LOGISTICS SOLUTIONS FOR COMPANY A's LATIN AMERICAN MARKET

by

Ming Yan
B.Eng., Shanghai University of Technology, 1991

and

Hua Yu
B.Eng., East China University of Technology, 1994

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Approval

Name: **Ming Yan**

Hua Yu

Degree: **Master of Business Administration**

Title of Project: **Logistics Solutions for Company A's Latin American Market**

Supervisory Committee:

Michael Parent
Senior Supervisor
Associate Professor
Faculty of Business Administration

Colleen Collins-Dodd
Second Reader
Associate Professor
Faculty of Business Administration

Date Approved: Dec. 7/04

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Abstract

Company logistics is a key component of a company's strategy to improve performance. When the company expends to a new overseas market, logistics function plays a vital role in successful start-up operations and sustainable business expansion. This paper starts with the roundup of logistics fundamentals and then draws out two optional logistics solutions - in-house and third-party logistics – for Company A's Latin American market. After forward considerations of geographical, political and economic factors in Mexico, Brazil and Argentina, a detailed in-house distribution network has been designed with a hub in Mexico. Thereafter, third-party logistics, a one stop outsourcing solution, has been analyzed as an alternative for the company to improve its logistics efficiency by taking advantage of the third-party logistics service providers in its Latin American market. Both solutions have been scrutinized under certain criteria and a final recommendation has been put forward.

Acknowledgements

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1 OVERVIEW

1.1 Project Overview

1.1.1 Purposes and Objectives

This project focuses on business logistics research and analysis of Company A's Latin American market. The study is part of the firm's long-term international business expansion program relating to its supply chain management capability. The project involves an analysis of the firm's global logistics and distribution and is supervised by the Department of Business Administration at Simon Fraser University.

This paper proposes leveraging Company A's logistics practice between delivery performance and cost reduction within its supply chain to achieve seven fundamental objectives:

- Understand Customs Policies and Trade Compliances;
- Gain insight into the effects of political and social climates;
- Identify important aspects of transportation, brokerage, and customs regulations and their subsequent impacts on Company A's global logistics strategy;
- Establish a detailed analytical model of international distribution;

- Improve the efficiency of business logistics of off-shore manufactures and suppliers by promoting best practices;
- Build a foundation to propel international logistics integrity; and
- Assist in introducing findings and recommendations that help Company A build a more robust supply chain network in its Latin American market.

A full understanding of customs regulations, restrictions, and trade compliances will enable decision makers at all levels to make informed decisions regarding global expansion. Internal policies relating to cost implications for customs duty, transportation, and brokerage should incorporate a logistics solution to strengthen the capability of supply chain teams and reduce costs and improve efficiency of operations management. A reliable logistics solution should contain all of the key variables and study how these variables could affect the company's profitability and supply chain efficiency. An appropriate business logistics environment will improve the time to market and will be integral to building competitive advantage, increasing customer satisfaction, and improving profitability.

Various factors could affect the efficiency of transportation and distribution. Cost considerations for international trade, transportation and distribution include transportation, tariff, tax, and facility investment. Along with these direct costs, there are importation barriers such as customs regulations, restrictions, and quotas that could greatly impact the profitability or even feasibility of developing a market in a foreign country. Dynamic social and political climates can critically impact the sustainability of

Company A's supply chain and can very often act as driving forces for major change in a country's importing policy. A sound logistics strategy could help Company A manage its supply chain in the least costly and most expeditious manner and attain certain levels of customer service.

1.1.2 Project Scope

1.1.2.1 Logical and Theoretical Scope

The basis for modeling Company A's business logistics solution is derived from analysis of the following:

- Logistics Fundamentals in Global Supply Chain Management
- Outsourcing Logistics

1.1.2.2 Company Project Scope

- Research Political/Social Climates, Customs Regulations, Restrictions, and Trade Compliances for the following markets:
    - Mexico;
    - Brazil; and
    - Argentina
- Develop short-term and long-term logistics distribution strategies based on the analyses of international transportation, warehousing and other services for the target market. Considerations include:
    - In-house Distribution Strategy
    - Outsourcing Logistics

- Develop specific recommendations for optimization of Company A's distribution in the Latin American market.

1.2 Company Overview

1.2.1 Company A

Company A is a world leader in advanced power electronics. Company A makes a positive difference in the lives of people around the world by combining proven technology with unprecedented market understanding to bring its consumers products that enable the delivery of electricity anytime and anywhere (http://www.companyA.com).

Company A operates in high growth segments of the advanced power electronics market and sells well-established products and systems to a diverse customer base in the Distributed, Mobile, and Programmable power markets (http://www.companyA.com).

- Distributed Power

  Distributed Power products allow customers to increase energy efficiency and freedom both on and off the grid, while making a positive impact on the environment (http://www.companyA.com).

- Mobile Power

Mobile products provide the freedom and safety of clean, quiet electricity when and where customers need it by providing on-board auxiliary power or standalone portable power (http://www.companyA.com).

- Programmable Power

Programmable products provide reliable, high quality power that enables customers to develop, test, manufacture and power precision equipment to compete in the advanced global power electronics industry (http://www.companyA.com).

Company A's enabling technology converts raw electrical power from backup power, central utility, distributed or renewable generation into high-quality electricity required by electronic and electrical equipment. The company's knowledge and experience in advanced power electronics is helping to accelerate the commercialization of emerging power systems and solutions (http://www.companyA.com).

1.2.2 Company A's Logistics Goods Flow

Company A has several manufacturing and warehouse facilities in Burnaby, British Columbia, Canada; Arlington, Washington; Livermore, California; and Elkhart, Indiana. Additional facilities are located in the United States and Barcelona, Spain (http://www.companyA.com). Products traveling in the company's global logistics network could be grouped into three categories: Finished Goods (FG), Sub-assemblies

(SA), and Components (CP). The company imports CP and SA from China, Hong Kong, United Kingdom, etc., and assembles them into FG in the Burnaby and Arlington facilities. Furthermore, to make the products more competitive, the company has outsourced several product lines outside of North America.

The following flow charts (Figure 1, Figure 2) show how Company A's products flow through the firm's supply chain network.

Figure 1 Inbound Flow from Suppliers to Company A's Manufacturing Facilities in North America

