (GDP) (EUR-Lex, 2011). Although on a different scale, the ratio is quite similar with regards to the Canadian transportation services sector, which represents four and two-tenths percent of Canada's GDP, or fifty-three billion dollars (Transport Canada_a). Truck transportation represented the largest segment of transportation services in Canada and accounted for thirty-one of the sector's share of GDP (Transport Canada_b). It is evident that the transport industry has been and continues to be one of the main commodities for individuals and organizations across the world. As this industry continues to grow from a business perspective, companies and organizations continue to look for more efficient and effective means of transporting goods, all while remaining sustainable and cost effective. One way several countries have made progress is by introducing a business development that combines both ability and efficiency, and in

most cases, cost reduction for the company: Outsourcing.

The term outsourcing started receiving attention by corporations in the world's most modern economies around the same time as the global economy took a positive incline in the late 1900's (Dorwin et al., N.D). Businesses spent a large portion of the 20th century aspiring to gain total control over their core commodities, company assets and distribution channels. This was largely due to the perception that the core value within the firm came from the internal management stream mechanism that controlled the entire production process. However, over the past two decades, those perceptions have been skewed due to the changes in trade and competition, which have increasingly added pressure and demands to the industry as a whole. With competition requiring firms to serve larger regions as well as national markets, improvements within technology in the supply chain continues to create potential economies of scale (Yates, 1989). Ultimately, there will be more advances in communication and transportation, which will in turn create new business models and the way firms delegate their operations. With competition continuing to tighten and increasing demands being justified by shorter lead times, quality, and lower prices, corporations must rely on external sources and outsource operations that are not part of their core competency.

According to Paul Lauria of Automotive Fleet Magazine, countless organizations have discovered through unsuccessful experiences that outsourcing is no panacea. With regards to transportation, some companies will ultimately spend more money on fleet operations when they are certain that outsourcing would allow them to spend less; sometimes such outcomes result from working with unscrupulous suppliers (Lauria, 2002). Through a *2012 Global Outsourcing and Insourcing Survey*, constructed by Deloitte Consulting LLC, the organization stated that although outsourcing continues to go mainstream becoming another standard business practice that should be evaluated as business needs mandate, they were also beginning to see more clients contemplating insourcing functions due to vendor non-performance or changes in business strategy (Deloitte, 2012). When using an external resource for a function of the supply chain, the most important internal and

external responsibility that a company should control and monitor is the communication between both parties. As a result of outsourcing being implemented, the need for co-operation between companies has also increased (Deloitte, 2012).

In the case of Company X, operating the transport function internally is not favorable, simply because it is not their core competency. Company X is fundamentally a science-based company. Producing thousands of imaginative products, as well a leader in scores of markets – from health care and highway safety to office products, abrasives and adhesives, Company X's success begins with their ability to apply technologies, often in combination with an endless array of real-world customer needs. A portion of Company X's transportation management involves the distribution of goods from the company's distribution facility in Milton, Ontario, outbound to other cities in the Greater Toronto Area (GTA). Company X outsources this portion of the transportation function to an external transport carrier (Carrier Y) who focuses their reputation on developing responsive logistics solutions creating a competitive advantage. Over three hundred North American companies rely on Carrier Y for their customized transport solutions, as well as their key performance measures, including International Organization for Standardization (ISO). Carrier Y is responsible for the inbound and outbound distribution of Company X's, Less-Than-Truckload shipments from the distribution center (DC) and around the GTA, all within a 54 km radius. In this case study, Carrier Y has presented potential cost reduction opportunities for Company X in the form of a dedicated transport concept. A dedicated transport concept is a third-party service that dictates equipment (vehicles) and drivers to a single customer for its exclusive use on the basis of the contract (Coyle et al., 2011: 518). In other words, rather than combining Company X's goods with different products from other companies in order to create a full shipment, Carrier Y would solely serve Company X on a specified route. This route is strategically mapped out to serve as a milk run, improving the system that is currently set in place. Carrier Y has projected a 17% cost reduction following the system being implemented; this percentage is not a committed one, but an estimate of the potential savings. If Company X accepts this proposal, Carrier Y would meticulously map out the implications for the final percentage of cost reduction. The

author of this case study is unaware of the model Carrier Y has used to establish these reductions. This case study will determine how much it will cost Company X to bring this portion of the transport operation in-house and then later calculate the difference in cost with regards to Carrier Y's proposal.

1.2 Transportation in the Supply Chain

In the early 1950s, Jay Forrester of Massachusetts Institute of Technology, constructed the "Forrester Effect," an industrial dynamics model that exhibited functions of the supply chain (Forrester, 1961). This revolutionary model has acted as the evolving foundation that positioned itself at the core of most organizations and businesses around the globe. This model described the functions of money, orders, materials, personnel and equipment as five flows in any economic activity being interrelated by an information network, otherwise known today as a supply chain (Forrester, 1961; Gupta et al, 2013). With the increase in technology, and the global demand for resources, trading between countries increased which resulted in creating a high demand for transportation and distribution techniques. It wasn't until the 1980s that the concept of operations like transportation, logistics and distribution management began to merge into a single term familiar today as *Supply Chain Management* (Gupta et al, 2013). The management of the chain is essentially the glue that holds the entire operation in place. The overall objective of Supply Chain Management (SCM) is to integrate the organizational units along a supply chain and coordinate material, information, and financial flows in order to fulfill customer demands, with the intention of improving the competitiveness of a supply chain as a whole (Seiler, 2012). As the overall goal of a company is to remain competitive while decreasing operating costs, two elements remain universal in perfecting this capability; efficiency and effectiveness. Efficiency and effectiveness are often used to describe performance (Möller and Törrönen, 2003). Efficiency is a cost-related advantage and effectiveness is an advantage of customer responsiveness within supply chain management research. This means that efficiency improvements are achieved through operations like *Just-in-Time* production, *lean* and *six sigma* approaches, as well as logistical innovations (where as effectiveness is achieved through customer perception) (Möller and Törrönen, 2003). One function of SCM that plays

an essential role in the efficiency and effectiveness of the overall operation is transportation. Transport flows connect an enterprise with its suppliers and with its customers through the flow of materials. Observed in its totality from a historical, economic, social, and political perspective, it is unquestionably the most important industry in the world (Coyle et al., 2011: 32). There are five main transportation modes that allow the world to operate day-to-day, hour-to-hour and minute-by-minute. These modes include road transport, railways, air, water and pipeline. Each of these modes can operate on a local or international level and are often combined by enterprises to create efficiency, effectiveness, and reduce cost all while improving their carbon footprint. Each of these modes produces positive and negative elements that affect the over-all transport. It has become an endless cycle for companies around the world; continuously working on improvements and innovations that will be more environmentally friendly, yet still add value to the industry. One of the major advances used where corporations can reduce cost, while improving their carbon footprint, is turning to intermodal transportation. Intermodal operations arrange movement of customer's freight in containers and/or trailers over long distances by contracting, and using railroads or waterway for the long-haul portion of the journey. This allows for reduction in greenhouse gasses, eliminates congestion and in most cases, cost reduction. There are positive and negative outcomes that transpire with each decision; therefore, weighing these factors is imperative in the decision making process. The final stage of the pickup and delivery from these ports is dependent on the contractual agreement discussed by both parties. In most cases, the final transportation will be completed via road transport using both truck-load (TL) and less-than-truckload (LTL) vehicles to finish the final route. The vast majority of all Canadian- U.S. freight movement is by truck (Coyle et al., 2011: 113).

1.3 Trucking Sector

In 2003, it was estimated that the trucking sector was a fifty-five billion-dollar/ year industry and growing.¹ The industry consists of three categories of carries: For-hire

¹ Transport Canada: The Trucking Industry in Canada- Sector Overview, 2008. This value excludes owner-operator sector.

carriers, Private fleets and Owner-operator. For the purpose of this research paper, the researcher will focus mainly on For-hire and Private Fleets.

1.3.1 For-Hire

Third party carriers or external carriers, who haul goods for a fee (determined by the contractual agreement) represent the 'for-hire' sector. For-hire carriers are required to have expert knowledge on the ins and outs of operations, as their core competency is within the transportation industry. For-hire carriers use a collaboration of small and large fleets having as many as 3000 tractors, and a similar number of trailers for the most efficient and effective movement of goods. The use of a for-hire service includes the vehicle (tractor or trailer) as well as a driver. When using an external party, all secondary expenses including vehicle maintenance, driver wages, and tire replacements are under the carrier's liability. The for-hire sector represents approximately half of the industry total (Transport Canada, 2008).

1.3.2 Private Carriers

Businesses who maintain a fleet of trucks and trailers for the purpose of moving their own product or goods are considered private carriers. Companies that control the delivery services of the goods are usually associated with a private trucking sector, so they can operate in an efficient and effective manner dependent on the operations of their distribution system. Private fleets may choose to operate using dedicated company drivers, leased drivers, or owner-operators. Many private carriers are also licensed to carry goods for other users in the same manner as a for-hire carrier. Private carriers represent one the largest portion of the three sectors in Canada. The private sector represents just over half of the industry total (Transport Canada, 2008).

The original distinction between these two trucking carriers was for the purpose of granting a fleet an operating license. Currently, with deregulation having a major impact on the trucking industry, these distinctions appeared blurred.

“For example, private fleets can, and often do, haul products for compensation allowing them to find backhaul where they would otherwise have to return empty. Private

fleets are now more likely to contract out some specific freight movements where the for-hire sector can do the movement more efficiently, for example, better load balancing opportunities.” (Transport Canada, 2010 report)

1.4 Truck Load (TL) and Less than Truck Load (LTL)

The structure of a transport system is determined by the size of the single shipment whether it is a full truck/ container or a small shipment that is consolidated with other products. Large shipments can travel directly from the manufacturer to the destination in full transport units and in a single run; whereas, small shipments must be consolidated in a transport network where a single shipment is transshipped once or several times and the products in the transport is broken and further distributed at transshipment points (Fleischmann, 2005: 229). TL carriers provide service to shippers who tender sufficient volume to meet the minimum weights required for a truckload shipment. With the exception of a few international large carries, the TL sector has suffered a major impact with regards to fuel and capacity. Shippers have paid as much as 50% in surcharges on a typical TL freight bill; however, TL carrier executives have privately admitted that there is no sufficient business model to cope with \$135-a-barrel crude oil or \$4.50-a-gallon diesel (Coyle et al., 2011: 134). As a result of the cost escalations, several TL carriers continue to reduce their over-the-road capacity for shorter routes, or look towards intermodal transport for longer hauls. If the focus is on Less than Truckload (LTL) production, there are several different adequate ways of consolidating small shipments that can be achieved by using a Logistics Service Provider (LSP), or keeping the logistics in-house by using a Transportation Management System (TMS) and outsourcing the physical movement. There are multiple combinations that can be formulated to achieve efficient and effective means of transporting goods while reducing costs.

1.5 Reason for Research

After gaining an insightful year of work experience in the transportation department of Company X, there was always an interest regarding the fleet transportation. I, as well as other colleagues had ongoing conversations on whether or not bringing the transportation

fleet in-house would save the company money. Subsequently, after 1.5 years in the Logistics and Transport Management Masters Program, I felt it would be interesting to bring this idea of a proposed model to Company X, knowing full well they were a company who related immensely to the problem area of my research assignment. Due to the scale and scope of the assignment, we were able to narrow down the report to a section that was currently of high relevance to the company. From this point, establishing the model and body of the report would help Company X in upcoming decision-making.

1.6 Problem Area

The problem area that this thesis will analyze is twofold. There has been an increased amount of interest in determining whether or not outsourcing certain operations of the supply chain will not only be cost effective, but value effective. The reason for outsourcing to third party companies is because their core competency is an operation that exceeds that of the original company. Although these third-party logistic (3PL) companies are experts in this specific trade, and will complete the operation in a way that is most efficient and effective, the main problem that occurs is loss of control experienced from the original company. In order for 3PL companies to be profitable, they must charge a premium; however, that may be excessive in comparison to the 'real' cost if the company were to keep the operation in-house. In order for the company to stay competitive from outsourcing, the outcome (including cost) must be a positive reflection and gain value for the company. If determining organic costs of the operation will give the company a perspective on total costs, is Company X willing to bring the outsourced function in-house or will they use it as negotiating collateral for cost structure?

The second problem that may arise is theoretical findings countering the discovered quantitative outcome. In the last decade, there has been an increased amount of qualitative findings that express the positive and strategic features to outsourcing specific trades. Even if the cost of operating an in-house operation is cheaper than if a third party were to operate the function, should Company X follow suit in these theoretical cases despite the price differentiation?

1.7 Purpose

The purpose of this case study is to create a model that will outline a cost structure for a delivery operation that will later be used to illustrate allocated costs involved in transporting goods on a dedicated route.

Creating a cost model that can be used as an organizational tool for potential cost reductions within a function of the supply chain will generate a generic tool that can be used by other companies who may find themselves in a similar situation. The researcher will collaborate these results with the theoretical findings to determine whether the model is feasible enough to change the functional operation, or rather use it as a client-vendor negotiation model.

In order to develop this research strategy outline, the researcher has conducted a case study on Company X, based on a comparative analysis with a presented 'dedicated concept' proposal constructed by Carrier Y (an external transport carrier). In presenting this case study, the researcher expects to use the created model in a different context where an individual will be able to achieve the same results based on the applicable variables that are imputed. Although this model has formulae based on variables found through industry best practices in Ontario, the variables can be easily altered based on the position where one is located.

There are three expected contributions connected to this case study:

1. Proposed Model
2. Case Study and Result of Applying the Model
3. Validating the model based on Empirical Material

These contributions will be executed throughout the duration of this case study, expanded in the following chapters and will be referred back to in the conclusion of the report.

1.8 Scope and Limitations

The aim of this case study is to provide Company X with an insight into what a potential outsourcing function would cost if the operation was brought in house, if the option proved to be viable, the pros and cons of each scenario, and how these implications would impact

the current structure of the company. The paper focuses on situations of both a strategic and operational level.

Company X uses a variety of external parties for the movement of their goods to locations around the world. For the purpose of this case study, the researcher will focus on the implementation of a dedicated route proposal based on an existing route that is currently set in place in the GTA within 30-54 km radius. With that being said, the model presented in the Theoretical Framework can act as a tool providing a cost structure to any company.

2. Research Methodology

In this chapter, the researcher will describe how the problem was approached and the strategy used to collect the information needed to evaluate and analyze the problem.

2.1 Research Design

The research design is the initial plan in which the researcher will determine the guidelines for the data collection and analysis phases of the research project. This is when the researcher will determine the paradigm to follow. A research paradigm is a framework that guides how research should be conducted based on people's philosophies and assumptions about the world and the nature of knowledge (Collis and Hussy, 2009: 11). Within this framework, the structural accuracy of the research and the appropriate methods used is what will allow the research to unfold. One of the primary decisions to be made is whether or not the research will be quantitative, qualitative or both; the researcher will also address the philosophical assumptions that are connected to these decisions.

2.2 Collection of Primary and Secondary Data

The data collection in this thesis is gathered through a variety of sources. Data is obtained from Company X, Carrier Y, books, e-books, newspaper articles, case-studies, semi-structural interviews as well as government sources such as: Transport Canada, Canadian Gazette, Ministry of Transportation (MTO). The sources listed above include both primary and secondary data.