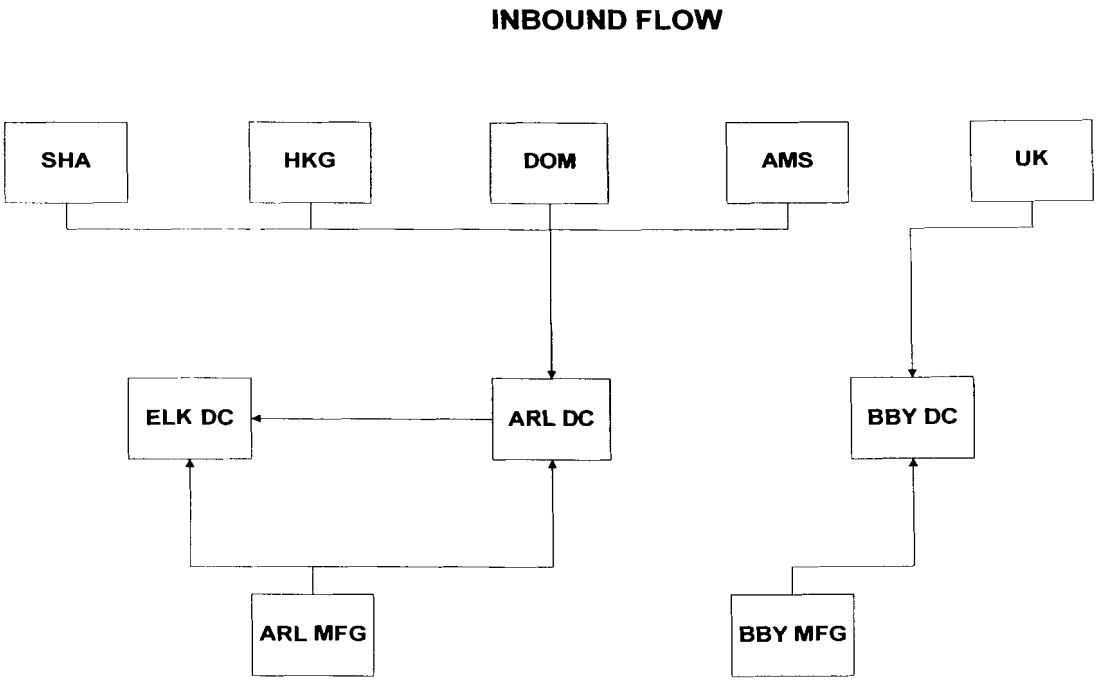
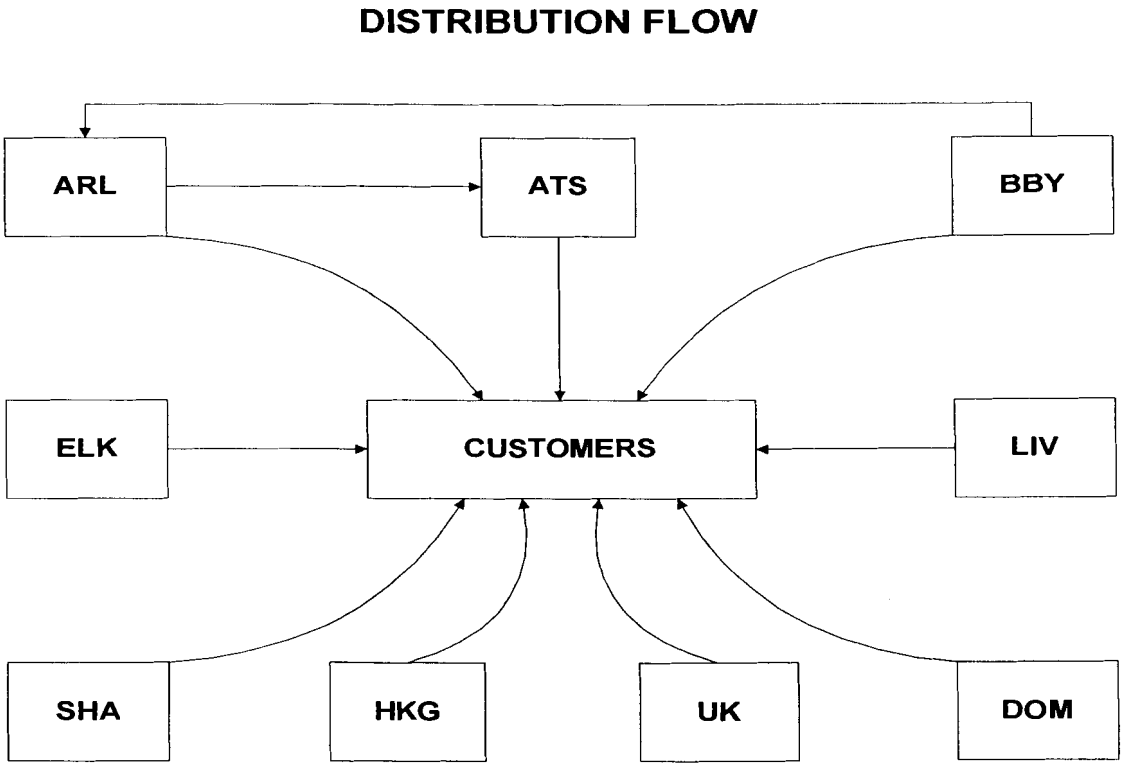


Figure 2 Distribution Flows From The Company A's Manufacturing Facilities, Distribution Centers and Outsourcing Partners to The Final Customers.



Instead of simply importing CP or SA from China to North American by water, the company employs complicated distribution paths and combinations of shipment routing. A growing number of products are produced outside North America; furthermore, an increasing number of those outsourced products are shipped from the countries of origin directly to customers outside North America.

Table 1 Acronym for Figure 2

Acronym	Definition	Acronym	Definition
FG	Finished Goods	DOM	Dominica
SA	Sub-assembles	ELK	Elkhart
CP	Components	ARL	Arlington
DC	Distribution Center	LIV	Livermore
BBY MFG	Burnaby Manufacturer		

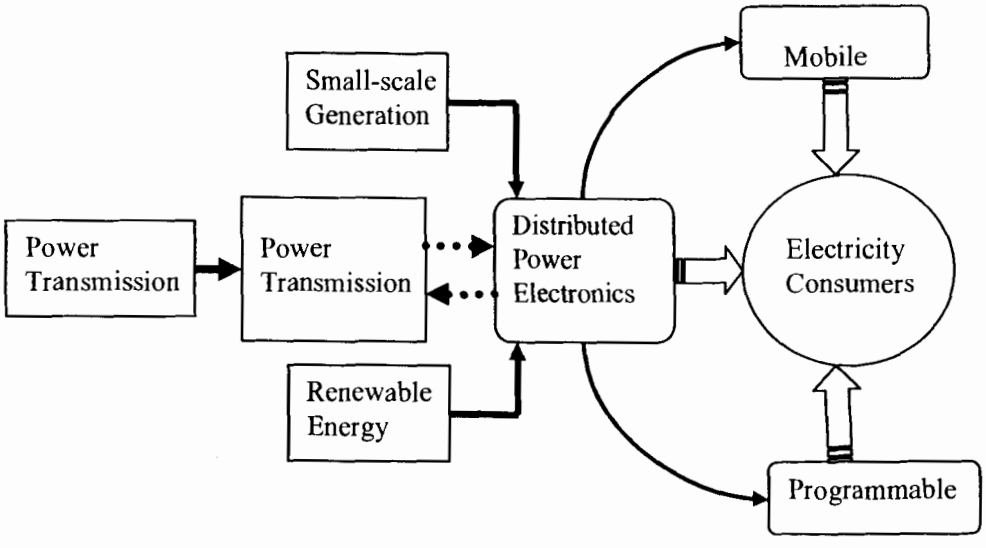
1.3 Industry Overview

Advanced power electronic equipment converts on-grid or off-grid electricity into different forms of power suitable for transmission, distribution and consumption under certain requirements. The application can be the conversion of power from renewable and advanced energy or storage technologies into electrical power that can be used as a primary or backup power source. Vice versa, the conversion of surplus power generated from small-scale generation or renewable energy can be used as a power source back into the grid network.

Advanced power electronic equipments are major components in an electric power system, which starts from power generation to the electricity consumption (Figure 3). As the bridge between power distribution networks and special applications required by consumers, advanced power electronics have to satisfy both power producers and consumers' interests while at the same time, meet certain technical requirements. Thus, advanced power electronic equipment producers such as Company A, have always been following the market trend of the electric power industry and electricity consumption.

Given their strong influence on the power electrics industry, consumer considerations are always a top priority when a company develops its future expansion plan.

Figure 3 How Company A's Products Fit into The Electric Power System



Note: A summarized industry PESTEL framework has been attached in the appendices.

2 LOGISTICS STRATEGY FUNDAMENTALS

2.1 The Philosophy of Logistics and Supply Chain Management

2.1.1 Supply Chain/Supply Chain Management

Supply chain is the continuous link between the supplies of raw materials through production to the finished product being delivered to the final consumer. This link "encompasses all activities associated with the flow and transformation of goods from the raw materials stage, through to the end user, as well as the associated information flows." (Handfield, and Nichols Jr., 1999, p.2.)

Supply chain management is one of the key function a business organization manages the flow of goods though out the supply chain. The term - supply chain management - arose in the late 1980s and came into widespread use in the 1990s (http://ca.wiley.com, 2004). Materials and information flow both up and down the supply chain. "Supply chain management is the integration of these activities, through improved supply chain relationships, to achieve a sustainable competitive advantage." (Handfield, and Nichols Jr., 1999, p.2.) Supply chain management is more generally defined as:

> The systematic, strategic coordination of the traditional business functions and the tactics across these business functions within a particular company and across businesses within the supply chain, for the purposes of improving the long-term

performance of the individual companies and supply chain as a whole. (Mentzer, DeWitt, Keebler, Min, Nix, Smith, & Zacharia, 2001, pp.1-25.)