2.2.1 Primary Data

Primary data is generated from an original source such as the researchers own experiments, surveys, interviews or focus groups. In the case of Company X, a quantitative model has been created based on average yearly costs of specific variables gathered from secondary sources. In order to receive valid variables, consulting transportation companies as well as government services via telephone was required to obtain accurate information. Following the researchers submission of the variables, employees from Company X created

a focus group in the transportation department. Here individuals provided insight and suggestions based on the variables that were important and required for generating precise values. Professionals in the transport industry, as well as professionals at Company X, approved the variables in the formula before moving forward. The final step is using the values formulated in the *"LTL Operational Costs"* spread sheet in coordination with the variables and values formulated on the *"In-house Dedicated Concept"* spread sheet. Once the researcher has created an own model in a dedicated concept comparison, the model will be valuable to Company X in future decision-making.

2.2.1.1 Case Study

A case study is a methodology used to explore a single phenomenon (the case) in a natural setting using a variety of methods to obtain in-depth knowledge (Collis and Hussy, 2009: 82). As Yin (2009) describes, the research aims not only to explore a single phenomena, but also to understand them in a particular situation. The research uses multiple methods in the data collecting stage. The case study regarding Company X does just that; uses multiple methods of collecting data, both quantitative and qualitative. While the qualitative characteristics are set as an interpretivist paradigm, the quantitative characteristics follow a positivist approach where the researcher will develop theoretical framework supporting the quantitative model provided to Company X.

There are different types of case studies that can be focused on, subject to the information that the researcher has access to. Some examples include, exploratory case studies, descriptive case studies, illustrative case studies, experimental case studies, explanatory case studies and opportunist case studies (Collis and Hussy, 2009: 82). The case study regarding Company X uses a combination of explanatory and opportunist case studies. Opportunist case studies arise when the researcher has access to a particular business, person or other case. The researcher may be limited to a few aspects of the organizational life; however, the findings that result from the study can be both original and useful for the company in examination (Collis and Hussy, 2009: 82). In this study, the researcher was able to access the Transportation Department of Company X. The researcher will have access to a specific case regarding the potential implementation of a dedicated fleet,

proposed by an external party (Carrier Y), along with Company X personnel needed to overlook the operation.

2.2.1.2 Interviews

Along with the focus group and case study as primary material, this thesis has also stemmed from interviews, both spoken and via e-mail. Spoken interviews were specific and followed a demanding time constraint in order to access the most important information as the interviewee's followed strict schedules. E-mail interviews were useful because they eliminated the pressure of on-the-spot and face-to-face communication. Using e-mail offered more flexibility with the opportunity to pull extensive information, and resulted with documentation on specific reports published for the government. However, as a result, this method created longer response times.

The face-to-face interviews, as well the interviews over the phone, were of a semi-structural nature. In a semi-structured interview, a portion of the questions asked were prepared; however, the interviewer is able to ask additional questions based on the interviewee response and in order to obtain more detailed information about a specific question allowing the interviewee to elaborate on answers (Collis and Hussy 2009:195). The questions asked required answers with specific values, leaving no room for the interviewee to alter the answers. Because these values are related to specific external parties, some of the companies required confidential security on the recorded responses, yet allowed the values to be recorded without the company name disclosed.

This section allowed for a holistic approach in gathering information and, as such, produced high quality answers as the data provided was first hand. Having some of the questions following a predetermined structure ensured that the core of the topics that needed to be touched on were not forgotten and all question/answers reflected relevance. An interview guide of sample questions asked during interviews can be found in Appendix 3.

2.2.2 Secondary Data

Secondary data is data collected from existing sources, such as publications, databases and internal records that may be available in hard copy form or on the Internet. In addition to gathering primary data through the creation of a quantitative model, the specific variables used in this model were generated from reviewing data in secondary sources. The secondary data that was collected in this case study was gathered through Company X's database, Carrier Y's transportation data summary, books, scientific articles, legislation, industry reports, and websites. The secondary data has only been used in the theoretical framework; however, it has been referred to in other chapters. The sources of information were retrieved from online databases and search engines by searching for keywords like outsource, core commodity, transportation, LTL Transportation, TL Transportation, supply chain functions, logistics, dedicated route, value chain etc. After gathering data, the researcher selected sources of information believed to be relevant for the nature of the study. The majority of the information used was gathered via University of Gothenburg and University of Western Ontario educational online hosts. Aside from online books used, books found in the university library were used for further research.

2.3 Qualitative and Quantitative Research

Qualitative and quantitative methods of research are used to describe data collection. It is common that one will usually differentiate between the two methodological approaches to distinguish the type of data that is being collected. Whether the information is easily specified (which usually means it is measurable and is classified as hard data), or whether the data is anecdotal (usually meaning it is gathered through communications and is considered soft data), the researcher will disclose which method is favored.

2.3.1 Qualitative Method

Qualitative methods of research are designed to explore and understand the meaning behind social or human problems (Creswell, 2009: 3). In this method, the process of research usually involves emerging questions and procedures, the analysis of sets of data specifically presented around the theme of the research, and the researcher eventually

interpreting the data from his/her perspective. Qualitative method approach also looks at the meaning of concepts. It tries to identify the attributes that construct it, which is different compared to qualitative approach (Goertz & Mahoney, 2012). Qualitative research is closely associated with interpretivism, which can be described as an inductive process. The aim of this method is not necessarily to determine if the information is valid, but rather choosing an inductive style, focusing on individual meaning, and the importance of understanding the meaning behind it (Creswell, 2009: 4). As such, an interpretation of the social context in which the respondent's function is necessary.

2.3.2 Quantitative Method

Quantitative methods of research are designed to test theories by studying the relationship among proven variables. In general, the quantitative method approach constructs concepts through the identification and collection of indicators that are delineated by the concept. (Goertz & Mahoney, 2012). Quantitative data is normally precise, and can be captured at various points in time and in different contexts. These variables are measurable and the numerical data can be analyzed using statistical procedures. Quantitative research is usually associated with a positivist methodology, which usually results in findings with a high degree of reliability (Creswell, 2009: 4). During the initial phase of this research assignment, a deductive approach was required. This approach allowed the researcher to explore the most valid form of reasoning, later examining the possibility to reach a specific and logical conclusion. The researcher of this case study was able to test the hypotheses and theories through a deductive method.

By the sheer nature of this case study, both qualitative and quantitative methods are needed to defend the research outcome. This approach can ensure a more holistic understanding of the phenomena as the merits of both approaches can act complementary (Collis & Hussey, 2009:7). Determining the projected operational cost for completing an outsourced function in-house was part of a quantifiable method using numerical variables. However, prior to the case study the cost of operating the transportation function internally was unknown, whereas, the outsourced cost had already been expressed. Therefore, determining whether or not insourcing or outsourcing was preferred in *theory*,

despite the cost, was crucial for this investigation. For this reason, choosing a case study as the preferred method is because both qualitative and quantitative data could be collected, as well as primary and secondary data.

2.4 Ontological and Epistemological Assumptions

When conducting academic research there are several different methodological concepts that can be implemented and that can directly affect the process and outcome of the conducted research. For example, if the researcher was to construct the case study based solely on the quantifiable findings of the research it would consequently affect the nature of the results because in this case, the quantifiable results are conflicted by theory researched through qualitative sources. These methods allude to philosophical assumptions that will be further discussed and examined. These concepts are interlinked with each other and assist in defining how the research is conducted.

One major issue that arises when constructing qualitative and quantitative research is the epistemological assumption, which is concerned with what we accept as valid knowledge (Collis & Hussey, 2009: 59). Epistemology studies the philosophy of what is knowledge and what is justified belief. From a positivist approach, the only valid information is that which can be observed and measured. Less attention is put on the concept and more focus is on aggregation and operationalization (Goertz & Mahoney, 2012). The researcher is independent of what is being researched. Interpretivists believe that the nature of reality is subjective and is socially constructed based on people's behavior and thoughts, and therefore there are multiple realities. This approach is more useful in social science but is less convincing in natural science where facts and statistics base the reality (Collis & Hussey, 2009: 58-59).

The other concern that is presented when dealing with both qualitative and quantitative research is the ontological assumption. Positivists state that the basis of positivism signifies that valid knowledge has only been derived from scientific proof and there is only one reality. Interpretivists believe that social reality is subjective because it has been socially

constructed. The interpretivist paradigm has the belief that social reality is subjective because it is shaped by our perceptions; therefore, there are multiple realities (Collis & Hussey, 2009; 59). The positivism paradigm refers to information and data that derives from factual statistics and scientific proof. Knowledge gained from statistical study can be used to complete qualitative survey and thus decrease the level of error (Falconer & Mackay, 1999). Therefore, regardless of the researchers perception of the information, it is valid (Collis & Hussey, 2009; 56-59). The positivist paradigm eliminates any caution toward researcher biasing.

In this case study, both a positivistic and interpretivistic view is suited for the conducted research. The positivistic ontology of this case study is the assumption that the nature of the reality does not change because it is conducted through statistical findings and is therefore not affected by the perception of the researcher. Through the quantifiable model the imputed values are not altered dependent on the researchers point of view, yet recorded directly from the source. The interpretivistic ontology of this case is concerned with what the researcher can accept and define as knowledge. In other words, attempting to interact with the theoretical beliefs of the proposed research and defending the case from a theoretical perception. These philosophical assumptions also complement the nature of the data collected from a reliable and valid standpoint.

2.5 Reliability and Validity

The level of data reliability and validity is important when publishing research literature. What the researcher is presenting is important however, where he/she has gathered the information from is equally important. The researcher must first determine if the research will be a qualitative or quantitative study. The information needs to be separated as either nominal data or numerical data because if these methods are collaborated, it can be difficult for the reader to determine which paradigm is being used (Collis & Hussey, 2009: 63).

Research reliability means that the research can be conducted multiple times by other

researchers and the outcome produces the same results every time. Reliability tends to be high in positivist studies. Validity focuses more on the findings that reflect the phenomenon being studied. Validity tends to be higher in an interpretivist study, where the aim is to gain in-depth knowledge about the investigated phenomenon (Collis & Hussey, 2009). The model that has been constructed in this thesis is quantitative in nature, following a positivist paradigm, which produces a high reliability. The model has settings that can be easily replicated and have also been tested throughout this case study. The model has been constructed in a way that an individual can input values dependent on the company cost structure and produce accurate results based on industry best practices. The model presented has been created to deal with flexibility. The model's results are an accumulated summation of the imputed values; each party can customize the tool in order to cater specified characteristics. In order to obtain accurate information regarding the process in which the researcher plans to investigate, contacting professionals in the industry is necessary in the beginning stages of the case study in order to ensure the respondents have enough time to gather and prepare information/ reports from previous years in order to provide accurate answers. Following communication, whether it was via e-mail or phone, a personal debriefing occurred where the researcher recorded valuable information and imputed the data directly into the report to refrain from misjudgment later in the process. One of the problems the researcher has faced has been a confidentiality issue where a company in the industry can disclose specific company information and contribute to the report, but wish to remain anonymous. When situations such as these have occurred, the researcher has either taken a different route, and formulated data based on provincial and governmental recent reports, or has contacted different individuals from different companies. Another issue that may have slightly hindered the reliability of the report is the use of estimated values. These values have been necessary to include since the alternative of an exact value like fuel is consistently changing. Aside from the slight issues indicated, it can be stated that the reliability regarding the cost model is at a rather high level since all of the values have been evaluated against industry best practices. With validity having a higher focus in a qualitative, interpretivist study, the aim is to gain in-depth knowledge about the investigated phenomenon. With regards to this specific case study, the analysis

and decision making results focus on what the empirical results state compared against what theory states. For this matter, validity is crucial in this case study. The author has constructed research built upon what theory states about the specific topic, but also builds upon an aggregation and compilation of views, ideas and previous completed case studies that relate to the subject matter. The information included is what Company X and the researcher have considered to be critical to the proceedings of the research. In Chapter 3 the research provided under “Economic Cost Models” is crucial in the decision making process of this case study. With material being recorded based on information extracted from scholarly articles, books and past case studies, the published information recorded proves to be valid. Further, to ensure that the cost model is reliable, a sensitivity analysis has been created in order to provide information on how robust the results/ conclusions are within the model.

2.6 Thesis Disposition

The researcher has constructed Figure 1 to display a schematic view of the thesis disposition.

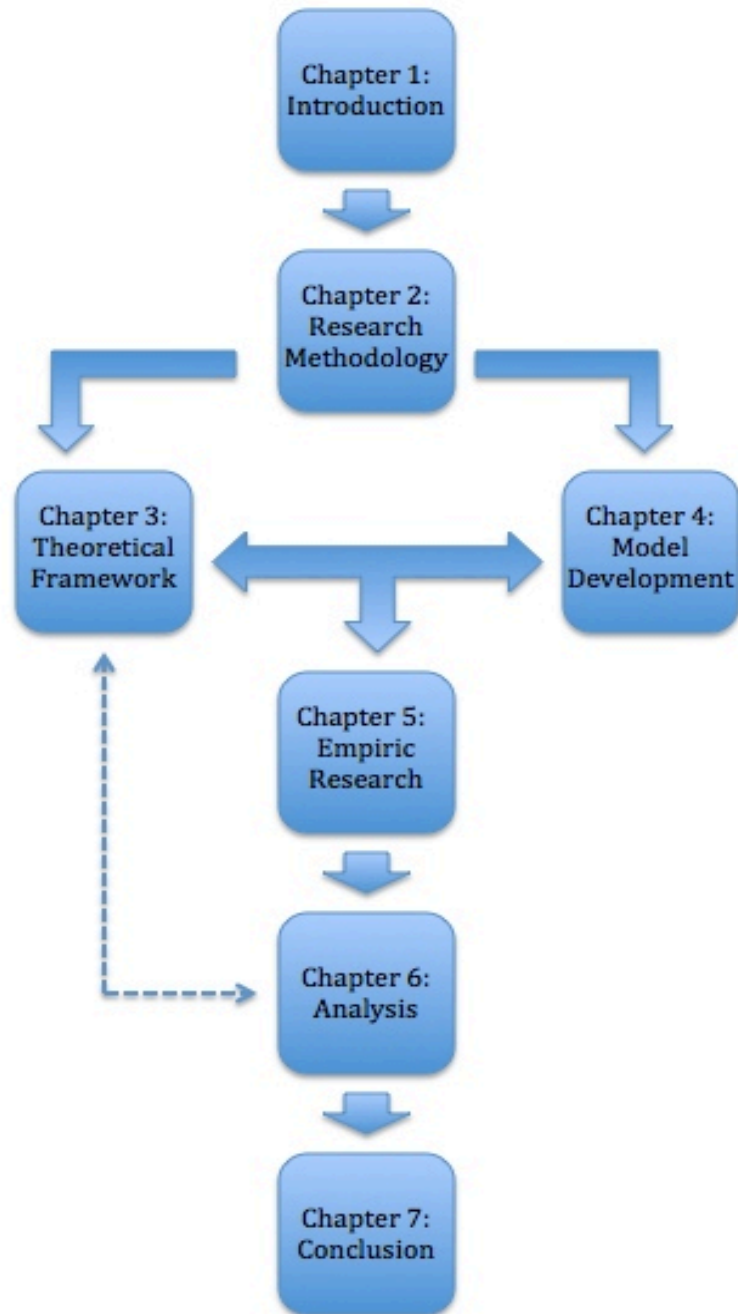


Figure 1: Thesis Disposition

3. Theoretical Framework

This chapter will provide a description of relevant existing theory within the context of outsourcing and insourcing. The chapter forms the theoretical foundation of the thesis. A comprehensive depiction is given on the topic of outsourcing and insourcing, as it is traditionally understood in current research. The chapter is concluded with a section on Economic Cost Models that touch on past case studies and experiences within outsourcing and insourcing of logistic functions.

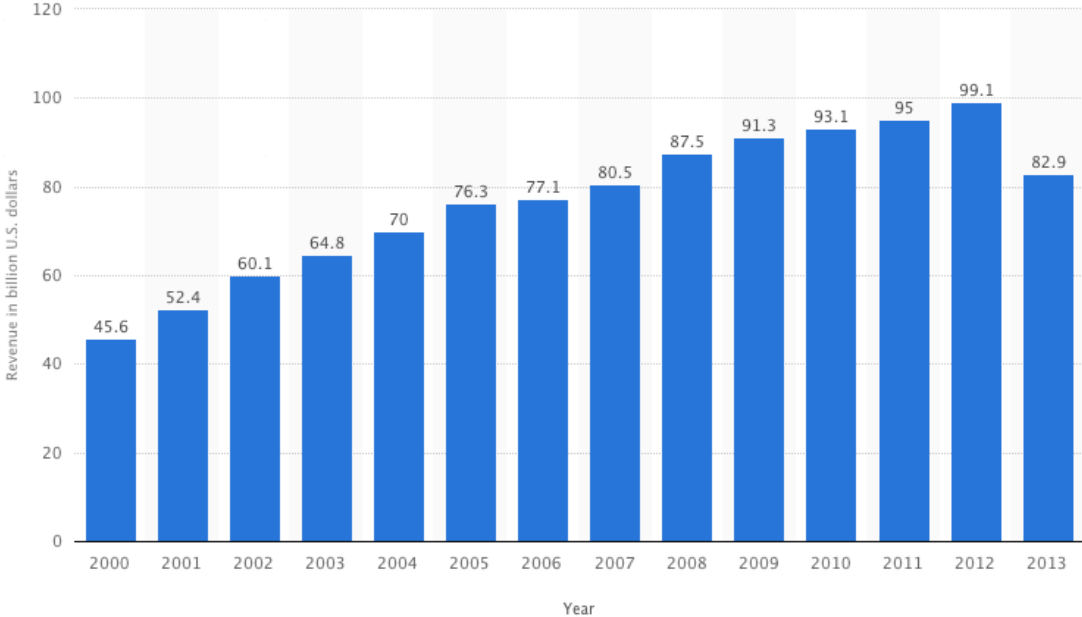
3.1 Outsourcing

Although outsourcing is continually receiving an immense amount of attention, and is currently peaking, it would be senseless to say that this function is a new phenomenon. In essence, the seed that planted these theories dates back to 1885 when businesses began to grow. John Stuart Mill, author of *Principles of Political Economy*, theorized about the benefits of production on a large vis- à-vis small scale (Singh, 2006). Mill explains the theory on a “bigger-is-better” concept. He explains that, in order to obtain hierarchical control “the larger the enterprise, the farther the division of labor may be carried. This is one of the principal causes of large manufactories” (Mill, 1885: 81). Controlling all functions of the business was thought to be the main priority. This theory, as Mill mentioned, evolved over time and led into the post war period, where maintaining high volume of product and manufacturing became stiffer and suddenly obtaining this hierarchal possession of the whole operation was seemingly impossible; help was needed. “In addition to taking advantage of economies of scale, vertical integration allowed access to a wider market and conglomerate/ portfolio diversification provided the potential to benefit from risk spreading and economies of scope” (Singh, 2006: 2). It wasn’t until the late 1900s that Schumacher, author of *Small is Beautiful: Economics as if People Mattered*, focused on a controversial study of the structure of Western economies, and openly challenged the doctrine of increased specialization and the giant corporation reflecting on the philosophical platform of the “small-is-beautiful” paradigm (Schumacher, 1973). Schumacher’s theory was so advantageous because he focused on explaining this economic

phenomenon of low-cost, small-scale technology as an alternative to high-cost, large-scale technology through philosophical themes. With Schumacher changing the paradigm of *bigger-is-better*, taking a *Smaller is Beautiful* approach, different ways of operating have evolved, one of which is outsourcing. Through the paradigm shift towards smaller and more agile organizations, the economy began focusing on core competencies, realizing that larger companies having total control of all operations are no longer a competitive advantage. With different businesses focusing on specific functions of the supply chain, larger companies that have all of their operations in-house, can no longer stay competitive. Outsourcing is no longer just about cost saving, it is a strategic tool that may power the twenty-first century global economy (Corbett, 2004). The time line in the figure below shows the global market size of outsourced services from 2000 to 2013. In 2005, the revenue of the global outsourcing market was seventy-six billion U.S. dollars and reached its peak in 2012 at ninety-nine billion U.S. dollars.

Table 1: Global Market Size of Outsourced Services from 2000-2013

Global market size of outsourced services* from 2000 to 2013 (in billion U.S. dollars)



It is evident that outsourcing functions -other than a company's core competency- have allowed companies to not only avoid bankruptcy, but also stay competitive. There will

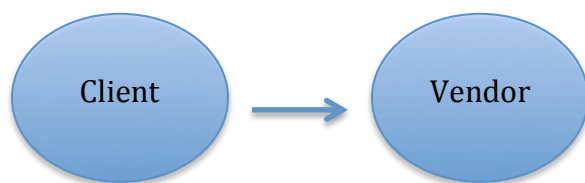
always be strategic planning involved in determining which functions are outsourced; however, in the current economy, Mill's theory of "bigger-is-better" has become a distant memory.

3.1.1 Definitions

There are several different definitions and variations of the term "outsourcing." Various individuals, including philosophers, economists, industry professionals etc. have all analyzed and evaluated their idea of the term and it is therefore considered encompassing. According to the book, *Enterprise Architecture as strategy: Creating a foundation for Business Execution*, there are three mutually exclusive outsourcing models: transaction, cosourcing, and strategic partnership.

Transaction Model

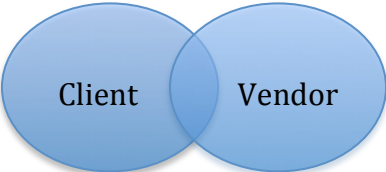
The transaction model is a narrowly defined, reputable process that holds the client and the vendor at an "arms-length" relationship, where both parties act independently and have no relationship to each other. Both of these parties act in their own self-interest, all while completing the task at hand, and without pressures from external sources. With quality and cost per transaction acting as the motivation for this model, the client- vendor agreement has similar expectations. The client expects processes completed at the highest level of competency in the industry as well as a competitive pricing index. The vendor contributions include standard best practice components, current IT systems, maintaining a high level of innovation, as well as the completion of tasks while gaining economies of scale.



Cosourcing Model

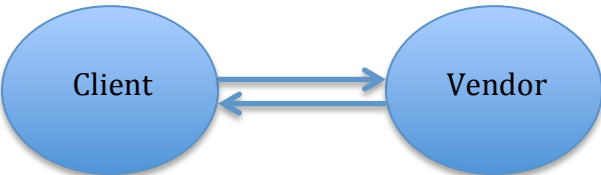
The *Cosourcing model* is a cooperative client-vendor relationship in the sense that both management parties work together in the task or project output. This model focuses on the

total success of the project and working together to achieve the best outcome. With the project management and innovation involved in this model, the client-vendor expectations are collaborative and work together. The client anticipates cost savings techniques and access to expertise, where the vendor not only offers expertise in the specialized technologies, but also offers labor arbitrage that potentially reduces costs while maximizing profits.



Strategic Partnership Model

In the *Strategic Partnership* model, there should be an equal success outcome for both the client and the vendor. The client-vendor relationship in this model acts as a bilateral agreement where both parties openly discuss their responsibilities and mutually reliant performances, reporting to each other upon completion. The model focuses on bottom-line impact where the client expectations include cost savings and variable capacity, and the vendor offers integration expertise, disciplined practices as well as economies of scale.



According to these three mutually exclusive outsourcing models, Company X is currently in an ‘arms-length’ relationship with Carrier Y, where both parties act independently and have no relationship with each other. Company X does not report to Carrier Y based on their performance level. Carrier Y only provides the service as stated in the contractual agreement, paid “by the piece.” If Company X so chooses to accept the dedicated freight model based on Carrier Y’s proposal, the outsourcing model would then be considered a

Strategic Partnership where a bilateral agreement including both parties openly discussing their responsibilities and mutually reliant performances and reporting to each other upon completion.

3.1.2 Motives for Outsourcing

Motives for outsourcing are dependent on the firm and the industry in which it specializes. Making the right decision based on whether or not to outsource a function of the supply chain can be the key factor in sustaining a company's competitive advantage and is one of the most important tasks of a successful management. Although strategic implications have been discussed over the years about these operational decisions, aside from control, these decisions are purely based on the basis of costs; whether it is how much it will cost to obtain proper training to bring the operation in-house, or how much it will cost to use an external party. For most companies who specialize in manufacturing of a product, their core competency is revolved around the production of the good, as well as the systems leading into it. It is common that companies keep a lot of their operational and accounting functions in-house rather than outsourcing it. It is becoming an increasingly popular method for businesses (that lack the capacity to sustain a fully functional IT department) to outsource many of those IT functions that can essentially help free up well-needed space and capital. For large businesses, transferring IT functions to third party logistic providers could potentially represent high cost savings and gains in efficiency. A company should consider outsourcing if they focus a lot of time, energy, and money on an activity that is not the core competency. In the transportation industry alone, there are proven beneficial reasons in which companies outsource their fleet. When weighing the benefits, there are a few variables that must be considered. According to author Matt Bernstein, of Inbound Logistics Magazine, volume discounts are one of the most significant reasons to outsource transportation. It is obvious for a company that specializes in this industry to obtain more vehicles. The provider will have significant buying power in the marketplace for the best available, up-to-date innovations and will receive heavy discounts for the purchases of these goods. With the discounts being based on volume, it is evident that a third party

provider will receive higher discounts than any non-transport company (Bernstein, 2001). Infrastructure is another crucial element in the transport industry, and obtaining the necessary foundation to cope with the scattered volume of goods can result in a costly production. When outsourcing this function of the supply chain, the company is also freeing up man-power and time spent managing issues like, vehicle maintenance, environmental innovations, tire replacements, driver performances etc. These are all activities that are distributed and can happen at any time. It is crucial that attention and proper tools are present when incidents sporadically occur. When a third party obtains this function, these activities are no longer the company's responsibility and it allows for time and devotion to be allocated in areas more adequate to the competency of the company.

3.2 Insourcing

The term "insourcing" can be defined in a complex context or simply as the internal sourcing of business activities. It was very common in the 19th century for businesses to keep all of their functions in-house in order to obtain total control of the enterprise. Referring back to Mill's "bigger-is-better" theory, perceived value came from operating on internal functions; having all activities of the business under one establishment. However, that is no longer prevalent in the 21st century. Insourcing of specific functions has become one of the single most important factors of a business today. Determining what functions of the company will be insourced is crucial to the position of the company. From a customer service, cost, legal and public relations perspective, insourcing logistics operations can be a risky endeavor. Whether or not a company views logistics as core or non-core function, logistics is a fundamental part of most businesses and the effects of getting it wrong can therefore be catastrophic (Baxter, 2006). After research has been conducted, and a company decides that insourcing is the best option, a significant amount of time must be considered for the planning and launch of the project. Taking into consideration the significant business risks involved in insourcing, a recommended nine months of quality preparation is recommended prior to the service notice even taking place (Baxter, 2006). The amount of preparation invested is of course a result of the complexity of the project. In 1999, Kwikform Ltd., a division of Interserve, "one of the world's foremost support services

and construction companies, operating in the public and private sectors in the UK and internationally,"² successfully brought its entire distribution operation of approximately seventy vehicles back in-house with only one month preparation prior to three month's notice being served (Baxter, 2006). Although this was a successful transformation -mostly due to the amount of personal involved in the transition- the amount of risks with associated stress levels would have been extremely high creating an unsettling environment as a whole, which could essentially lead to back up or re-work. It is very important that a company takes the time to assess all measures involved in insourcing a function, whether they have insourced the activity at one point in time, or have never operated the function internally; all risks must be evaluated and planned accordingly.

With ever-increasing technical innovations, completing tasks in-house can prove to be more efficient and cost effective. An example of this was proven in 2004 when economists George Baker and Thomas Hubbard examined how trucking companies decided whether to employ their own truckers or hire independent drivers who owned their own rigs (Fisman & Sullivan, 2013). The results indicated a trend toward internal employees because evidence in the case result clearly indicated changed characteristics based on the increased used of GPS and monitoring technology. Prior to these innovations, it only made sense to outsource to driver-owners because naturally, through experience, they learned to complete routes quickly while protecting their vehicles. Now, with monitoring systems like RFID and GPS, employees can be monitored closer than that of an external provider. Another high-risk strategy that companies have been investing in is creating more positions internally with the aim to acquire more control on functions that will create more value if operated in-house. Randy Mott, the CIO of General Motors (GM) plans on doing just that. In 2012, GM outsourced ninety percent of its IT services to companies such as HP/EDS, IBM, Capgemini, and Wipro; only ten percent are completed by GM employees (Murphy, 2012). The aim of the strategy is to flip those percentages within three years creating three new software development centers, all within the US. Where in most cases a strategy such as this would suggest budget cuts, that is not the intention here. Instead,

² Interserve: One of the World's Foremost Support Services and Construction Companies.
<http://www.Interserve.com/about-us>

implementing value added opportunities for GM to be more creative and gain business-changing ideas, which essentially come from IT. This philosophy would enhance the speed of production and deliver the innovative projects faster. Every company is different and the goals and ideas for future innovation are dependent on those who act on the opportunities with the intention of successful results. For all the focus on outsourcing, economic forces are actually pushing corporate giants to grow larger (Frisman & Sullivan, 2013).

When a company insources functions of the supply chain, they are insinuating that this function is part of their core competency and they can administer that portion of the chain better than any other external party. A company's core competency is its unique ability to perform a task that has been acquired from its developers or founders and has remained competitive or has developed internally over time. This ability to perform such a function is not easily imitated and acts as a competitive advantage, adding value to the company and delivering it to the consumers in the industry. It is very rare that a company's core commodity is expanded over all functions of the supply chain. It is for this reason that a company focuses mainly on their core competency and outsources other functions that do not add value to the core operation. In this way, a company uses a competitive advantage to gain greater overall efficiency in its business.

3.3 Economic Cost Models

Different companies can use different cost models dependent on the industry they are in and the criteria, which they wish to measure. An economic model is a simplified version of reality, designed to yield hypotheses about economic behavior that can be tested (Ouliaris, 2011). Economic models are, for the most part, subjective in design because they are specific in the measures of outcome. When measuring the economic cost of transportation, a theoretical model seeks to derive verifiable implications about economic behavior under the assumption that agents maximize specific objectives subject to constraints that are well defined in the mode (Ouliaris, 2011). In the case of Company X, this would be the Operational Cost Model. The results of these theoretical models give the companies a better idea and understanding on how to best handle the operation as well as the market in

which they are located.