2.1.2 Logistics

Logistics concerns physical goods and information flows from raw materials to finished products that are distributed to end-users. Some definitions of logistics are as follows:

> Business logistics is the process of planning, implementing and controlling the flow of personnel, materials and information from the point of origin to the point of destination at the required time and in the desired condition. ... the process of planning and controlling the flow of raw materials, work in progress or finished products from the point of origin to the point of destination (either to a factory for further processing, to a warehouse for storage or to the marketplace for sale) at the required time and in the desired condition. (Edward G. Hinkelman, 2002)

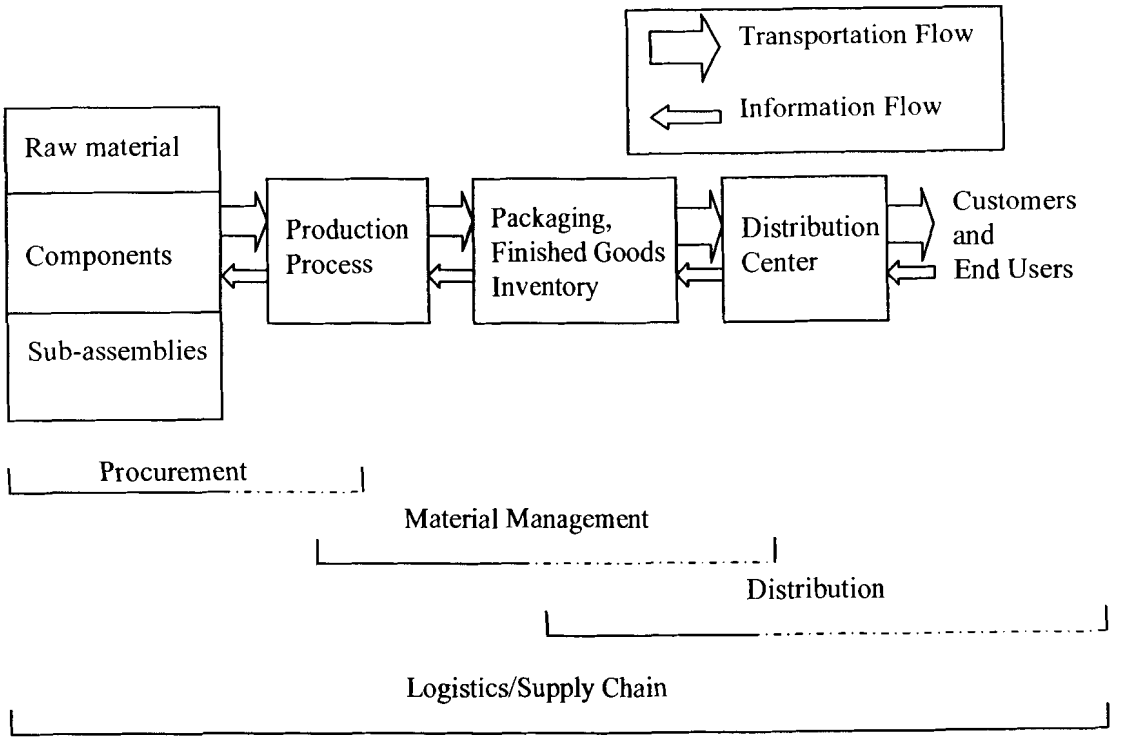
> Logistics is that part of the supply chain process that plans, implements, and controls the efficient, effective flow and storage of goods, services, and related information form the point of origin to the point of consumption in order to meet customers' requirements. (From the by laws of the *Council of Logistics Management*, http://www.clm1.org. para. 5)

Although the definition between supply chain and logistics management appears fuzzy, for the purposes of this project, international business logistics and supply chain management will be referred to interchangeably and the main focus will be on managing the goods and information flows in the most efficient and effective manner, regardless of descriptive title (Baliou, 2004).

2.1.2.1 Distribution

Distribution is one element of logistics concept and only focuses on transporting physical products through distribution channels. Procurement and material management represent flows through the production process, while distribution represents flows from the point of final production to end-users. Figure 4 illustrates different elements that make up a complete logistics system/supply chain.

Figure 4 Key Components of Logistics/Supply Chain

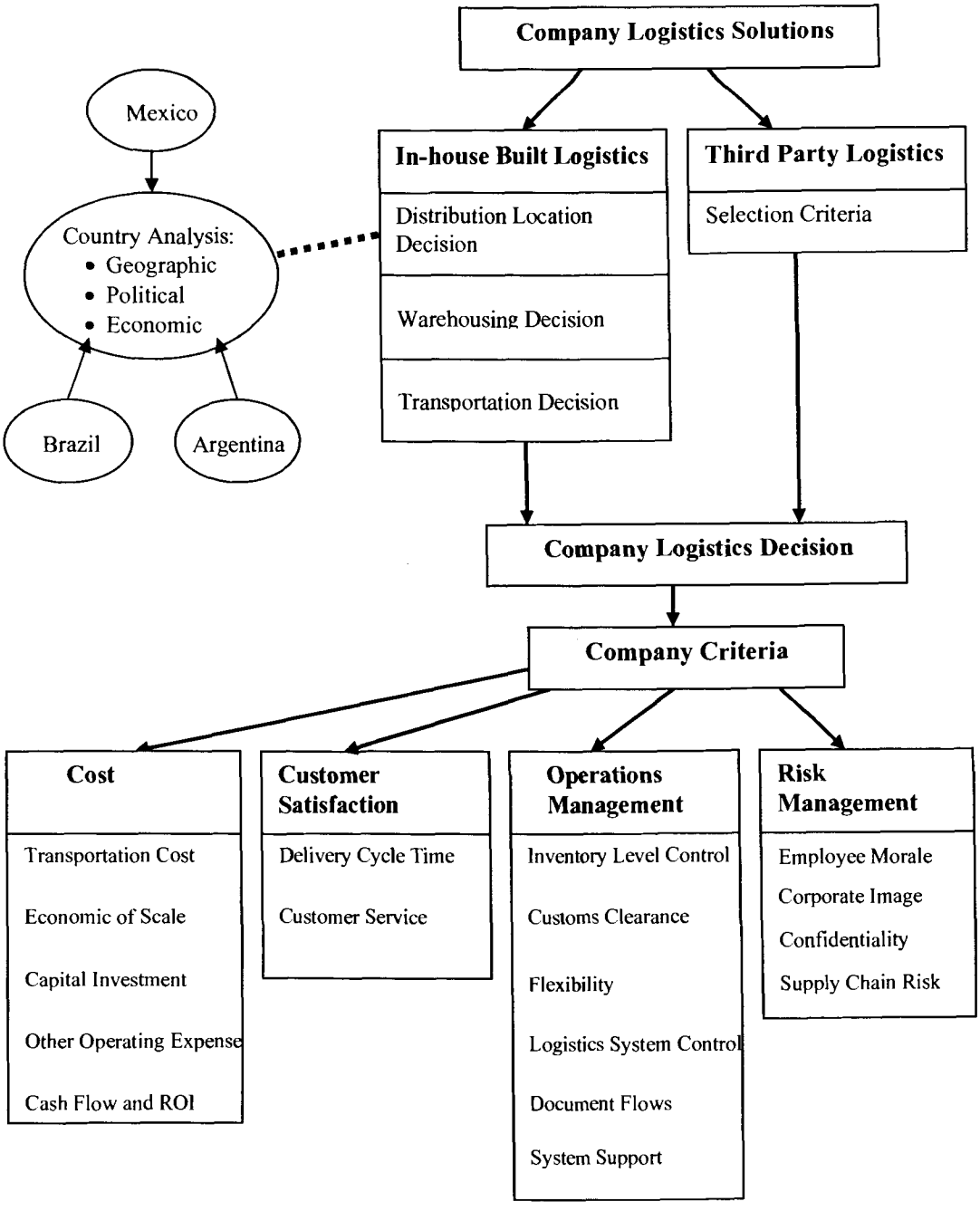


2.1.2.2 In-house Built Logistics and Third Party Logistics

In-house logistics and third-party logistics are two common practices in supply chain management. In-house built logistics is that the company owns its logistics function, while third party logistics is that the company outsources its logistics function to external logistics service provider which takes the full responsibility for the company's supply chain requirement and charges the service fee according to the volume of the goods flow through the distribution network.

This paper analyzes the two alternatives of logistics solutions – in-house logistics and third-party logistics - for Company A. The following diagram is a framework of how this paper is structured.