Companies who outsource can have a number of different models that help them bridge the gap to the answers they are searching for that will better enhance their supply chain. For example, The Partnership Model³ was created to provide explicit methods for dealing with problems that may lead to partnership failures. This model had three components: drivers, facilitators and management components that exemplify compelling and strategic benefits for a company when outsourcing (Ruzzier and Srabotic, 2012). Gartner sourcing experts, Cohen and Young (2006), have introduced a new Multisourcing Model in which internal and external delivered services are “blended seamlessly, governed closely and evaluated continuously for effectiveness and efficiency (Ruzzier and Srabotic, 2012).” This model is used to provide a more holistic and strategic approach to sourcing as a whole if a company wishes to ensure successful outsourcing initiatives. According to a KPMG study,⁴ a major component that measures the success rates and maintains goal achievement after outsourcing starts is Performance Measurement; support and commitment from top management is the second most important success factor. Both of these components are essential, because when companies outsource, they do so to improve their operations, services and cost. If the achievements of these factors are not being met, the outsourcing function can potentially fail because the objectives are not being met.

A case study applied to a Fortune 500 firm -Goodyear Tire and Rubber Corporation in October 2002, demonstrated the use of a quantitative model useful for consideration of international risk factors unique to outsourcing-insourcing decisions (Schniederjans and Zuckweiler, 2004). Goodyear announced that it would be outsourcing its hose operations from Lincoln, Nebraska to Chihuahua, Mexico, and that labor costs and logistic transport costs were primary factors in the outsourcing decision. An equation used to represent which decision to choose based on the cost to insource or outsource was represented with the following equation: $Q = \frac{FC_{in} - FC_{out}}{VC_{out} - VC_{in}}$ where Q is the customer demand for

³ Lambert, D. M., M. A. Emmelhainz, and J. T. Gardner. 1999. 'Building Successful Logistics Partnerships.' *Journal of Business Logistics* 20 (1):165-82.

⁴ KPMG, 2000. "Outsourcing Logistics: Status, Issues and Trends in Partnerships." www.bearingpoint.de/media/industries_infrastructure_services/outsourcing_logistics_rotterdam.pdf

the units of hose, FC is the Fixed Cost of either insourcing and outsourcing decisions, divided by the Variable Cost of insourcing and outsourcing decisions. Based on the imputed cost values, the Q units ended up being less than the estimated cost productions in the US. The choice was clearly in favor of outsourcing the production to the Mexican operation, since their fixed cost was lower. This supported the actual decision that Goodyear Corporation made in 2002 (Schniederjans and Zuckweiler, 2004). Now, the point of the case study was to look at the cost model if there was an international risk factor, and how one minor increase or decrease in parameter settings could skew the results in reciprocal directions. The authors suggested a minor fluctuation in currency between the U.S. and Mexico -which is very common, not only in these two countries, but numerous countries. The authors suggested that a US dollar increases in value relative to the Mexican Peso by one tenth of 1 percent. Assuming no other parameter impacts, the most direct effect this currency fluctuation would have is on the variable cost of operating a plant in the US in relation to Mexican variable cost. The new equation taking into consideration the parameter change is now: $Q^* = \frac{FC_{in} * RF_{in} - (FC_{out} * RF_{out})}{(VC_{out} * RV_{out}) - (VC_{in} * RV_{in})}$, where the new components model the mathematical adjustment to the model parameter. Based on the two cost values, the result of Q* resulted in a higher value than the expected customer demand for units which would reverse the decision in the first equation in favor of insourcing the production in the U.S. By the simplicity of these two equations, the audience can see that in long term the cheaper variable cost in the U.S. will represent the least total cost decision for these operations; however, when a slight glitch occurs like currency fluctuations, the increasing variable cost in the U.S. plant makes it more attractive. What this case study demonstrated was how a cost model can react when realistic and minuscule changes are made in model parameters that are unique to situation like insourcing and outsourcing decisions. This is a prime example of when a sensitivity analysis could be used. There are two types of analysis that are common in measuring deviations: uncertainty analysis and sensitivity analysis. Uncertainty analysis quantifies the scale of the resulting uncertainty in the model predictions due to uncertainty in the model inputs, whereas a sensitivity analysis is the study of how the uncertainty in the output of the model can be apportioned to different sources of uncertainty in the model inputs

(Saltelli et al. 2004). These two analyses can serve a number of useful purposes when trying to build the models validity. These include corroborating the model structure, identifying critical regions in the space of the inputs, determining minimum data standards and establishing priorities for updating the model (including model simplification) (Lilburne and Tarantola, 2009).

Another common model that is concerned with outsourcing is the Transactional Cost Model (TCM). The TCM derives from the Transaction Cost Theory (TCT) which has three factors determining the importance of transaction costs: (1) the specificity of the assets required for performing the transaction, (2) the uncertainty surrounding the transaction, and (3) the origin of the critical investments associated with the transaction and their alignment with the allocation of residual rights (Aubert, Rivard, and Patrey, 2004). The nature of each factor is situational, and hypotheses are established based on the type of case being studied. Empirical studies have found that results from this theoretical substance are numerous. For example, in an investigation on information systems, Nam et al. explored the impact of organizational, environmental and economic factors on two dimensions of outsourcing decisions using the TCM. The results of the study indicated that uncertainty and tacit IT knowledge are significant while asset specificity and numbers of potential vendors are not (Nam et al., 1996). Naturally, a higher degree of uncertainty leads to less outsourcing which has a significant role in the decision to outsource. There was no significant link between asset specificity and outsourcing. Below is a simplified model representing the hypothesis of the transactional model.

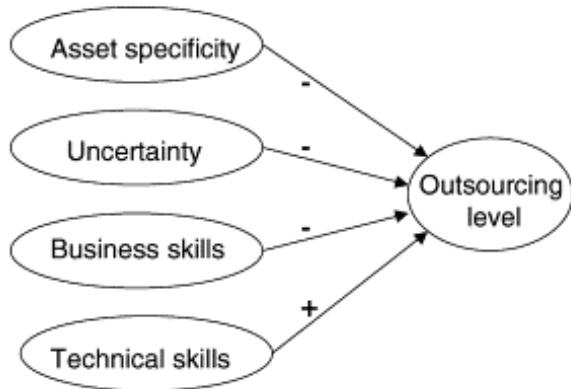


Figure 2: Hypothesis' Associated with the Transactional Model in an Outsourcing Situation

As mentioned earlier, there are several different models that can best exemplify criteria specific to a company requirements, but the success of the model comes from testing and obtaining results. Pilot Chemical Company, a global chemical company that produces specialty chemicals (Chemlogix, LLC, 2007) were faced with a transportation outsourcing challenge in 2006, where the company began experiencing high “cost-to-serve” issues with its vendors and customers. Several authors, including Kaplan, 1989; Cooper and Kaplan, 1998; Braithwaite and Samakh, 1998; Kaplan and Narayanan, 2001 describe the term “cost-to-serve” as costs describing customer-service (Guerreiro et al., 2008). Once the company realized their freight costs and activities required more focus, they needed to create a model that would increase visibility of transactional cost components, automate shipping management processes and enhance oversight to mitigate rising “cost-to-serve” issues. Pilot Chemical utilized the services of ChemLogix, LLC to manage freight payment and automate billing, and chose to manage logistics control on their own; a function that is not their core competency. As a result of this, updating data on a regular basis proved difficult as manufacturing personnel were primarily focused on making the product, not data analysis (ChemLogix, LLC, 2007). In order to solve this dilemma, Pilot needed to implement a Transportation Management System (TMS). Pilot had initial ideas to manage the TMS system internally, however, Mike Rohrbaugh, Supply Chain Manager at Pilot Chemical Company stated: “The goal was to implement a TMS with minimal impact on existing operating procedures.” The only feasible way to do this was to use a third party logistic provider (3PL) who specialized in this industry. Where Pilot was already utilizing

ChemLogix, they had already established a close, trusting working relationship with each other and understood the business operations and procedures. After Pilot made the decision to outsource this function, the results proved successful. There was significant reduction in variances between freight accruals and actual costs. The improvement in carrier performance went from ninety percent to an overall level of ninety-eight percent, and they also generated substantial savings in excess of self-funding goals (ChemLogix, LLC, 2007).

In practice, as firms make the transition from in-house performance to outsourcing of logistics functions, the evaluations they make concerning outsourcing as a strategy can be incremental, unsystematic and influenced by factors beyond cost or service gains; these findings may help fill in some of the gaps between theory and practice and point to areas of process improvement (Mello, Stank, and Esper, 2008). Outsourcing research based on case studies completed by de Boer, Gaytan and Arroyo (2006), focus on real logistics outsourcing decision-making processes. The model they have created is based on a decision-making strategy, controlled by the limits of bounded rationality that is completed as soon as a satisfactory solution is found (Mello, Stank, and Esper, 2008). As a result of their findings, there are several differences between models used in literature and evidently in practice; companies may follow processes that differ from the “ideal” methods offered from specific models (de Boer, Gaytan and Arroyo, 2006). Different aspects such as culture, industry, geographical location etc. can affect the rationale behind outsourcing. In 2005, a research assignment was conducted in Turkey with 250 of the top 500 Turkish firms, specified by the Istanbul Chamber of Commerce for the year 2001. The results found that 3PL firms in Turkey were undervalued, simply due to the ignorance toward the phenomenon (Aktas and Ullengin, 2005). Adapting to a theory dated back to 1950, Turkish businessmen think that they should operate their business themselves simply because they are not aware of the benefits of outsourcing logistics activities. For operations that companies don't have the resources for -like a transportation carrier- a selection criteria for outsourcing is based on a carrier that has a good reputation or one that is easy to deal with. With that, of the firms who do outsource logistics in Turkey, ninety-five percent of

them are foreigner capitalized (Aktas and Ulengin, 2005). With the increase in foreign companies exemplifying this outsourcing trait, the Turkish level of commitment to the utilization of 3PL's is not discouraging. As Turkey continues to develop, education levels will continue to increase, and the ignorance to the outsourcing function will slowly decimate. Initially, in the USA, 3PL firms were mostly used for transportation activities (Holcomb, Manrodt and Thompson, 1998), which is where Turkey is currently at with regards to outsourcing. The case study concluded with results from showing knowledgeable material about logistics executives considering outsourcing as well as to the 3PL service providers who are considering relationships with firms planning to enter the Turkish market. 3PL services in Turkey have potential for further development and the vision of developing Turkey into a logistics hub in the region will further enhance the use of the 3PLs in the years to come (Aktas and Ulengin, 2005).

4. Model Development

In this chapter the author will break down the model into different levels, meticulously describing how each component of the model was developed. There are three components that this model will exemplify:

- 1. Costs*
- 2. Environmental Aspects*
- 3. Quality Aspects*

The components are the building blocks of how this model is constructed. The cost component will compare alternatives, in-house model and outsourced proposal. Essentially, these values will decide which option will best suit Company X. The model has been implemented in the form of an excel work sheet that can be found in the appendix. Below, the modules listed will represent the cost components used in this case.

4.1 Cost Components

4.1.1 Vehicle Costs

For the purpose of this case study in retrieving the most cost efficient tools, rather than acquiring vehicle ownership of the fleet of six, contracting a full maintenance lease with *Penske* –a transport leasing and expert support company- was the best alternative both financially and logistically. After consulting with *Penske*, Company X was able to provide them with the vehicles needed to complete the operation, and in turn, receive an exact per month quote for the full maintenance lease, based on a five-year contract. *Penske* covers all elements in maintaining the most effective and efficient vehicles, but requires Company X to have at least two million dollars in liability, license plates and drivers. The full maintenance lease has eliminated costs that will potentially skew the base model. The decision in leasing the vehicles was based on extensive research regarding the equipment purchase cost, and expected lifetime information obtained from dialogue with equipment suppliers and fleet operators and comparison to prior studies.

4.1.1 Labor Costs of Drivers

This model estimates the labor costs of drivers based on the labor union rate, compared against other company labor rates in the industry. Sources of driver costs are also based on case studies from other vehicle configurations, in which actual driver rates of pay are ascertained. *The Ministry of Transportation for Ontario* also provides average costs for commercial truck drivers in Ontario. The unit costs reflect rates of individuals employed under Company X. This rate includes all the essentials that a full time employee would obtain in the company (Workplace Safety and Insurance Board (WSIB), benefits, vacation, medical or parental leave etc.).

4.1.2 Non- Driving Hours and Costs

It is crucial to include the non-driving costs from both an operational and labor perspective. Although there are several hours where the vehicles are not physically operating, all hours must be included and accounted for in the final model. To determine the amount of truck idle time, estimating the amount of pre-work that must be completed by the driver (paperwork, pre-trip, fuel) is calculated, along with time for lunch/break and lastly terminalling (loading and unloading). The cost for driver time (from loading and unloading of payloads) is included using the appropriate hourly rate. This case study is constructed from a congested location perspective, therefore, the speed (km/h) of the vehicle, as well as the fuel has been altered, and therefore, including a percentage burden for traffic is unnecessary.

In order to determine non-driving costs, the following formulae are needed:

$$(a) = \# \text{ Of Stops on One Dedicated run/ 1 vehicle} * \text{Time spent on Terminalling}$$

Once 'a' (total terminalling time/ 1 vehicle) has been determined, accumulating the pre-work time spent as well as lunch and breaks in addition to 'a' will result with the total non-driving time:

$$(b) = a + \text{Pre-work} + \text{Lunch/Break}$$

This variable will provide the total amount of hours not being driven but still accumulated and recorded for one vehicle.

Multiplying this final variable by the amount of specified vehicles used will provide the total amount of non-driven hours in one day. To find the annual amount of non-driven hours the following formulas are applicable:

$$c \text{ (total vehicle non-driving hours/ day)} = b * \text{Total vehicles}$$

These variables will then be combined with the total amount of hours worked per day, including non-driving hours and multiplied by the driver wage. This value will show the total driver wages for all vehicles per day. The formula will look like this:

$$\text{Driver Wages} = (y + c) * \text{Driver Wage}$$

Once the total wages for one day have been allocated amongst all the vehicles, the annual driver wages can be determined with the following formula:

$$\text{Annual Driver Wages} = \text{Total Combined Driver Wages} * 5 \text{ (days/wk)} * 50 \text{ (wks/yr)}$$

4.1.3 Fuel Costs

Fuel costs reflect average consumption levels expected for each vehicle configuration (expressed in liters per hundred kilometers and liters per one kilometer) as well as the expected fuel price for fuel purchases made in the region of interest. Fuel costs are a result of the influence of distance traveled, vehicle fuel consumption, and fuel prices. Essentially, the fuel cost would be determined on a contractual basis between the client and the fuel company. The fuel contract would be determined based on the size of the fleet and the amount of fuel consumed. These values are generally representative of averaged annual roadside cost levels determined by *M.J. Ervin and Associates*, reduced according to confidential consultation with petroleum industry marketers concerning the available

discounts for purchasers who secure lower prices through larger annual quantity purchases of fuel (Transport Canada, 2006). Such discounts vary according to amount of fuel purchased.