Figure 5 Project Framework



2.2 In-house Built Logistics

The physical goods/information flow chart shown in Figure 4 gives an explicit list of some of the most important elements within a company's supply chain. This is also a specific indication of the distribution scope. This list can be 'exploded' once again so as to reveal the detailed aspects within the company's distribution network. All of these functions and sub-functions need to be planned in a systematic way. The distribution function could be further categorized into several sub-functions including location of storage, warehousing, and transport strategy.

To business organizations that want to own their logistics function, detailed business decisions are linked to each of the sub-functions as logistics managers search answers for the warehouse location, transport mode, routing and scheduling. Among all the decisions to be made, the first and most important one is the location of storage (distribution center for a certain market territory). Only after the distribution center of the target market has been decided, the company could plan the movement of the products from the production site to the target market. Most of the distribution decisions such as transport modes and routing, types of operations to be employed are squarely based on the location in which the company plans to build the distribution center. It is not unfair to say that the choice of the distribution center location is a strategic decision for a company that wants to expand into overseas market.

2.2.1 Location Decision

Locating fixed distribution facilities throughout the supply chain network is an important decision problem that gives form, structure, and shape to the entire supply chain system. When many companies begin to employ the logistics concept, the fundamental concern for the choice of fixed facilities is cost. Firms are motivated to exercise care in making the location decision due to the high capital expenditure and the long-term consequences once the decision is made. A good distribution location could help the company control the total cost of supply chain and gain market advantages.

However, since markets are becoming increasingly competitive, the decision where to strategically locate logistics operations seems to be an art in logistics strategy. Today, the management of a firm recognizes that logistics system performance, measured along such dimensions as product availability, speed of delivery, consistency of delivery times, loss and damage rates, flexibility for special requirements, and so forth, is an essential element of the marketing mix or product offering. Cost is not the only consideration for the company to make location decision of overseas distribution center. The reasons are as follows:

- The cost of international transportation is highly dynamic and fluctuating. Transportation cost is largely influenced by shipment availability and global business environment.
- Providing that customer satisfaction is essential nowadays, the company would not risk its business operations by sacrificing customer service in a newly developed area in order to minimize the logistics cost.

Thus, when making location decision for overseas distribution facilities, firms have introduced a modern logistics concept, which employs a systematic approach considering all aspects of the business environment and evaluates trade-offs between decision-driving factors. Companies that intertwine their focus on these driving factors with cost will have more success than those that focus solely on cost.

2.2.1.1 Driving Factors

2.2.1.1.1 Geographic Factor

Geographic consideration here is more concerned about the market accessibility, which is the ability to efficiently move products to local market and market in neighboring areas. A good geographic location could help companies not only fulfill the demand of local market, but also easily radiate to other major markets in the same business area.

Geographic concerns integrated with multiple related variables can support strategic and tactical location decision making through the analysis of spatial and nonspatical data derived from both internal corporate and external sources, such as sales forecast, existing customer locations, existing facilities location and capacity data, and/or legal matters, etc.

2.2.1.1.2 Political Factor

Political factor here in distribution location decision concerns the political environment of a certain country or business area and its impact on the logistics operations in long run. Political risk management must become a function of the overall logistics management

responsibility. Major Political factors include stability, ideology and geopolitical links (http://www.fita.org). The first two factors can significantly increase the so-called political risk to foreign investors while the later issue may limit the supply and distribution channels available to foreign investors who establish a base there.

Stability and Ideology - Political stability refers to the degree of predictability in government policies and the continuity of the main political leaders in the country. In general, an unstable political environment is evidenced by authoritarian governments that change frequently, creating a business environment fraught with high risk and few guarantees for investors. In a stable government, the policies of the leaders are well-defined and the system of elections and legislative actions is accepted and transparent. If a company is considering entering a foreign market with a history of political instability, give careful analysis of the probability that changes might occur during the planning period and of the likely impact on the company (http://www.fita.org).

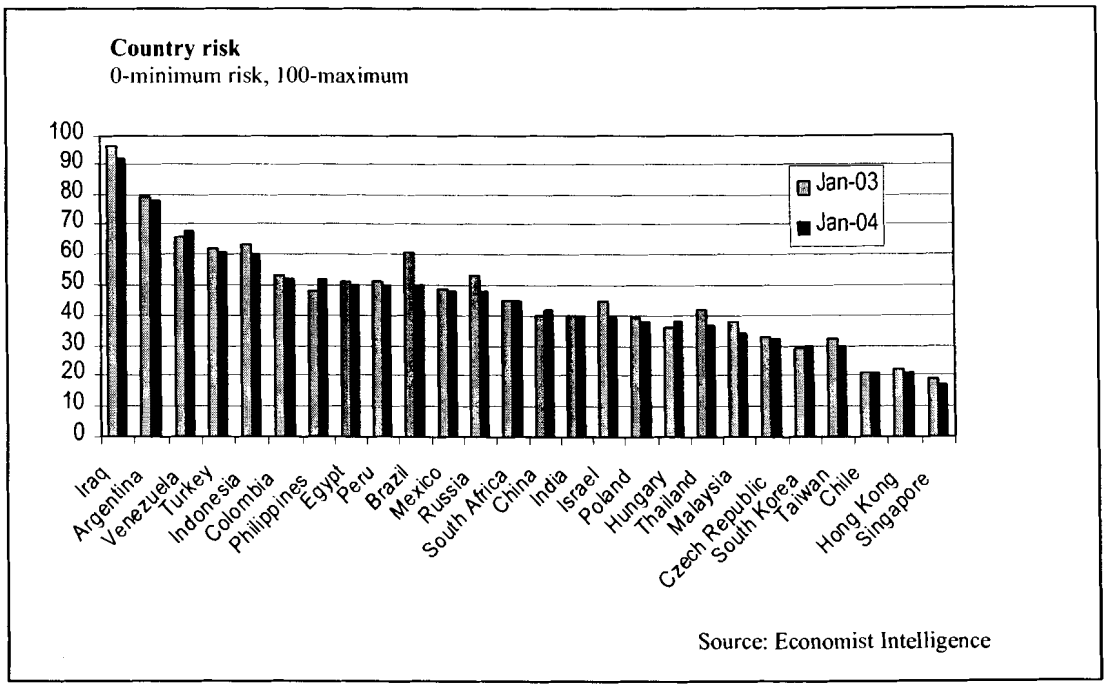
Geopolitical Relationships - Cross-border relationships between countries can have an adverse affect upon trade with one or all of the country members. Therefore, firms should be aware of these connections and plan for opportunities as well as problems. A review of a country's historical development will often disclose its geopolitical relationships, such as vestiges of its colonial heritage, war alliances, economic trading pacts, unions, and religious and cultural links. Successful entry into one country could easily lead to expansion into another

country with close geopolitical ties. On the negative side, rivalry between neighboring countries could cause unforeseen and dramatic disruptions in business and economic conditions confronting foreign investors (http://www.fita.org).

Moreover, to manage day-to-day logistics risks, a company shouldn't merely analyze the political situation in its supplier's home countries, say insurance brokers; the company should extend that assessment to the supplier's own foreign political risks. Another concern, especially since September 11, is that the logos of prominent U.S. companies abroad amount to incitements to violence, according to some insurance underwriter and brokers (http://www.cfo.com). Indeed, terrorism could pack a heady smash against global supply chain activities (http://www.cfo.com).

Country Risk - The country-risk ratings of the Economist Intelligence Unit (a sister firm of CFO.com) take account of 77 indicators of political stability and other measures of credit quality. The EIU's ratings show that Mexico stands less risky than Brazil and Argentina (Source: Economist Intelligence Unit, 2004).

Figure 6 Country Risks



2.2.1.1.3 Custom Regulation and Trade Restrictions

Custom regulation should be considered as one part of the political factor that impacts companies' decision upon the location of their foreign distribution centers. If they supply manufacturers that sell overseas, they may very well find they have to be conversant with and in compliance with foreign regulations.

Most countries are organized for import/export in the way that customs services oversee imported goods, ensuring that all local regulations are complied with and that the proper duties and /or tariffs are paid before goods enter a country. Exporting usually falls under the domain of another agency that regulates exporting and ensures that exporters meet export controls (http://www.wcoomd.org). In most countries, the burden falls on importers and exporters to keep track of ongoing changes in import/export rules. They

must also keep up with domestic and foreign regulations that affect packaging, labeling, public health requirements, and the environment (http://www.wcoomd.org). Experienced logisticians should take import/export compliance very seriously. Foreign Customs Laws and Exchange Controls/Import License are discussed further as follows.

Foreign Customs Laws - The countries of export destination may have absolute quotas on the quantity of products that can be imported. Importation of products in excess of the quota will be prohibited (http://www.wcoomd.org). Similarly, it is important to identify the amount of customs duties that will be assessed on the product, which will involve determining the correct tariff classification for the product under foreign law in order to provide updated tariff rate for other company functional departments, and to evaluate whether a distributor will be able to make a reasonable profit if it resells at the current market price in that country (http://www.wcoomd.org). It would be especially important to confirm that there are no antidumping, countervailing, or other special customs duties imposed on the products. These duties are often much higher than regular duties, and may be applied to products imported to the country even if the seller was not subject to the original antidumping investigation (http://www.wcoomd.org).

Exchange Controls and Import Licenses - Many nations of the world have exchange control systems designed to limit the amount of their currency that can be used to buy foreign products. These require that an import license from a central bank or the government be obtained in order for customers in that country to pay for imported products (http://www.wto.org). For exporters who wishes to get paid, it is extremely

important to determine (1) whether an exchange control system exists and an import license is necessary in the foreign country, (2) what time periods are necessary to obtain such licenses, and (3) the conditions that must be fulfilled and documentation that must be provided in order for the importer to obtain such license (http://www.wto.org).

2.2.1.1.4 Economic

Economic factors that could affect the distribution location decisions include market potential, human resources at the designed city/country, and infrastructure. The characteristics associated with these different factors change as countries develop. Market potential is the driving force behind the company's development plan before entering into a new business area. Market potential is normally indicated by the demographic distribution of employment rate and purchasing power of average income families. It's predictable that the higher rate of the market potential, the more attractive the target market is to foreign investors. As the market grows, the trend is to expand the pool of skilled labor, increase the income available for domestic consumption and investment, strengthen physical infrastructure and internal information flow, and bolster technology.

2.2.2 Transport Decision

The movement of goods from point of manufacture to the end user relies upon the four basic transport modes: rail, road, water (sea, river or lake), and air. The move by Company A towards global operations has had an obvious impact on the relative importance of the different modes of transport. In a global logistics, more products are

moved far greater distances because the company has developed the concept of contract manufacturing. Long-distance modes and multimodal transportation have thus become much more important to the development of logistics operations that have a global perspective (Zuckerman, 2002). All of these changes serve to emphasize the need to understand the concepts of the different freight transport modes and their combinations. According to a study by Kumar (1996), the major feature of the basic transport modes and multimodalism is described as follows:

- **Rail Transport:** Rail transport is used between ports and inland distribution centers separated by long distances since it is less expensive for carrying large volumes of cargo over long distances. Rail traffic has been adapted to carry container traffic, through specially designed wagons and container yards. Specialized container train services offer regular schedules with guaranteed departure time and guaranteed delivery time involving, as far possible, no transshipment.

- **Road Transport:** Road vehicles capable of transporting containers not only provide local distribution but also long haul services where rail links do not exist. Road transport has the inherent advantage of flexibility, door-to-door service capability, reliability, speed, etc. Roads and bridges are strengthened for carriage of ISO containers and satisfy the physical and technical requirements in regard to width, gradient and minimum free height for the carriage of such containers.

- **Air Freight:** The shipment of air cargo has always involved more than one mode of transport. However, intermodality was primarily confined to the pick up and delivery of the airborne cargo, usually by trucks going to and from the airports. The air cargo consignments consisted mostly of small parcels and individual shipments. Then, in the past decade, air transportation began to take part in more advanced intermodal movements of cargo on international routes.

- **Sea/Air:** This combines in itself the economy of sea transport and the speed of air transport and has become increasingly popular in international trade routes. The sea-air intermodal service provides shipper with increased flexibility and a wide range of options related to available routes and modes at his disposal, all based on tradeoff between cost and time. A shipper can select, among multiple transport options, the optimal service ranging from all air through a combination of, air and sea or air and surface modes, according to the shippers specific needs and fluctuating demand for the product.

- **Sea/Rail/Road/Inland Waterways:** This combination mode is in common use when goods have to be moved by sea from one country and one or more inland modes of transport such as rail, road or inland waterways to be used for moving the goods from an inland center to the seaport in the country of origin or from the seaport to an inland center in the country of destination (Kumar, 1996).

The main criterion of the transport mode selection is to balance costs with customer service. There are very significant trade-offs to be made when examining the alternatives available the different logistics factors and the different transport modes.

2.2.3 Warehousing and Storage Decision

Warehousing is an important activity in the distribution of materials, from raw materials and work in progress through to finished goods. It is integral to the supply chain within which it operates and as such its roles and objectives should be determined by the objectives of the supply chain (Zuckerman, 2002). There are a number of reasons why warehousing is required and important:

- To help link demand requirements with production capabilities, to smooth the flow and assist in operational efficiency;
- To enable large seasonal demands to be catered for more economically;
- To provide a good customer service;
- To allow cost trade-offs with the transport system (bulk delivery, etc); and
- To facilitate order assembly (Rushton, Oxley, and Crouher, 2000)

These reasons indicate that the old concept of warehouses as places to store goods has been superseded. Warehouses, perhaps better referred to as distribution centers, exist primarily to facilitate the movement of goods to the end user. Three different

warehousing systems are noted: public warehousing, leased warehousing, and private warehousing.

- **Public Warehousing** – The public warehousing is a simple process and its pricing is based on the usage of the space (http://www.asapwarehouse.com). Customers only pay for what they use for space and labor. The risks are fully absorbed by the warehouse firm (http://www.asapwarehouse). The public warehousing provides services such as storage, handling, packaging, inventory control, and just-in-time management.
- **Leased Warehousing** – The leased warehouse is owned not by the user but usually by the financier. (Dereli, 1992). Although leased warehousing involves a long-term commitment of investment, the charges for the space are incurred at regular intervals over a period of years. Therefore, the cost can be treated as a variable one for a given warehousing throughout capacity (Baliou, 2004).
- **Private Warehousing** – A private warehouse is operated by the owner of the goods stored at that facility such as a manufacturer or distributor (http://www.seaboardwarehouse.com). The private warehousing provides better ability to meet the specific needs of the firm and greater control of the operation than the public or leased warehousing does.

In order to develop a physical distribution network that provide the best service at a given level of cost, service and cost become the determining factors for decisions of facilities number, size and location.

For the best possible customer service, a warehouse would have to be provided right next to the customer, and it would have to hold adequate stocks of all the goods the customer might require. This would obviously be a very expensive solution.

At the other extreme, the cheapest solution would be to have just one warehouse (or central warehouse) and to send out a large lorry to each customer whenever his or her orders were sufficient to fill the vehicle so that an economic full load could be delivered. This would be a cheap alternative for the supplier, but deliveries might then only be made to a customer once quiet a while. This is definitely not going to meet the customer's expectation.

There is obviously a suitable compromise somewhere between these extremes. This will usually consist of the provision of a number of warehouses on a regional, national or international area basis, the use of long distance traffic to service these, with smaller delivery vehicles to run the orders to customers. For certain operations, of course, even these simple relationships will vary because of the need for very high levels of customer service or the very high value of products.

Physical distribution network and facility location strategies are aimed at establishing the most appropriate blend of storage and transport at a given customer service level. The interrelationship of the different distribution elements and their associated costs provides the basis for decision-making.

2.3 Outsourcing Logistics – Third Party Logistics

2.3.1 Third Party Logistics Concept

Third Party Logistics (3PL), a new business model for physical distribution, originated in the U.K. in the late 1980's under such name as *integrated logistics* and became highly popular in the U.S. in the 1990's (www.nli-research.co.jp, 2004). Described as providers of transportation, distribution and related services (including international/local transportation, customs brokerage, warehousing, etc.), the third-party logistics community was able to bring value to client relationships by synthesizing what had formerly been highly fragmented logistics and physical distribution processes. Because 3PL requires that providers have intimate access to the corporate strategy of their clients, relationships are based on long-term contracts as a rule (www.nli-research.co.jp, 2004).