In order to calculate the average annual fuel cost, the following formula is offered:

$$\text{Current Fuel Rate (Cents/Liter)} * \text{Annual Fuel Consumption (Liters)}$$

4.1.4 License Fees

License fees are bound to differ depending on the country in which one is operating. There are different specifications presented based on the region in which an individual or company is effective. Each region should have certain laws and restrictions in which the operator is responsible for adhering too. In the United States, once a company has determined the fleet size, vehicle registration and licensing fees are determined by each states department of motor vehicles (DMV) or other agency if one does not exist; in Texas, vehicle registration and licensing fees are determined by the *Texas Department of Transportation*⁵. Each state or region differs dependent on state laws and agreements. This also holds true for obtaining registration and licensing fees in the Europe. In the UK alone there are two registration systems; one in Great Britain, *Driver and Vehicle Licensing Agency (DVLA)*⁶ and one in Northern Ireland, *Driver and Vehicle Agency (DVA)*⁷. Although these two agencies have different names, both have equal statuses. Each region must determine these fees according to where the operation is based. In order to obtain this value, contacting the regional department of transportation in which one plans to operate will provide the truest results.

Once the annual licensing fee has been obtained for one vehicle, the following formula is presented for accumulating the annual licensing fees for all vehicles:

$$\text{Annual Licensing Fee} * \text{Total Amount of Vehicles being Operated}$$

⁵ *Texas Department of Motor Vehicles, Helping Texans Go. Helping Texans Grow. Register your vehicle, 2014.* <http://txdmv.gov/motorists/register-your-vehicle>.

⁶ *Driver & Vehicle Licensing Agency. How government works. GOV.UK, 2014.* <https://www.gov.uk/government/organisations/driver-and-vehicle-licensing-agency>.

⁷ *Driver & Vehicle Agency. Driver and Vehicle Licensing, 2014.* <http://www.dvani.gov.uk>.

4.1.5 Insurance

Insurance is a requirement regardless if the company is obtaining their own private transportation fleet or if the company is engaging in a full maintenance lease. If a company is using a third party provider for a for-hire contract, the insurance is allocated in the total amount discussed in the contractual agreement.

In order to calculate the insurance as a percent of cost, the following formula is offered:

$$\text{Insurance (\% of Total Cost) * Total Operational Costs}$$

4.1.6 Administration and Interest

Although the most recent report indicating average administration and interest rates on working capital costs that have been published are from 2005, Lloyd Ash, who maintains a professional consulting practice, has indicated in the unpublished 2013 report that he has submitted to Transport Canada, that these percentages have not changed. The percentages used have been applied to the research assignment based on costs that have previously been applied to cases on average industry levels for fleets in trucking businesses in Canada (Transport Canada, 2010).

In order to calculate the administration and interest as a percent of cost, the following formula is offered:

$$\text{Administration and Interest (\% of Total Cost) * Total Operational Costs}$$

4.1.7 Operator Profit Margin

Through the economic downfall in 2008 and 2009, companies were experiencing extremely low trucking margins. The margins began to increase shortly in 2010 and continue doing so today (2014). For trucking enterprises that have proven to be managed very well, it is common for these companies to be earning margins between two and a half percent and five percent (Transport Canada, 2010). With this specific hauling situation being particularly new, the researcher has assumed a three percent operator profit margin.

In order to calculate the operator profit margin as a percent of cost, the following formula is offered:

$$\text{Operator Profit Margin (\% of Total Cost)} * \text{Total Operational Costs}$$

4.2 Environmental Aspects

Environmental aspects in collaboration with transportation seems to be an ongoing issue with regards to pollutants like noise, vibration, congestion etc. and more importantly air pollutant emissions. The transport sector has the second biggest greenhouse gas emissions (GHG) in the EU, responsible for about a quarter of EU greenhouse gas emissions making it the second biggest greenhouse gas emitting sector after energy (European Commission). Of that, more than two thirds of transport-related GHG emissions are from road transport (European Commission). In Figure 4.1, the figure displays the EU27 GHG emissions by sector and mode of transport. Aside from Energy Industries, the Transport Sector is not far behind and we can see that road transport continues to increase in emissions.

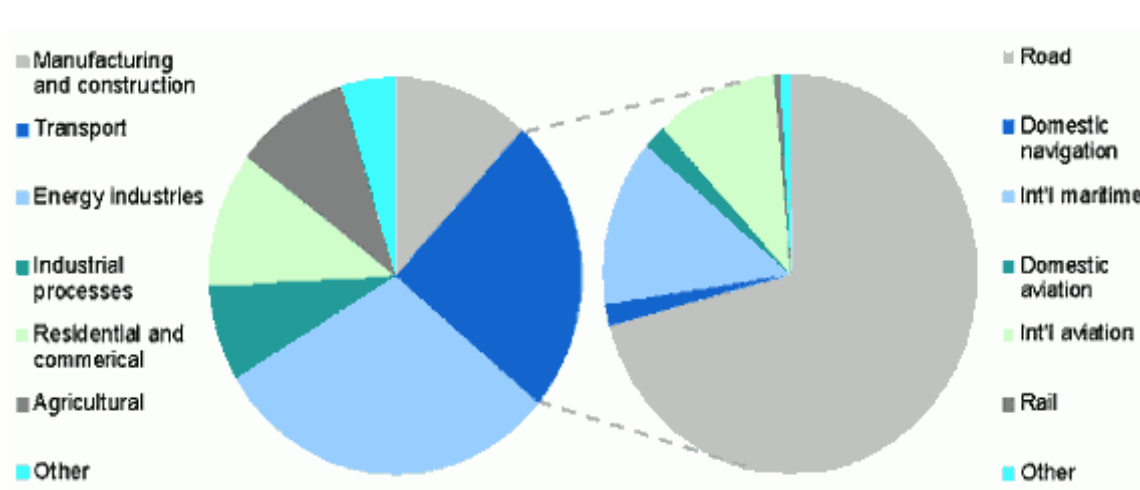


Figure 3: European Commission, Transport; EU27 Greenhouse Gas Emissions by Sector and Mode Transport, 2007

The impact that transportation has on land use goes beyond GHG emissions. Traffic, particularly in urban areas, is a major pollutant of noise and accidents (Hecht, J. 1997). Although, noise may seem to be a minor pollutant, it contributes to other health issues, like stress, lack of sleep, impaired hearing and cardio-vascular disease (Hecht, J. 1997).

Through experience it has been noted that as individuals become more disturbed by the noise pollution, they become increasingly aware of other environmental pollution problems as well (Kürer: 493). Accidents like ship and pipeline oil spills have obvious impacts on ecosystems and wildlife and can be directly related to environmental pollutants. However, road transport accidents have an indirect effect because they have severe impacts on human health, which can potentially be classified as a branch of environmental impact. In the case of truck accidents or vehicle accidents, there could be potential release of toxic or flammable chemicals having a direct effect on the environment (Hecht, 1997). These potential impacts of transport use are all aspects that must be taken into consideration. Using industry best practices like bio fuels, as well as integrated transportation management routes, can help reduce these issues over time. Having less vehicles operating in congested areas could potentially reduce accidents as well as eliminate back hauls that could in turn have a positive environmental impact.

4.2.1 Environmental Aspects

Although Canada only accounts for two percent of global Green House Gas (GHG) emissions, its per capita emissions are among the highest in the world and are continuing to increase (Canada Gazette, 2012). In a national inventory report, Canada’s GHG emissions amounted to 690 megatons (Mt) and of that 190 Mt were a result of the transport sector. In the table below, the *National Inventory Report* has recorded Canada’s GHG Emissions both in 2005 and in 2009.

Table 2: National Inventory Report: Canada's GHG Emissions 1990-2009

Source	2005	2009
Total	731	690
Transportation	193	190
Heavy-duty vehicles	44	45

It is indisputable that the transportation sector amounts for a large portion of Canada’s total GHG emissions. In 2009, a reported twenty-eight percent was accounted for transportation alone (air, vessel, rail and road) and within this sector twenty-four percent

was a result of heavy-duty road vehicles (Canada Gazette, 2012). Although the total transportation decreased by 3 Mt from 2005-2009, the heavy-duty vehicles increased by 1 Mt. Environmental concerns are not to be taken indifferently, as the amount of transportation vehicles seem to be increasing immensely, and as a result, the GHG emission elevation as well. According to the *Transportation in Canada* report for 2012, in 2010, the road transportation sector emitted 135.9 Mt of CO₂, accounting for eighty-two percent of domestic transportation-related GHG emissions and 19.6 per cent of total Canadian GHG emissions. Freight activity, which is mostly dependent on diesel fuel, contributed to the majority of PM_{2.5} and NO_x emissions (75.4 percent and 54.2 percent of road emissions) (Transport Canada, 2012). These values are an accurate indication that emissions are continuing to rise and it is accurate indication that legislation will respond accordingly. Referring to Part 1: Notices and Proposed Regulations Vol.146 (2012), a regulation proposal was published:

“Heavy-duty Vehicle and Engine Greenhouse Gas Emission Regulations, which establish mandatory standards for new on-road heavy-duty vehicles and engines that are aligned with U.S. standards for vehicles of model years 2014 and beyond sold in Canada.”

These regulations would apply to companies manufacturing and importing new on-road heavy-duty vehicles and engines of the 2014 and later model years for the purpose of sale in Canada. These regulations would work to significantly reduce the emissions released by heavy operating vehicles each day.

There are other ways to ensure environmentally sustainable transportation systems are used within a network. Optimizing the distribution networks and route planning across all operations by determining routes that optimize distance and time, expanding driver training, both from a safety and environmental efficiency perspective, and from a dangerous goods perspective, supporting the development and use of safe and efficient natural refrigerant solutions for commercial applications, and progressively phase out HFCs appliances, are all used to protect the environment (Nestlé Ltd., 2013).

4.3 Quality Aspects

The third level that this model refers to is the quality component. The quality component deals with the speed, flexibility and reliability dimensions associated with the model. Below are the quality components associated with the case study.

4.3.1 Travel Speed

The average travel speed was determined by interviews with transport carriers who operate in the GTA⁸ compared against the *Estimation of Costs of Heavy Vehicle Use Per Vehicle-Kilometer in Canada Report* submitted in 2006 (Transport Canada, 2006).

4.3.2 Goods Being Moved

The amount of vehicles required to perform this dedicated run in the GTA is determined by the amount of goods that need to be transported.

4.3.3 Driving Hours

In order to calculate the total amount of hours driven, determining the total kilometers driven, including the trip home is essential. Once the total Km have been determined, dividing this value by the *Average Travel Speed* (km/hour) will determine the total drive time for one vehicle per day. The formula should be presented as such:

$$Y = \text{Total Km driven} / \text{Average Travel Speed (Km/Hr)}$$

In order to find the total amount of driving vehicles for all vehicles per day the following formula is presented:

$$y = Y * (\text{Total Vehicles Being Operated})$$

4.3.4 Congestion Percentage

In the transportation industry lead-time, fuel consumption and overall operating costs are dependent on the flow of traffic. For trucks operating in congested areas, time lost can lead

⁸ Semi-structured interview with Canada Cartage (Canada's largest specialized provider of fully-outsourced dedicated trucking fleets and complementary last-mile logistics solutions)

to a variety of unaccounted costs. Lost time can cause driver wages to increase (dependent on the contract), fuel increases, lost vehicle productivity and often fines if the transport load is not delivered to the customer in the specified time window.

4.3.5 Fuel Consumption

Along with the rates associated with the various vehicle configurations and traffic volumes being a major indicator affecting the fuel consumption, researching alternate sources of information was required. Related engineering publications from authorities such as, the *Society of Automotive Engineers* SAE had already performed this portion of the research and it had proven to be very helpful in obtaining authorized values from a congested and non-congested perspective (Rapone et Al.).

In order to calculate the *Annual Fuel Consumption*, calculating the Average Total Kilometers (Km) driven by each vehicle is the first step. Once the total Km's have been determined, calculating how many stops for delivery the vehicle makes, including the trip home is next. Once that distance including the stops is recorded per vehicle the following formula is utilized:

$$\textbf{Total Km * Liters per 1km}$$

Once this fuel consumption/vehicle/day variable has been determined the next formula follows:

$$\textbf{Total Vehicle Fuel Consumption= Per Vehicle Consumption (L/1km/day) * Total Vehicle(s)}$$

These values determine the total fuel consumed by the combined vehicles in one day. Once the total vehicles have been allocated, based on the above formulas, the values will then contribute to the fuel costs in determining the fuel costs/day for the combined vehicles and finally, the fuel costs for the combined vehicles per year.

5. Empiric Research

In this report, the ultimate purpose of the empiric research is to determine the cost differentiation between completing the transport function of Company X's supply chain in-house, or for Company X to accept the dedicated concept model presented by Company Y.

5.1 The Current Situation

Company X is a company that does not specialize in the transport function of the supply chain. All activities, aside from contacting carriers and paying the freight bill, are outsourced to an external carrier. In this specific case, Carrier Y is responsible for all of the freight activity from the Milton, DC to customers located in the GTA. Carrier Y has recently suggested a dedicated concept channeling Company X's demands in order to propose a more efficient and effective model that will be more attractive and better suited for Company X. Carrier Y has put together a data summary based on Company X's values in the form of an excel sheet where the probill summary is broken down by day, weight, distance, location, freight charges, destination summaries, and environmental impact. A portion of these values have been used in determining the cost structure based on a potential opportunity to bring this activity back in-house, if the values prove to be sufficient.

5.1.1 The Dedicated Concept Proposal

Carrier Y has proposed a model for Company X in the form of a dedicated concept, in which the operation would prove to be more environmentally acceptable and incorporate a significant cost reduction. The dedicated concept model has projected an uncommitted, 17% cost reduction, projecting a new annual program cost of \$1,356,000. Figure 4 models the new-dedicated concept.

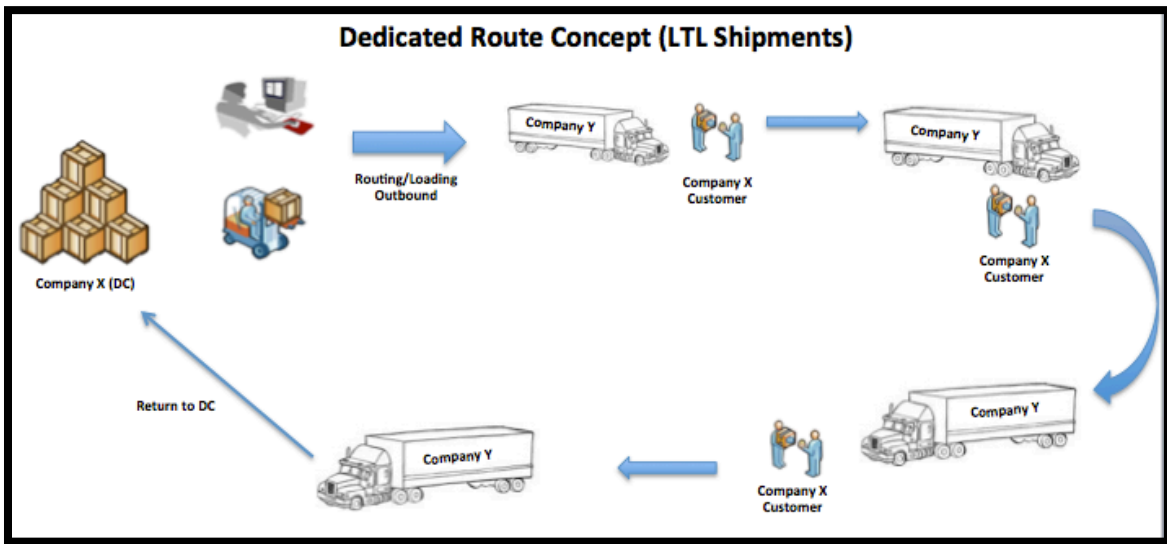


Figure 4: Dedicated Route Concept in the GTA

In Figure 4, the operation is outlined in a 'milk-run' formation where the onsite Carrier Y staffing is responsible for the routing of trucks for the next day deliveries, loading of trucks, interface between the DC and Company X customer service. There would also be productivity tracking and shipment tracking support in addition to appointing management for specific customers. Once the scheduling has been completed, Carrier Y would carry goods in a dedicated formation, carrying *only* Company X products and at the end of the route, return to the Milton, DC. The function will essentially improve product integrity in the sense that there will be fewer touches leaving next to no room for interruptions in lost or damaged accusations, dedicating the proper equipment for the job, having multiple resources available for situational events, dynamic planning, not only from a staffing perspective, but from equipment and resource flexibility and lastly Carrier Y support from head office with onsite coordination.