3PL goes beyond transport and storage to designing a logistics network by determining warehouse locations and routing, performing inventory management and information management, and even proposing product lineups and personnel allocations, hence builds a worldwide industry that complements customer initiatives through a host of primary and value-added services (Price, 2004). The third party in 3PL refers to an entity other than the client and transport company. Originally, providers did not own physical distribution assets and conducted business by using transport companies. However, in practice some providers own their physical distribution assets for trucking and warehousing (Craig, 2003).

2.3.2 A Win-Win-Win Situation

As the third party logistics operation became more global in scope, the attraction for companies to engage such services grew in kind (Gardner, 2004). A major change - transportation companies and public warehousing companies are becoming 3PL providers - has been occurring gradually over the past decade, and we see an acceleration of this development as we go further into the 1990s (Copacino, 1997). This movement is formidable and irreversible because it is customer-driven.

Logistics is a vital component of a company's strategy to improve performance. International business players have realized that the best way to improve performance is to concentrate on the core competence – R&D, making a product, or marketing, and outsourcing the rest, including logistics/distribution from a 3PL service provider (Goolsby, 2002).

In addition to the appeal of lean thinking for importer/exporter, 3PL firms offer several benefits at an operating level (Gardner, 2004):

> First and foremost, transportation costs can be reduced by outsourcing logistics. Because a mainstay of the 3PL model is the consolidation of cargo between shipping points around the world, contracting with such an entity can reduce transportation costs. As a non-asset-based operator, the 3PL firm contracts for space allotments with steamship lines, airlines and trucking firms and gets a volume discount in exchange for its guarantee to pay for any unused space. The

3PL firm in turn sells the allocations to individual importers and exporters at a price lower than what most companies could negotiate independently (Gardner, 2004).

Ultimately ender user of a product may benefit from an attractive price and timely service. This creates a win-win-win situation thereupon the company maintains a competitive market price, the customer reaches a valuable service and the 3PL provider is compensated for its efforts (Gardner, 2004).

3 IN-HOUSE DISTRIBUTION STRATEGY IN LATIN AMERICAN

Latin America is Company A's current target market in the company's market development strategic plan. According to the market research that has been done in advance, three countries, which have the most optimistic market potential in Latin American, are Mexico, Brazil, and Argentina. This chapter will discuss which country is the most suitable candidate for the company's distribution center for the South America market and how the logistic distribution network should be set up in Latin America.

3.1 Latin American Market Findings

3.1.1 Mexico

3.1.1.1 Geographic location

Mexico is located in Middle America, bordering the Caribbean Sea and the Gulf of Mexico, between Belize and the US and bordering the North Pacific Ocean, between Guatemala and the US. Mexico holds a strategic location on the southern border of the US and links South America and North America (CIA,World Factbook, 2004). This provides Mexico the unique ability to radiate to both continents. (See Figure 7, America Map)

Figure 7 America Map

3.1.1.2 Political

Mexico is a federal republic consisting of 31 states. The General Election held in July 2000 marked the first time since the 1910 Mexican Revolution that the opposition defeated the Institutional Revolutionary Party (PRI). Vicente FOX of the National Action Party (PAN) was sworn in on 1 December 2000 as the first chief executive elected in free and fair elections (CIA, World Factbook, 2004).

3.1.1.3 Trade Policy

3.1.1.3.1 Trade Agreements

The trade agreement that has the most significant impact to Mexico's import and export policy is NAFTA. According to International Trade Canada, over the last ten years, Mexico has actively sought to build on the success of the North American Free Trade Agreement by establishing a wide network of 10 free trade agreements and one economic complementation agreement, by providing preferential access to 32 countries on three continents, including the United States and the European Union members (Ministry of Economy, www.economia-snci.gob.mx). In addition to NAFTA, Mexico has successfully completed free trade agreements with most of the South American Countries, the European Union, Israel, and the European Free Trade Association (EFTA, made up of Iceland, Liechtenstein, Norway, and Switzerland). At present, Mexico is in varying stages of negotiations for FTAs with Japan, Brazil, and Argentina (Ministry of Economy, http://www.economia-snci.gob.mx). Mexico's policy of trade liberalization has made Mexico more aware of the need to expand its export markets, particularly as its

dependence on the US market increases, and consequently its eagerness to deepen trade relations with its Latin American neighbors. Mexico, Argentina, and Brazil all signed the bilateral Partial Scope Agreements in the 1990's, which provide tariff preferences between each other. These agreements will cease to exist once a free trade agreement enters into force (http://infoexport.gc.ca).

However, despite its record of trade liberalization and rapid expansion of exports, Mexico has been unable to diversify its trade. 2002 trade data show that 89 percent of Mexico's total merchandise exports were to the US market alone. Less than 1 percent of total Mexican exports went to Central America during this period, despite free trade agreements with most of the countries in the region (http://infoexport.gc.ca). It is the one of the government's priority to diversify its exporting destinations away from the US and towards other markets.

3.1.1.3.2 Customs Broker and Documentation

For Mexico, importers must use a customs broker to process their goods. It is the responsibility of this private sector agent to ensure that all documentation is presented to Mexican customs officials (http://infoexport.gc.ca). International Trade Canada has listed the following documentation as required by Mexican customs:

- Commercial invoice.
- Bill of landing or airway bill of landing endorsed by the transport company.
- Documents required in order to comply with specific regulations applicable to the particular good.

- Proof of country of origin.
- If applicable, a document confirming guarantee of payment of additional amounts that may be payable if the declared value is less than the estimated price established by the Mexican government for merchandise, which has been undervalued. (http://infoexport.gc.ca)

3.1.1.4 Economic Environment

Population	104,959,594 (July 2004 est.)
GDP:	purchasing power parity - $941.2 billion (2003 est.)
GDP - real growth rate:	1.3% (2003 est.)
GDP - per capita:	purchasing power parity - $9,000 (2003 est.)
Inflation rate (consumer prices):	4.5% (2003 est.)
Unemployment rate:	3.3% plus underemployment of perhaps 25%

(2003)

(CIA World Factbook, 2004)

Mexico has a free market economy with a mixture of modern and outmoded industry and agriculture, increasingly dominated by the private sector. Recent administrations have expanded competition in seaports, railroads, telecommunications, electricity generation, natural gas distribution, and airports. Per capita income is one-fourth that of the US; income distribution remains highly unequal. Trade with the US and Canada has tripled since the implementation of NAFTA in 1994. Real GDP growth was a weak -0.3% in

2001, 0.9% in 2002, and 1.2% in 2003, with the US slowdown as the principal cause (CIA World Factbook, 2004). Mexico implemented free trade agreements with Guatemala, Honduras, El Salvador, and the European Free Trade Area in 2001, putting more than 90% of trade under free trade agreements (CIA World Factbook, 2004). The government is aware of the need to upgrade infrastructure, modernize the tax system and labor laws, and provide incentives to invest in the energy sector, but progress is slow.

The following data retrieved from CIA World Factbook better describes Mexico's economic situation: About 30 percent of Mexico's roads are paved, but local transportation is still seriously underdeveloped. Some 20 percent of the country's roads were built for the specific purpose of transporting cargo to the US border. As a result, it can be up to 17 percent more expensive to ship goods from the State of Sinaloa to Mexico City than it is for the similar distance from Sinaloa to the northern border. Of Mexico's 238 airports, 28 are capable of clearing or storing international shipments. But air shipments between Mexican cities usually cost twice as much on a weight-distance basis than cargo movements between Mexican and US cities. Mexican ports are benefiting from more than six years of privatization, which has in some cases reduced costs and demurrage by 25% since 1997. However, 80 percent of port shipments are international. With an exceptionally high literacy rate of 92.2%, Mexico is among one of the most educated countries in Latin America thanks to the continuous investment in education. (CIA, World Factbook, 2004)

3.1.2 Brazil

3.1.2.1 Geographic location

Brazil is located in Eastern South America, bordering the Atlantic Ocean. Brazil is the largest country in South America and shares common boundaries with every South American country except Chile and Ecuador. (See Figure 7, America Map)

3.1.2.2 Political

Brazil became an independent nation in 1822. The largest and most populous country in South America, Brazil has overcome more than half a century of military intervention in the governance of the country to pursue industrial and agricultural growth and development of the interior. However, the dictatorial history still has a strong influence in the government operations. (CIA, World Factbook, 2004)

3.1.2.3 Trade Policy

Since 1989, Brazil has pursued a policy of trade liberalization and has become increasingly open to a wide range of imports (http://infoexport.gc.ca, 2004). Despite the new macroeconomic environment, some aspects of the regulatory environment continue to present challenges to foreign exporters, particularly Brazilian import laws, as tariffs remain the primary instrument used to regulate imports.

3.1.2.3.1 Tariffs

Brazil is a member of the Common Market of the Southern Cone – MERCOSUL (Argentina, Brazil, Paraguay, and Uruguay). Accordingly, Brazilian import duties must take two distinct situations into account: (a) trades involving MERCOSUL member countries; and (b) trades with third countries. The import duty on merchandise traded within the MERCOSUL authority was reduced to zero. In order to qualify for the reduced rates valid within the MERCOSUL authority, a Certificate of Origin attesting that a certain product comes from a MERCOSUL member country must be obtained.

Trade with countries outside MERCOSUL is subject to the Common External Tariff (CET), known as TEC in Brazil. CET levels range between 0% and 20% (OUSTR, http://www.ustr.gov). As the MERCOSUL member countries faced great difficulty in reaching uniform foreign tariffs capable of meeting their individual interests, they were allowed to maintain certain items as an exception to the TEC, the so-called exception list, which each country maintains.

3.1.2.3.2 Import Licensing

All products imported into Brazil are subject to Brazilian customs procedures and fees. Beginning in 1997, import procedures became computerized through the use of SISCOMEX (Sistema de Comércio Exterior), which has reduced paper work and the amount of information required (OUSTR, http://www.ustr.gov). Brazilian importers must be registered in the Foreign Trade Secretariat 's Export and Import Registry and receive a password given by Customs to operate the SISCOMEX. The SISCOMEX has a

graphic interface for the composition of electronic import documents and transmits information to a central computer (http://strategis.ic.gc.ca).

3.1.2.3.3 Commercial Invoice

Invoices must include the date and place of shipment, markings and numerical order of packages, an exact description of the goods, country of origin, weight and prices plus shipping, insurance and other charges (http://infoexport.gc.ca)

3.1.2.4 Economic Environment

Population	184,101,109
GDP:	purchasing power parity - $1.375 trillion (2003 est.)
GDP - real growth rate:	-0.2% (2003 est.)
GDP - per capita:	purchasing power parity - $7,600 (2003 est.)
Inflation rate (consumer prices):	14.7% (2003)
Unemployment rate:	12.3% (2003 est.)

(CIA, World Factbook, 2004)

Brazil's GDP growth has declined for three years consecutively (2001, 1.7%, 2002, 1.5%, 2003, -0.2%, CIA, World Factbook, 2004). The growth rates above reflect real growth in local currency. Fluctuations in nominal GDP also reflect volatility in the exchange rate. The economy was under critical stress in 2002 with election uncertainties,. This resulted in 35% depreciation of the *real*, less foreign direct investment (dropping to $16.6 billion, $6 billion less than the previous year's total, data retrieved from CIA, World Factbook, 2004), and speculation that Brazil might follow Argentina by defaulting on public debt.

Public debt briefly rose to 63% of GDP, 11% above the 2001 year-end level(CIA, World Factbook, 2004). Brazil was helped by the IMF, which stepped in with a record $30 billion program. Lula's incoming government further slashed spending and increased its primary-budget surplus target from 3.75% to 4.25% of GDP, consistently meeting and sometimes exceeding the requirements of the IMF agreement (Data source: CIA, World Factbook, 2004).

In a survey done by Bardados Investment and Development Corporation (www.bidc.com), even with a weakened performance, Brazil's economy outweighed that of all other South American countries and is expanding its presence in world markets. From 2001-03, real wages fell and Brazil's economy grew, on average, only 1.1% per year, as the country absorbed a series of domestic and international economic shocks. The three pillars of the economic program are a floating exchange rate, an inflation-targeting regime, and tight fiscal policy, which have been reinforced by a series of IMF programs. In 2003, Brazil ran a record trade surplus and recorded the first current account surplus since 1992 (CIA, World Factbook, 2004). While economic management has been good, there remain important economic vulnerabilities. The most significant are debt-related, the government's largely domestic debt increased steadily from 1994 to 2003, straining government finances. Moreover, Brazil's foreign debt (a mix of private and public debt) is large in relation to Brazil's modest (but growing) export base. Another challenge is maintaining economic growth over a period of time to generate employment and make the government's debt burden more manageable.

Market creation and economic stabilization have enhanced Brazil's growth prospects. Brazil's exports have nearly doubled in the last decade and imports have more than doubled. Brazil has much to gain through free trade in terms of economic growth and realizing its trade potential (http://infoexport.gc.ca).

In Brazil, only about 10% of the roads are paved, and most of them are corridors connecting the industrial centers of Sao Paulo and Rio de Janeiro with Salvador in the north and Porto Alegre in the south (CIA, World Factbook, 2004). Brazil has only one road to link Venezuela and limited road connections with Peru and Colombia. Trade with Argentina is predominantly by ocean freight, since there are only three major land crossings. Public literacy is 86.4% with a good reserve of skilled workers (CIA, World Factbook, 2004).

3.1.3 Argentina

3.1.3.1 Geographic location

Argentina is located at Southern South America, bordering the South Atlantic Ocean, between Chile and Uruguay. Argentina is the second-largest country in South America (after Brazil) possessing strategic locations relative to sea-lanes between the South Atlantic and the South Pacific Oceans (CIA, World Factbook, 2004). (See Figure 7, America Map)

3.1.3.2 Political

Following independence from Spain in 1816, Argentina experienced periods of internal political conflict between conservatives and liberals and between civilian and military

factions. After World War II, a long period of Peronist authoritarian rule and interference in subsequent governments was followed by a military junta that took power in 1976. Democracy returned in 1983 and numerous elections since then have underscored Argentina's progress in democratic consolidation (CIA, World Factbook, 2004). Argentina has recently experienced one of the most challenging periods in its history. With recent economic stability, the government has begun to look beyond the confines of its domestic preoccupations by agreeing to negotiate with international lending institutions and private bondholders.

3.1.3.3 Trade Policy

Argentina is an open market with few restrictions on imports. Argentina's new liberal trade regime, which began with the 1989 reforms, has resulted in the drastic lowering of high tariff rates, the elimination of specific duties and its complicated structure of non-tariff barriers, and the simplification of document requirements (http://infoexport.gc.ca).

3.1.3.3.1 Customs Brokers

Imports can only be cleared through Customs by registered importers. Importers must use the services of a licensed customs broker to carry out the documentation and filing procedures.

3.1.3.3.2 Tariffs

Like most of other nations, Argentina uses the Harmonized Commodity Description and Coding Systems to classify goods and assign tariffs. Tariffs are applied to CIF (cost,

insurance, and freight) value of imports. Basic tariff rates are from 0 to 30% depend on the characteristics of the imported goods with additional taxes, which apply to some import sectors range from 0.50% to 3%. Excise taxes may also be levied on the following products range from 4% to 66% (Data source from International Trade Canada (http://infoexport.gc.ca).

3.1.3.3.3 Documentation

According to International Trade Canada, the basic documentation that required for Argentina Custom includes:

a. Commercial invoice (containing a sworn declaration)

b. Bill of Lading

c. Packing list

Note: All certificates issued abroad must be authenticated or legalized by the Argentine Consulate.

Additionally, a certificate of origin may be required for imports that benefit from preferential tariff treatment or that are subject to antidumping or countervailing duties or safeguards.

3.1.3.4 Economic Environment

Population:	39,144,753 (July 2004 est.)
GDP:	purchasing power parity - $435.5 billion (2003 est.)
GDP - real growth rate:	8.7% (2003 est.)