In order to determine price differentiation for further action, Company X advised the researcher to act as a consultant to determine the cost of the dedicated route if the company would personally complete the operation themselves.

5.2 Dedicated Route Operational Costs

5.2.1 Vehicle Costs

To complete this section of the case study, the researcher had to determine what types of vehicles would be needed to complete a full dedicated route transporting Company X's desired products. This was determined by the probill count accumulated from April 2012 to March 2013. The probills, along with the weight, were calculated based on a daily summary (weekdays) for the full duration of the year. Based on the average daily weight of goods transported, the researcher was able to allocate 'x' amount of goods on each vehicle based on the weight limitations. For the dedicated route from the Milton, DC,- to customers in the GTA, six dedicated units would be needed per day. Based on past summaries, in order to satisfy the capacity, the vehicles would need to consist of 3 Straight Trucks with a Tailgate, 2 Tractor/ 30' Pup Trailers with a Tailgate and 1, 52' Tractor Trailer. After consulting with Company X, it was decided that a contract based on a full maintenance lease was the best option to obtain these 6 vehicles. To obtain the best-fit value for this model, consulting with a representative from Penske: "... a transportation company who delivers innovative transportation and logistics solutions that are vital to the success of the companies and people in which they serve,"⁹ was the best suited option for this case. Penske provided the researcher with an exact quote for the selected vehicle types, based on a five-year full maintenance lease contract agreement. Choosing this option would eliminate inconveniences for Company X, with regards to maintenance, repairs, tire replacements etc. Penske Truck Leasing and Penske Logistics have also recently joined the United States Environmental Protection Agency's (EPA) Green Power Partnership after voluntarily purchasing Renewable Energy Certificates (RECs) (Move Ahead, 2014). Because Penske is, "committed to reducing its indirect emissions from electricity usage and is a supporter of renewable power generation,"¹⁰ selecting this provider would be helping to reduce each company's carbon footprint.

⁹ Penske. A Business Driven by Values, 2014. <http://www.gopenske.com/penske/> (05 APR. 2014).

¹⁰ Mike Costanza, "Penske Joined U.S. EPA Green Power Partnership," March 12,2014. Web. 05 APR. 2014.

5.2.2 Labor Cost of Drivers

After consulting with Company X, the drivers would be contracted under the labor costs of drivers based on the labor union rate. This research assignment reflects driver wage rates, assuming the driver is an employee of Company X; therefore, it is unnecessary to include wage burden costs/percentages to this model. These wages were also reviewed against wage statistics from Statistics Canada,¹¹ the US Department of Labor, Published Teamsters Wage Rates, and US County and State Wage Survey Statistics. Considering the sources, as well as consulting with a former representative from Canada Cartage (Canada's largest specialized provider of fully-outsourced dedicated trucking fleets and complementary last-mile logistics solutions), the wage rate for this model was determined.

5.2.3 Driving Hours

In order to calculate the total amount of hours driven, the researcher had to first, determine the total Km driven. Based on Carrier Y's Data Summary spreadsheet presented to Company X, *Distances (kms)* were allocated from the Milton DC, to each city located in the GTA in order to estimate environmental impact. From the values listed, calculating the average distance from Milton's DC to 16 selected cities would provide a value that would be use for the trip to the GTA and the trip from the GTA back to the DC. Once that allocation was determined, the researcher was able to estimate the average distance between each of the 16 cities located in the GTA in order to obtain a value that would be sufficient in calculating distances on the dedicated route. In order to determine the total amount of kms driven for each vehicle, determining how many skids/ pallets that would fit on each vehicle would decide the amount of stops needed to fulfill each route, which would in turn determine: a) the trip from the DC to the GTA, b) total distances in-between cities, and c) the trip from the GTA to the DC. Once the total Km's have been determined, dividing this value by the Average Travel Speed (km/hour) will determine the total drive time for one vehicle per day. The formula should look like this:

¹¹ Statistics Canada. (2011). Canada's State of Trade: Trade and Investment Update 2011. VII. SPECIAL FEATURE: The Evolution of Global Value Chains. Outsourcing of Business Activities in Manufacturing, SIBS Survey. http://www.international.gc.ca/economisteconomiste/performance/statepoint/state_2011_point/2011_7.aspx?lang=eng

$$Y = \text{Total Km driven} / \text{Average Travel Speed (Km/Hr)}$$

Straight Truck	168 km / 37km/hr
30' Pup Trailers with Tailgate	228km / 37km/hr
Tractor 53' Trailer	318km / 37km/hr

In order to find the total amount of driving for all vehicles per day the following formula is presented:

$$y = Y * (\text{Total Vehicles Being Operated})$$

Straight Truck	4.54 hr * 3
30' Pup Trailers with Tailgate	6.16 hr * 2
1 Tractor 53' Trailer	8.59 hr * 1

5.2.4 Non- Driving Hours and Costs

To determine the amount of truck idle time, estimating the amount of pre-work that must be completed by the driver (Paperwork, pre-trip, fuel) was calculated, along with time for lunch/break and lastly terminalling (loading and unloading). The cost for driver time resulting from loading and unloading of payloads is included using the appropriate hourly rate. All estimations were supervised by a transportation professional from Company X.

In order to determine non-driving costs, the following formulas are needed:

$$(a) = \# \text{ Of Stops on One Dedicated run} / 1 \text{ vehicle} * \text{Time spent on Terminalling}$$

Straight Truck	3 stops * .5 hr
30' Pup Trailers with Tailgate	5 stops * .5 hr
Tractor 53' Trailer	8 stops * .5 hr

Once 'a' (total terminalling time/ 1 vehicle) has been determined, accumulating the Pre-Work time spent as well as Lunch and Breaks in addition to 'a' will result within the total non-driving time:

$$(b) = a + \text{Pre-work} + \text{Lunch/Break}$$

Straight Truck	1.5 hr	+ 1 hr	+ 1 hr
30' Pup Trailers with Tailgate	2.5 hr	+ 1 hr	+ 1 hr
Tractor 53' Trailer	4 hr	+ 1 hr	+ 1 hr

This variable will provide the total amount of hours not being driven, but still accumulated and recorded for one vehicle.

Multiplying this final variable by the amount of specified vehicles used will provide the total amount of non-driven hours in one day. To find the annual amount of non-driving hours, use the following formulae:

$$c (\text{total vehicle non-driving hours/ day}) = b * \text{Total vehicles}$$

Straight Truck	3.5 hr	* 3 vehicles
30' Pup Trailers with Tailgate	4.5 hr	* 2 vehicles
Tractor 53' Trailer	6 hr	* 1 vehicle

These variables will then be combined with the total amount of hours worked per day, including non-driving hours and multiplied by the driver wage. This value will reflect the total driver wages for all vehicles per day. The final formula will look like this:

$$\text{Driver Wages} = (y + c) * \text{Driver Wage}$$

Straight Truck	13.62 hr	+ 10.5 hr	= 24.12 hr	* \$35	= \$844.26
30' Pup Trailer with Tailgate	12.32 hr	+ 9 hr	= 21.32 hr	* \$35	= \$746.35
Tractor 53' Trailer	8.59 hr	+ 6 hr	= 14.59 hr	* \$35	= \$510.81

Once the total wages for one day have been allocated amongst all the vehicles, the annual driver wages can be determined with the following formula:

$$\text{Annual Driver Wages} = \text{Total Combined Driver Wages} * 5 \text{ (days/wk)} * 50 \text{ (wks/yr)}$$

Combined Driver Wages	\$2,101.42	* 5	* 50
Annual Driver Wages	= \$525,354.73		

5.2.5 Travel Speed and Congestion

This case study focuses on a transport route functioning in the GTA, which is the heart of Toronto, Ontario. Due to the recurring congestion – traffic congestion seen regularly during peak traffic periods, when travel demand is high,¹² the speed in which the vehicles are traveling must be altered to obtain a true value. The impact of this congestion is significant. Estimates from 2006 for the Greater Toronto and Hamilton Area (GTHA) suggest that congestion costs commuters as much as \$3.3 billion annually in terms of delay and increased vehicle operating costs.¹³ In order to obtain an estimated value true to its position, the average travel speed was determined by interviews with transport carriers who operate in the GTA,¹⁴ compared against the Estimation of Costs of Heavy Vehicle Use Per Vehicle-Kilometer in Canada Report submitted in 2006 (Transport Canada, 2006).

5.2.6 Fuel Consumption

Although previous case studies in the transport sector all had fuel consumption rates associated with the study, Company X's fuel consumption is very specific in regards to the type of truck and trailer used, as well as the area in which the dedicated route would be operating. The GTA is a very large, yet congested area in which there is a very high volume of traffic during peak times throughout the day. After researching congested areas in and around the GTA and comparing those results to trends prepared for the *Ministry of Transportation*, it is evident that these areas stay occupied through the core of the day.

¹² Congestion Management Plan. Delcan and Laura Consulting for the City of Toronto Transport Division, October 2013.

¹³ Costs of Road Congestion in the GTHA (Greater Toronto and Hamilton Area), Metrolinx, December 2008.

¹⁴ Semi-structured interview with Canada Cartage (Canada's largest specialized provider of fully-outsourced dedicated trucking fleets and complementary last-mile logistics solutions)

According to Figure 5, the graph represents truck traffic building earlier than total traffic. These results compel fleet managers to dispatch trucks at certain windows to avoid the congested periods. Within the GTA, the bulk of truck traffic operates between 07:00 and 17:00, which indicates that, unless the carriers were operating after hours, they would be affected by this congestion.

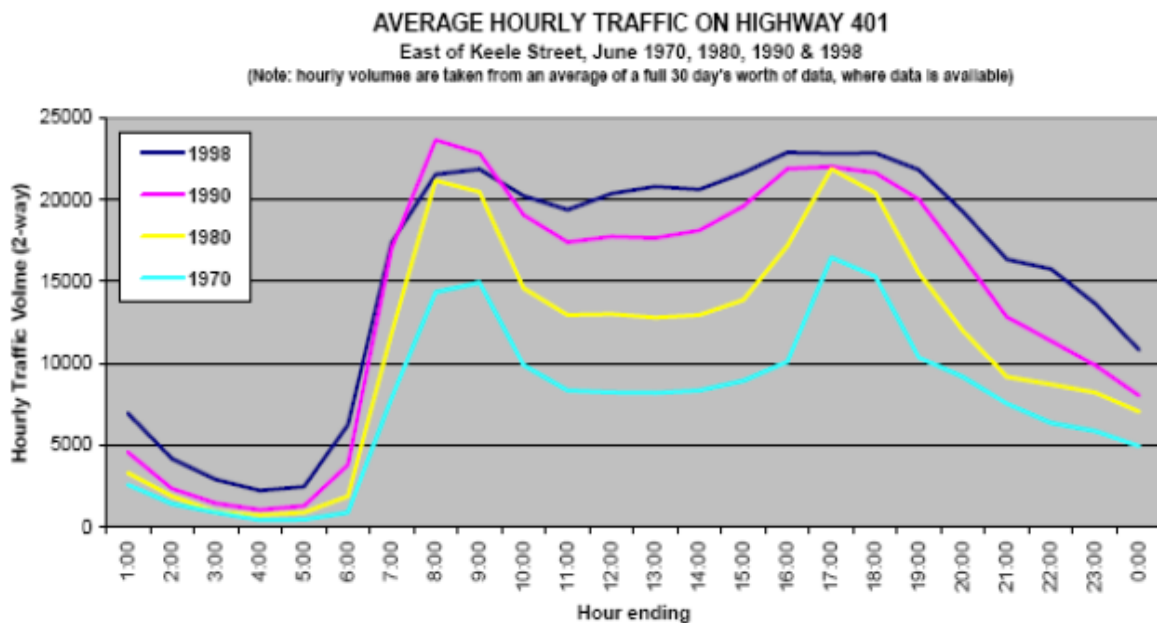


Figure 5: Historical Hourly Traffic Volumes on Highway 401

Under the previous heading, the researcher has calculated the average total Kilometers (km) driven by each vehicle, along with the amount of drop-off stops the vehicle makes, including the trip to the GTA and the trip back to the Milton DC. These values allow for the fuel consumption to be allocated based on the kilometers covered. In determining the total liters per 1km, the Society of Automotive Engineers had already undergone a portion of a research study, which provided an average per vehicle fuel consumption in liters/ 100km. These values were obtained from a congested perspective, and for the purpose of the following formula, the researcher has divided this number by 100 to receive the per kilometer rate.

Total Km * Liters per 1km

Liters for 1 Total Route		
Straight Truck	168 km	* 0.64 liters / 1km
30' Pup Trailer with Tailgate	228 km	* 0.64 liters / 1km
Tractor 53' Trailer	318 km	* 0.64 liters / 1km

Once this fuel consumption/vehicle/day variable has been determined, the following formula is applied:

$$\text{Total Vehicle Fuel Consumption} = \text{Per Vehicle Consumption (L/1km/day)} * \text{Total Vehicle (s)}$$

Liters for 1 Total Route			
Straight Truck	107.52	* 3	= 322.56
30' Pup Trailer with Tailgate	145.92	* 2	= 291.84
Tractor 53' Trailer	203.53	* 1	= 203.52

These values, determine the total fuel consumed by the combined vehicles in one day. Once the total vehicles have been allocated, based on the above formulae, the values will then contribute to the fuel costs in determining the fuel costs/day for the combined vehicles and finally, the fuel costs for the combined vehicles per year.

5.2.7 Fuel Costs

In this case study, the fuel price was determined by consulting with a representative from *Transport Canada*, Louis-Paul Tardif. The fuel cost was generated based on a 2010 configured for the government based on the *cost of operating trucks in Canada*. From this report, fuel costs have been gathered from a consulting firm *Logistics Solution Builders*, who maintains a database of realistic fuel consumption rates for each case study hauling scenario. These are based on, and updated with, consultation of fleet operators, discussions with distributors of power units to the industry and review of published literature on fleet energy management benchmarks, and targets (Transport Canada, 2010). For the purpose of this study, the researcher has used the estimated fuel price level for the specified

province (Ontario) constructed in the chart below. These values were provided in the 2010 Transport Canada Report on Cost of Trucking in Canada, including the fuel tax.

Table 3: Estimated Trucker Fuel Cost by Province (2010)

Estimated Trucker Fuel Costs by Province 2010 (Diesel)				
Province	Est. Purchase Cents/Litre (with fuel taxes)	Tank Wagon Cents/Litre (without fuel taxes)	Provincial Fuel Tax Cents/Litre	Federal Fuel Tax Cents/ Litre
British Columbia	104.3	85.3	15.0	4
Alberta	84.2	71.2	9.0	4
Saskatchewan	87.3	68.3	15.0	4
Manitoba	87.5	72.0	11.5	4
Ontario	90.6	72.3	14.3	4
Quebec	98.0	77.0	17.0	4
New Brunswick	96.5	75.6	16.9	4
P.E.I	93.7	69.5	20.2	4
NFL	96.3	75.8	16.5	
Yukon	97.4	86.2	7.2	4
N.W.T	100.7	87.6	9.1	4
Nova Scotia	95.4	76.0	15.4	4

In order to calculate the fuel cost, the following formula is offered:

$$\text{Cost of Fuel for 1 day/ vehicle} = \text{Current Fuel Rate (Cents/Liter)} * \text{Fuel Consumption (Liters)}$$

Fuel Cost for 1 Total Route/ Vehicle			
Straight Truck	107.52	* .91	= \$97.84
30' Pup Trailer with Tailgate	145.92	* .91	= \$132.79
Tractor 53' Trailer	203.53	* .91	= \$185.20

Once the cost of fuel per vehicle for one day has been accumulated, the fuel cost for total vehicles operating in one day can be calculated as well as the total fuel costs for the year.

Straight Truck	\$97.84	* 3 Trucks	\$293.52
30' Pup Trailer with Tailgate	\$132.79	* 2 Trucks	\$265.58
Tractor 53' Trailer	\$185.20	* 1 Truck	\$185.20
Total Daily Cost of Fuel			\$744.30
Annual Fuel Cost	\$744.30	* 5 * 50	= \$186,075.00

5.2.8 License and Registration Fees

The license fees have been calculated based on values presented by the *Ministry of Transportation* (MTO) in the specific region and province, in this case Ontario. The *Official MTO Truck Handbook* specifies all particulars in obtaining a certified license to drive a commercial vehicle. In order to reduce incidents of collisions and high-risk safety violations by new operators of trucks on Ontario highways, extensive testing and screening processes are conducted. *Commercial Vehicle Operators Registration* (CVOR) is a mandatory written test that operators will be required to successfully complete in order to obtain the certificate. Along with the CVOR test, all drivers must pass the *Highway Traffic Act; a National Safety Code Standard 10* (Cargo Securement). All drivers must meet the standards obtained in the regulations of the act (MTO, 2013).

Annual Licensing Fee * Total Amount of Vehicles being Operated

Total Annual License Fee	\$2,280.00	* 6	= \$13,680.00
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5.2.9 Road Tolls

This case study does not operate in a location where road tolls are present; therefore, the researcher has not accounted for this portion in the operational cost model.

5.2.10 Insurance

With regards to the case involving Company X, a full maintenance lease has been selected; therefore, the insurance must be allocated as a percentage of the revenue. This percentage reflects risk and claims performance of commercial fleets within the trucking industry. Collaborating with a *Risk Analyst* from Company X, who focuses on the company insurance as a whole, would be the best case scenario in obtaining a value for insurance. For the simplicity of this case study, the researcher assumed the insurance would fall between three percent and three point five percent of revenue. These values were assumed based on historical values, and research produced by Transport Canada. A quote from Penske (company quoted in full maintenance lease) indicated that they require at least a two million dollar liability in truck insurance from the company requesting the service. Furthermore, these values prove to be sufficient. Based on the information provided, the researcher consulted with Company X and chose to use three percent. The following formula will provide the Insurance cost as a percentage of total operation costs.

Insurance (% of Total Cost) * Total Operational Costs

$$\text{Insurance as Percent of Cost} \quad .03 * \quad \$860,771.53 \quad = \quad \$25,823.15$$

5.2.11 Administration and Interest

In order to obtain a reliable value that would indicate the average administration and interest rates on working capital costs in Canada, the researcher has consulted with Transport Analyst, Paul Guevremont, from Transport Canada. Mr. Guevremont has provided the researcher with both the United States and Canadian percentage rates on working capital costs. After reading over the American Transportation Research Institute (ATRI) published study on cost of trucking in the U.S., as well as Transport Canada's, 2010

final report on Cost of Trucking in Canada, administration and interest amount to 12% of total operational costs.

In order to calculate the administration and interest as a percent of cost, the following formula is recommended:

Administration and Interest (% of Total Cost) * Total Operational Costs

Administration and Interest as Percent of Cost .12 * \$860,771.53 = \$103,292.58

5.2.12 Operator Profit Margin (OPM)

When calculating the OPM for Company X, using a percentage that falls between the margins would be the most suitable measure. With this specific hauling situation being particularly new, the researcher has assumed a three percent operator profit margin. In order to calculate the operator profit margin as a percent of cost, the following formula is offered:

Operator Profit Margin (% of Total Cost) * Total Operational Costs

Margin as Percent of Cost .03 * \$860,771.53 = \$25,823.15

5.3 Variability in Model's Values

The motor carrier sector is a very diverse segment of the economy (Barton, R et al, 2006). For that reason, the development of statistical models has been hindered over the years, which in turn has made it more difficult to determine statistical averages when deciphering calculations such as operating costs.

In terms of the model's variable accuracy, meticulous attention has been devoted to obtaining either the industry best practice values in the specified location being observed or obtaining values directly from the source. There could potentially be a slight variance in the fuel costs, since the values obtained are from a 2010 report; the average annual fleet

discounted fuel price may have increased, inflating the fuel cost value. This inflation will have a minor effect on the overall cost model.

5.4 Results

When the highlighted values in the model are accumulated, the total price will determine Company X's dedicated operational cost when operating as an in-house activity. The total operational costs for Company X totaled **\$989,887.26**- a 27% reduction from the offer Carrier Y advised in their Dedicated Concept proposal. With this information the researcher –with the sanction of Company X- will determine if this cost reduction is enough to pull the operation back in-house, or remain in a contract with Carrier Y.

6. Analysis

To summarize up to this point, the researcher has described; the complete process of determining operational cost by involving the dedicated concept proposal, the development of the operational cost component model, tested the model, presented the alternatives, highlighted a range of issues that need to be taken into account regarding the outsourcing, and insourcing of Company X's transportation function. In this section, the researcher will begin by making an analysis of the model results presented in Chapter 4, by evaluating the advantages and disadvantages followed by the results of the model's sensitivity analysis. The constructed sensitivity analysis can be found in the appendix. The results will then be collaborated with the research collected in Chapter 3 of the Theoretical Framework. Once the modeled results have been elaborated upon, potential solutions will be structured to define the decision options.

6.1 The Proposed Model

There is no question that the standard route operated by Carrier Y for Company X, should be changed to a dedicated route concept. Company X has enough products to fill the capacity of a truck/trailer six times over. With over 19,000 probills accommodated by Carrier Y each year, and over sixty-five percent of them being operated in the heart of the GTA, Company X is currently paying over \$1.7 million in total charges each year for Carrier Y to complete this process. With the dedicated concept completed by either Carrier Y or Company X, this value is reduced immensely. Now that the dedicated concept proposal by Carrier Y has been elaborated on, the formulated model can be analyzed in greater detail and a comparison can be established.

6.2 Advantages and Disadvantages of Dedicated Model

The model offers both positive and negative aspects with regards to operating the dedicated concept in-house. If cost is the number one component for Company X, then the results of this model prove that insourcing this function of the supply chain is the best option; however, in theory, the activities that provide a competitive advantage are likely

the ones that receive an increased amount of internal investment, which in Company X's situation is not the case. Those functions that do not provide a competitive advantage are put in competition with an ever-expanding marketplace of external service providers, excelling in industry best practices and allowing the original company to focus on their core competency (Ruzzier & Srabotic, 2012).

6.2.1 Advantages of Insourcing Operation

There are a number of advantages that have derived from the results of this model. When deciding between purchasing and leasing vehicles used for this operation, the researcher was able to extract information from both categories to decide which option would better suit the operation at hand. After consulting with Penske (the rates, based on a five-year contract), a full maintenance lease proved to be the best option. With Company X being a company which does not specialize in transportation, the full maintenance lease would enable Company X eliminate the time spent, as well as working capital, on the fleet. Since Company X would be new to this insourced operation, obtaining this fleet could prove to be costly and time-consuming; two features a global company does not want to deal with. Instead, Company X agreed that choosing an external vehicle provider who would take care of everything from vehicle specification, configuration, financing and the responsibility of fleet maintenance and disposal was the appropriate path to follow. With this, Penske offered a per month price based on a 5-year contract which proved to be cheaper than Carrier Y's rate who currently has these vehicles at their disposal. If the decision was to insource this operation, activities where money is currently being spent could be eliminated by Company X's already implemented IT or TMS in Systems Application Products (SAP). SAP is an Enterprise Resource Planning (ERP) system that handles all the departments of an organization and has a special industry specific solution for almost all industries including transportation (Asthana and Haslam, 2012). Aside from advantageous cost savings, insourcing any function of the supply chain immediately resorts back to internal control. By insourcing the transportation function, Company X would have full control over productivity, communication, custom reporting, product integrity (fewer touches) and dynamic planning (flexibility). By bringing this activity back in-house, Company X could potentially integrate the new specialization into the organizational

structure and develop reporting procedures, monitor progress on the work, make adjustments to policies and procedures as necessary. They would also be able to hire, train and terminate employees depending on performance (Kokemuller, N.D). All of these aspects, aside from cost, lead back to the earlier point of internal control. Referring back to Chapter 4 on “Model Components,” the author described the breakdown of the model in different levels accurately describing how each component of the model was developed. The three components that the model exemplified were Costs, Environmental Aspects and Quality Aspects. The developed model has communicated and touched on these components in the case of Company X from an insourced perspective. Cost and control are the two factors, which will influence this change of operation. The disadvantages and results from past case studies described in the next section could potentially deter Company X from the decision of leaving the relationship with Carrier Y and completing this function on their own.

6.2.2 Disadvantages of Insourcing

With change, there may be disadvantages, which will ultimately bring along desired results. This is the case of Company X. Once the implementation process has been planned, the initial investment of the function will set in. If Company X maintains ownership of the entire operation; they will face initial investments that have not been seen previously. After the completion of the contract with Penske, if Company X decides they want complete control and decide to invest in a fleet, costs will immediately rise. By letting an external party have control over the operation, better cash flow can be attained and opportunity costs are avoided; the work of getting everything approved for final release of funds is also eliminated if outsourced (Anderson and Thoresson, 2002). With this operation being brought in-house, a labor investment must be taken into consideration. This is where the costs seem to increase. Each of the employees (whether designated as an employee working on the operations of the activity, staff member (loader/unloader) or as a driver) will be classified as Company X employees under Company X regulations and labor rates. This means full benefits will have to be included, thus increasing the cost of labor. If an external company completes this function, those costs would be reduced and tied up

capitol will be eliminated. The high investment required for insourcing may outweigh its benefits due to economies of scale. Although the model shows that internally, operating this function is cheaper, the model does not take into consideration training and experience in this department. Company X could potentially incur higher research costs, training costs and re-work costs due to incompetence and lack of resources. The in-house researchers could potentially have to take on multiple roles in order to compensate for the lack of competency, which could in turn reduce strategic flexibility. Because this function of the supply chain is new to Company X, the amount of time and effort spent on executing the transportation function could potentially be duplicated in comparison to that of an external provider whose core competency focuses on the transportation industry. A potential inconsistency factor for the sheer lack of experience can also be another issue Company X will face if the operation is brought in-house. Another disadvantage, which could be considered the 'most important aspect,' is the limited focus on Company X's core competency. Maintaining and operating a successful transportation fleet is far from Company X's specialties. With the SAP system currently in place, Company X is able to manage the transportation from an arrangement point of view and deal with the planning and IT aspect of the operation. The question is, should Company X be dealing with operating the fleet at all? If one assumes that operating the fleet (driving, maintenance, insurance, training, continuous improvement programs and flow optimization) is the core of Company X, than this situation should have never arisen because the operation would have obviously been kept in-house from the beginning. There is considerable education and training involved in operating a fleet from an internal standing, rather than allowing time and devotion to be allocated in areas more appropriate to the competency of the company.

6.3 Sensitivity Analysis

The formulated sensitivity analysis tests how the model results change by altering the input parameters for variables that might be uncertain. Using a sensitivity analysis will provide information on how robust the results/ conclusions are within the model.

Both *fuel cost* and *non-driving time* are two uncertain variables included in the operational cost model. These variables can fluctuate over time, skewing the model results. For this reason, the researcher has constructed a sensitivity analysis using these variables. The vertical axis represents the fuel cost alterations starting at eighty cents per liter increasing at a five-cent rate until reaching the limit of one dollar and fifty cents. The horizontal axis represents the second uncertain variable of *non-driving time*, which increases at a twenty-five minute rate until reaching the maximum, two hours. The row input cell is the *non-driving time* and the column input cell is *fuel cost*. Once these cells have been determined, a data table is formulated.

In the case of Company X, the sensitivity analysis shows that the final result is not significantly susceptible to changes in the primary inputs. Using reasonable ranges, fuel cost, and non-drive time, the model still shows a cost advantage to Company X if the work was done internally. As a form of due diligence, similar analysis may have been performed by Carrier Y to determine optimal pricing.

6.4 Discussion

In Chapter 3, the author explains how outsourcing continues to receive an immense amount of attention and for one to say that this function is a new phenomenon would be erroneous; this is no different for Company X. When trying to determine if this function of the supply chain should be brought in-house, or remain with an external provider, it is important to understand that Company X is no stranger to the outsourcing idea. According to internal sources, Company X has outsourced functions of IT development and maintenance services with an Indian IT services provider for the past 12 years; a portion of manufacturing has been outsourced to a French company and re-sold in the U.S. Another outsourcing function is staffing services for clinical documentation improvement, as well as outsourcing of the transportation fleet. Company X has realized, that in order to stay competitive and surpass market bests, outsourcing functions that are not at the core of the company have proven to be successful. From the model presented, it is clear that Company X could potentially benefit from owning the operation if the appropriate resources are present. If the function was brought in-house, the consolidation of activities is a strength

that could potentially be gained within the company (according to discussion with a Company X representative); the already implemented IT system would prove to be beneficial and having total control over the operation means that all of the costs are known. In other words, there is a competence level that could potentially adjust to the implementation of this in-housed operation; however, the operation has not been completed in-house for over 20 years, so experience would be novice at best. As mentioned earlier, if cost is the only factor affecting this model, insourcing this operation would be ideal –at first glance- for Company X. What the model does not show is the amount of time it will take to train employees on the new implementation, positions that could potentially be affected by the change due to the transfer of responsibilities, error and re-work costs. The model does not reflect the declination in certified commercial drivers over the past 10 years. This is not only a local problem, but also a global one. Gerard van Kesteren, chief financial officer of Kuehne & Nagel International, located in Germany and operating over 10,000 trucks and trailers, mentions in a recent article that, “There’s a serious driver shortage in Germany,” which means that “we have to pay somewhat more to get drivers. And because the margins are so thin, we have to pass this additional cost on to clients (Weiss, 2013).” Similar to European countries, Canada too is heading in the direction of driver shortage. According to Marco Beghetto of the *Ontario Trucking Association*: “Southwestern Ontario is the heart of the pipeline linking the auto industry to the rest of the country and the U.S., so the driver shortage will be felt most acutely here, and at some point or another this declination will impact how goods are delivered and the costs associated with products on the shelf” (Hnatyshyn, 2014). Another aspect this model does not cover is the needed infrastructure for idle vehicles. The complete operation proves to be cheaper if all of these resources are available.

According to the three mutually exclusive outsourcing models mentioned in the Theoretical Framework, Company X is currently in an, ‘arms-length’ relationship with Carrier Y. Company X does not report to Carrier Y based on their performance level and Carrier Y only provides the service as stated in the contractual agreement, paid by piece. If Company X chose to accept the dedicated freight model based on Carrier Y’s proposal, the

outsourcing model would then be considered a Strategic Partnership. In this case, a bilateral agreement including both parties, openly discussing their responsibilities and mutually reliant performances, reporting to each other upon completion is required. The Strategic Partnership solves several of the issues that arose if the function were to be implemented in-house. Essentially, a strategic partner can provide you with capital, or let you leverage their brand to give you more exposure (Eben, 2014). If Company X and Carrier Y establish clear objectives, making sure both parties have a mutual understanding of all of the aspects of the function, a positive outcome could result. Referring back to the Pilot Chemical Company and the ChemLogix LLC. Case study, we can see a real representation of a Strategic Partnership. Pilot wanted to implement a new TMS, which would potentially solve cost-to-serve issues and reduce internal and external costs to the company. After a failed attempt at completing the activity in-house, it would only make sense to communicate this concern and idea with ChemLogix LLC, an external provider who specializes in this work. Because Pilot had already outsourced functions of their company to ChemLogix in the past, this was the perfect opportunity to collaborate resources in creating a positive opportunity for both parties. The Strategic Partnership model focuses on bottom-line impact where the client expectations include cost savings and variable capacity and the vendor offers integration expertise, disciplined practices, as well as economies of scale. Based on the results of the case study, this collaboration proved to be successful in creating opportunities for both companies involved.

If Company X decides that they want to explore Carrier Y's proposal in greater detail, the opportunity for influential change is guaranteed. Carrier Y presented this proposal as a form of cost reduction opportunities, quality control opportunities and environmental stewardship opportunities. Carrier Y already has the infrastructure needed to complete the full operation; they are familiar with Company X's products, the implemented TMS is the sole focus of the company, and because transportation is their core competency, they are constantly being presented with the industry best practices including, environmental innovations on vehicles, diesel cost reductions, and experienced personal. Carrier Y is the only carrier who completes Company X's LTL operation in the GTA. If the proposal is

accepted, the strategic partnership will allow the companies to gain a competitive advantage in several areas. Carrier Y is currently transporting Company X's goods in the GTA on a non-dedicated system where there are multiple touches on the route. This could potentially lead to error and damage. With this dedicated model, Company X will be closer to the development of the operation, so the risks of making errors will be minimized, if not eliminated. Quick adjustments and check-ups can be made easily without wasting time and concerns can be discussed without a middleman; there would be reduced complexity. The dedicated concept implies that Company X would obtain the full solution -full dedication from the external provider, without having to create certain windows or space availability based on other suppliers. Company X would have fewer administrative tasks. The completed operation would be in the hands of Carrier Y, thus making them responsible for the productivity, truck location access and monitoring, custom reporting focusing on cost comparisons, activity and volume, benchmarking and specific target goals. This would then be discussed in a collaborative review with Company X indicating the improvements as well as concerns. Choosing an external provider would have a positive effect on the economies of scale, and since the chosen external carrier supplies other companies with their services, overall transport efficiencies could be made which would have a positive impact on the price charged. Because Carrier Y is supplying other companies with the same type of services, higher service standardization can also be obtained. Furthermore, by choosing to stay with an external supplier, Company X would have access to specialist knowledge in this industry. With the collaboration, Company X could potentially see this as an incentive for Carrier Y to focus more upon the provision of quality assured services. In order for Carrier Y to remain a credible partner, constant innovation, along with quality-controlled services, would be entrusted with renewed contractual agreements. If Company X accepts this proposal, the focus on core competency for both parties will allow for effective results.

6.5 Decision

Based on the analysis and the results from past case studies, it is evident that choosing an external provider whose core competency specializes in transport services would be the

best decision in theory; however, that doesn't mean Company X should disregard the results of the in-house operational cost model. There should be ample reflection on the outcome of the model with regards to cost components. Based on the results of the cost model, there are strategic implications for Company X that could impact the company immensely. It is evident that through insourcing, theoretical savings are present, however, there are many risks and disadvantages associated with this decision. Now that the cost components have been established, Company X can adopt a portion of the insourcing advantages through better negotiation because the breakdown of the cost structure proves that there are savings to be made. If Company X decides to accept the proposal presented by Carrier Y, the in-house model should be used as a negotiating tool that will affect the original proposal and components associated with it. In order to stay profitable, the external provider must charge a premium in completing services. Conversely, now that Company X has been presented with the actual costs associated with the operation, there is room for compromising between parties in settling on a model that is balanced on both ends. Evidently, Carrier Y's proposal is geared at a cost reduction of seventeen percent, which reflects existing research, aiming to establish a model that is better suited for Company X, yet still profitable for themselves- the question is how profitable? If Carrier Y is willing to discuss the individual components in presenting how each value has derived, it allows Company X to refer to their model and discuss the actual values based on the extensive research dedicated to establishing the in-house model. Once the collaborative negotiation has been completed, a common consensus can be recognized. If this strategic partnership is carried out successfully, it could create the possibility for Carrier Y to extend their services to Company X in areas other than the GTA. Once the completed vision has been aligned, both companies can implement a team dedicated to the configuration of the concept and develop a start-up plan based on well-defined requirements and measures. Information between Company X and Carrier Y has to be standardized with as much transparency as possible in order to have a successful outcome. Company X can outsource the operation while reaping the strategic implications of insourcing.

7. Conclusion

This final chapter will return to the root of this case study, summarize the initial research problems, and provide potential / viable suggestions to conclude this report.

After analyzing and interlinking the information drawn from Carrier Y's initial proposal with the constructed operational cost model, Company X will follow suit and keep the fleet operation outsourced. Despite the price differentiation, this decision was based on the results of the outsourcing theory as well as previous case studies completed in this field. While the verdict to remain in a professional relationship with an external party has been recognized, the evidence that has been constructed in this case study proves that there are strengths and weaknesses, regardless of the direction Company X would have chosen. Although Company X insources many activities of the transport function, the transportation fleet is an activity that extends far from the company's core competency. To obtain the proper resources and level of competence needed to execute this operation efficiently and effectively, Company X would need years of experience, training expertise and a rearrangement of the current infrastructure in order to stay competitive. The operational cost model proves that completing this operation in-house reduces costs by a sufficient amount; however, it does not focus on the long-term effects of the outcome if the operation was changed from an outsourcing operation to an in-house operation. The pros of leaving this function outsourced and accepting Carrier Y's proposal has outweighed the cons.

Carrier Y is a leader in the transportation industry and focuses on the industry best practices. Carrier Y implements and works with new innovations as the industry is exposed to technical and environmental issues on a regular basis. Investing in the appropriate infrastructure with experience and top-of-the-line IT networks, this external provider is the best option for Company X to remain in a relationship with, should they want to stay competitive while focusing on their main objectives. Once Company X accepts this proposal, and moves forward with the negotiation process, the constructed operational cost model should be used as tool in order to negotiate the cost structure that Carrier Y has currently

set in place. If Carrier Y is willing to work with the researched material in this case study, the communication between both parties as well as the base of the strategic partnership, will create a solid platform for future proposals and negotiations.

This case study had three expected contributions presented in order to connect and communicate the outcome of the assignment:

1. Proposed Model
2. Case Study and Result of Applying the Model
3. Validating the model based on Empirical Material

The original proposed model presented by Carrier Y to Company X was the foundation in which Company X consulted with the researcher in order to construct an own model that would display figures true to scale of how much it would cost to complete this operation as an internal function. After meticulous research and consulting with professionals working along-side industry best practices, the researcher proposed a model that would represent all of the components involved in completing this assignment. Once a generic model was created, the researcher took existing figures from the company database, along with researched values, and applied the model to this specific case study in order to test the model. By slightly altering the generic model, the researcher was able to find a result based on the specifications implied by Company X. The researcher has also constructed a sensitivity analysis to see how robust the model actually is. The sensitivity analysis shows that the final result is not significantly susceptible to changes in the primary inputs. These contributions have communicated and connected the model to deliver an outcome that is valuable to Company X in going forward with the proposal with Carrier Y. Connecting the results from the model with the findings in the theoretical framework has added value to the case and the future decision making of both parties.

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9. Appendices

Appendix 1: LTL Operational Cost Model

LTL Operational Costs	Vehicle Type				Total Trucks
	3 Straight	2 Tractor/ 30' Pup	1 - 53'		
<u>A. Vehicle Operational Productivity</u>					
Average Trip Travel Distance / Trip (KM)					238
Number of Trips Per Truck Per Working Day					1
Number of Days Worked Per Year					350
Average Travel Speed (km/hour) =	37				
Average Daily Driving Time (HR) / vehicle =	6.4				
Average Annual Driving Time (HR) =	1600				
Waiting / Loading / Unloading (Paid) Per Day (Hr) =	10.5	9	6		25.5
Annual Non Driving Time (Paid) (Hr) =	2625	2250	1500		6375
Total Drive Time (HR)	4.540540541	6.162162162	8.5945946		
Total Drive Time Including (non driving time)	8.040540541	10.66216216	14.594595		
Total Time Trucks Combined / Day	24.12162162	21.32432432	14.594595		60.0405405
Per Vehicle Fuel Consumption Rate (litres / 100 km)=	64				
liters/ 1km/ day	0.64	322.56	291.84	203.52	817.92
Annual Fuel Consumption (litres)=		80640	72960	50880	204480
<u>B. Vehicle Operation Costs</u>					
Full Maintenance Lease (Monthly fees)		\$4,815.00	\$4,400.00	\$2,090.00	\$11,305.00
Annual Full Maintenance Lease					\$135,660.00
Fuel Costs (cents / litre) / day	\$0.91	\$293.53	\$265.57	\$185.20	\$744.31
Average Annual Fuel Cost=		\$73,382.40	\$66,393.60	\$46,300.80	\$186,076.80
Driver Wages (3m Employees)	\$35.00	\$281.42	\$373.18	\$510.81	
3 Drivers for 3 Straight Trucks	\$105.00	\$844.26			
2 Drivers for 2 Tractor/30 ' Pup Trailers	\$70.00		\$746.35		
1 Driver for 1 53' Trailer	\$35.00			\$510.81	
Total Driver Costs for Combined Trucks					\$2,101.42
Total Annual Driver Costs for Combined Trucks					\$525,354.73
Annual Licence Fee	\$2,280.00				\$13,680.00
Total Operational Costs excluding Overhead Costs					\$860,771.53
Overhead Costs					
Insurance as Percent of Cost: 3%					\$25,823.15
Admin and Interest as Percent of Cost: 12.00%					\$103,292.58
Margin as Percent of Cost: 3.00%					\$25,823.15
Total Operational Costs					\$989,887.26

Appendix 2: Sensitivity Analysis

Model Sensitivity Analysis									
Fuel Costs	\$ 0.91								
Non-Driving Time (hrs)	0.25								
		Non-Driving Time							
	\$989,887.26	0.25	0.5	0.75	1	1.25	1.5	1.75	2
	\$ 0.80	\$ 964,020.54	\$ 979,114.29	\$ 994,208.04	\$1,009,301.79	\$ 1,024,395.54	\$1,039,489.29	\$1,054,583.04	\$ 1,069,676.79
	\$ 0.85	\$ 975,778.14	\$ 990,871.89	\$1,005,965.64	\$1,021,059.39	\$ 1,036,153.14	\$1,051,246.89	\$1,066,340.64	\$ 1,081,434.39
	\$ 0.90	\$ 987,535.74	\$1,002,629.49	\$1,017,723.24	\$1,032,816.99	\$ 1,047,910.74	\$1,063,004.49	\$1,078,098.24	\$ 1,093,191.99
	\$ 0.95	\$ 999,293.34	\$1,014,387.09	\$1,029,480.84	\$1,044,574.59	\$ 1,059,668.34	\$1,074,762.09	\$1,089,855.84	\$ 1,104,949.59
	\$ 1.00	\$ 1,011,050.94	\$1,026,144.69	\$1,041,238.44	\$1,056,332.19	\$ 1,071,425.94	\$1,086,519.69	\$1,101,613.44	\$ 1,116,707.19
	\$ 1.05	\$ 1,022,808.54	\$1,037,902.29	\$1,052,996.04	\$1,068,089.79	\$ 1,083,183.54	\$1,098,277.29	\$1,113,371.04	\$ 1,128,464.79
	\$ 1.10	\$ 1,034,566.14	\$1,049,659.89	\$1,064,753.64	\$1,079,847.39	\$ 1,094,941.14	\$1,110,034.89	\$1,125,128.64	\$ 1,140,222.39
Fuel Costs	\$ 1.15	\$ 1,046,323.74	\$1,061,417.49	\$1,076,511.24	\$1,091,604.99	\$ 1,106,698.74	\$1,121,792.49	\$1,136,886.24	\$ 1,151,979.99
	\$ 1.20	\$ 1,058,081.34	\$1,073,175.09	\$1,088,268.84	\$1,103,362.59	\$ 1,118,456.34	\$1,133,550.09	\$1,148,643.84	\$ 1,163,737.59
	\$ 1.25	\$ 1,069,838.94	\$1,084,932.69	\$1,100,026.44	\$1,115,120.19	\$ 1,130,213.94	\$1,145,307.69	\$1,160,401.44	\$ 1,175,495.19
	\$ 1.30	\$ 1,081,596.54	\$1,096,690.29	\$1,111,784.04	\$1,126,877.79	\$ 1,141,971.54	\$1,157,065.29	\$1,172,159.04	\$ 1,187,252.79
	\$ 1.35	\$ 1,093,354.14	\$1,108,447.89	\$1,123,541.64	\$1,138,635.39	\$ 1,153,729.14	\$1,168,822.89	\$1,183,916.64	\$ 1,199,010.39
	\$ 1.40	\$ 1,105,111.74	\$1,120,205.49	\$1,135,299.24	\$1,150,392.99	\$ 1,165,486.74	\$1,180,580.49	\$1,195,674.24	\$ 1,210,767.99
	\$ 1.45	\$ 1,116,869.34	\$1,131,963.09	\$1,147,056.84	\$1,162,150.59	\$ 1,177,244.34	\$1,192,338.09	\$1,207,431.84	\$ 1,222,525.59
	\$ 1.50	\$ 1,128,626.94	\$1,143,720.69	\$1,158,814.44	\$1,173,908.19	\$ 1,189,001.94	\$1,204,095.69	\$1,219,189.44	\$ 1,234,283.19

Appendix 3: Interview Guide

By the sheer nature of this report, each question was catered individually to the specific need of the model component. Below are a few sample questions used in order to give the reader an idea of how the semi-structured interviews were formulated.

- 1) What are the annual and monthly prices of a full maintenance lease based on specific vehicles?
 - 1b) Is it possible to get a price based on a 5-year contract?
- 2) What is the average wage of an Ontario Truck Driver?
- 3) What is the average salary of a full time employee, receiving full benefits?
- 4) What is the average travel speed of a lorry in a congested area?
 - 4b) What is the average travel speed of a lorry in the GTA?
- 5) What are the results of previous operating costs in Canada for the trucking?
 - 5b) Can the annual reports be sent via e-mail?