GDP - per capita:	purchasing power parity - $11,200 (2003 est.)
Inflation rate (consumer prices):	13.4% (2003)
Unemployment rate:	17.3% (2003)

(CIA, World Factbook, 2004)

Over the past decade Argentina has suffered recurring economic problems of inflation, external debt, capital flight, and budget deficits. Growth in 2000 was a negative 0.8% (CIA, World Factbook, 2004). The economic situation worsened in 2001 "with the widening of spreads on Argentine bonds, massive withdrawals from the banks, and a further decline in consumer and investor confidence. Government efforts to achieve a 'zero deficit' to stabilize the banking system, and to restore economic growth proved inadequate in the face of the mounting economic problems. The peso's peg to the dollar was abandoned in January 2002, and the peso was floated in February; inflation picked up rapidly."(www.travelsur.net). By mid-2002 the economy had stabilized, albeit at a lower level. In 2003, an export-led boom triggered an 8.7% surge in real gross domestic product (GDP). Investment in real terms jumped 38.1%, and capital flight has decreased (CIA World Factbook, 2004).

Argentina's impressive recovery is a function of a number of factors. First, following a decade of market reforms, the economy was fundamentally sound except for the high level of indebtedness. Second, the adoption of a market exchange rate and favorable international commodity and interest rate trends were catalytic factors in the export-led boom. Argentina has sound fundamentals and should continue to perform well in 2004, with growth projected to be in the 6%-8% range. Nevertheless, slowness in addressing

energy, public debt, banking compensation difficulties, and a continued-weak investment climate are major obstacles to sustaining the recovery.

3.1.4 Summary and Implications

3.1.4.1 Geography

Holding the joint point connecting North America and South America, Mexico appears the best transition zone between Company A's well-developed U.S. market and the emerging Latin American market, which may become the company's revenue engine in long run. The advanced transportation infrastructure from inland Mexico northwards to the U.S. border provides the ability for Company A to radiate its business into South U.S. market especially in California and Florida.

Brazil and Argentina have the similar geographic limitation when Company A's integrated supply chain network is considered. Both countries have good geographic accessibility to suppliers from Europe and East U.S. However, as for goods traveling from East Asia to Brazil/Argentina, it takes longer time/distance. (See *Figure 4-1, Americas Map*)

3.1.4.2 Political

All three countries are democratic societies with comparatively short records of transparent and public election history. Although historic dictatorship may still have influence over government behaviors, dramatic political turnover is not likely to happen.

Among all three countries, Mexico has the most open trade policy, which shows the country's positive attitude towards international trade.

3.1.4.3 Trade Policy

Besides the trade agreements, there are specific custom regulations and requirements of international trading in Mexico, Brazil and Argentina. Since the particularity of trade policy exists, it's not very meaningful to compare the difficulty among these regulations in details. Generally, Company A needs to be well prepared and make sure that all the regulation and requirements are met before rolling the chain.

3.1.4.4 Economy

Mexico's export has been suffered from the downturn of the U.S. economy for the last couple of years. This makes the Mexico government turn southwards to concentrate more on the South American neighbors. Mexico has better infrastructure foundations and more airports and seaports. The labor pool in Mexico is never a problem.

Brazil still plays the key role of South American economy engine, although its position has been seriously challenged by Mexico. The impact of South American economy crisis and the failed monetary policy in Brazil have scared off some foreign investors.

Argentina is recovering from the economy crisis and recorded an exceptionally high GDP growth in 2003. But the highly depreciated currency and the government performance

during the Argentina economy crisis left the investor less confidence. Argentina may have better momentum in the economy growth but the limited domestic demand will be a barrier hard to overcome.

3.2 Logistics Distribution Network for Latin America Markets

3.2.1 Distribution Locating Strategy

As the analysis and implications above, it's not difficult to draw the conclusion that among all three countries, Mexico takes a better position to be an area in which Company A locates its distribution center. The major persuasions demonstrating that Mexico outweighs Brazil and Argentina are as follows:

- Mexico could radiate to both North American and South American markets. Mexico is also a better site for the company to organize the inbound flows from existing suppliers and the outbound flows to target markets.
- Mexico has benefited from its open and free trade policy. The government decision to re-focus on South America will pave the way southwards for Company A.
- Mexico suffered less in the 1990's South America economy crisis. Mexico's strong linkage with the U.S. economy is a proof of stability to foreign investors.

Accordingly a physical distribution network with a hub at Mexico has been designed as *Figure 8* shows.

Inbound Configuration

Finished Goods, Sub-assembles from China to Mexico

Sub-assembles from Japan to Mexico

Finished Goods from Hong Kong to Mexico

Components, Sub-assembles from Europe to Mexico

Finished Goods from North America to Mexico

Outbound Configuration

Finished Goods from Mexico to Brazil

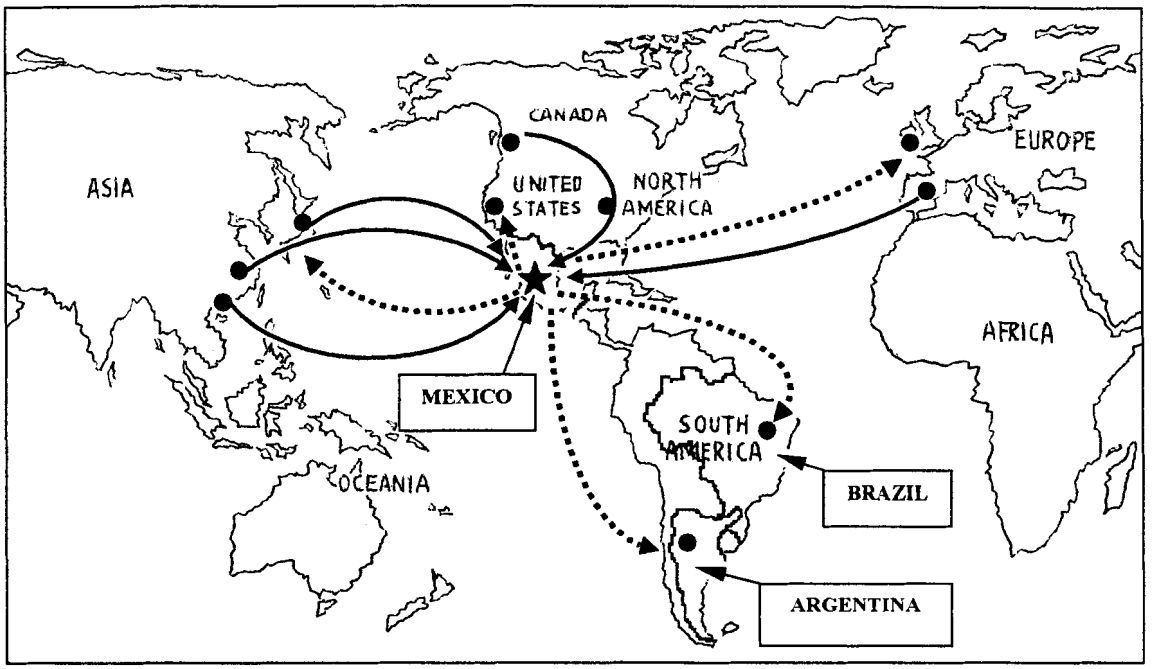
Finished Goods from Mexico to Argentina

Finished Goods from Mexico to Europe

Components, Sub-assembles from Mexico to North America

Finished Goods from Mexico to Japan

Figure 8 Logistics Distribution Network Guideline – Mexico DC Based



3.2.2 Warehousing Strategy

Company A needs to evaluate each mode of warehousing - public warehousing, leased warehousing or private warehousing – by comparing the cost generated among these storage systems.

- Public warehousing to the Company A is a flexible storage system. No capital investment in facilities, equipment or human resources is required. Flexibility in market dynamics may be a good reason for Company A to select public warehousing in short-run.

- The charges for the space incurred at regular intervals over a period of years can be treated as a variable cost for a given warehousing throughout capacity (Baliou, 2004, pp.495). Since the total variable cost of leased warehousing is less than that of public warehousing, leasing can be a middle-term storage strategy for Company A compared with public warehousing.

- If Company A generates a substantial and steady volume of business in Latin America, public and leased warehousing may become more expensive than private warehousing (Baliou, 2004).

As *Figure 9* shows, at very low warehouse throughput levels, public warehousing is the lowest-cost storage system. However, at very high warehouse throughput levels, private warehousing becomes the lowest-cost storage system.

The Trade off of fixed and variable cost between public and leased warehousing

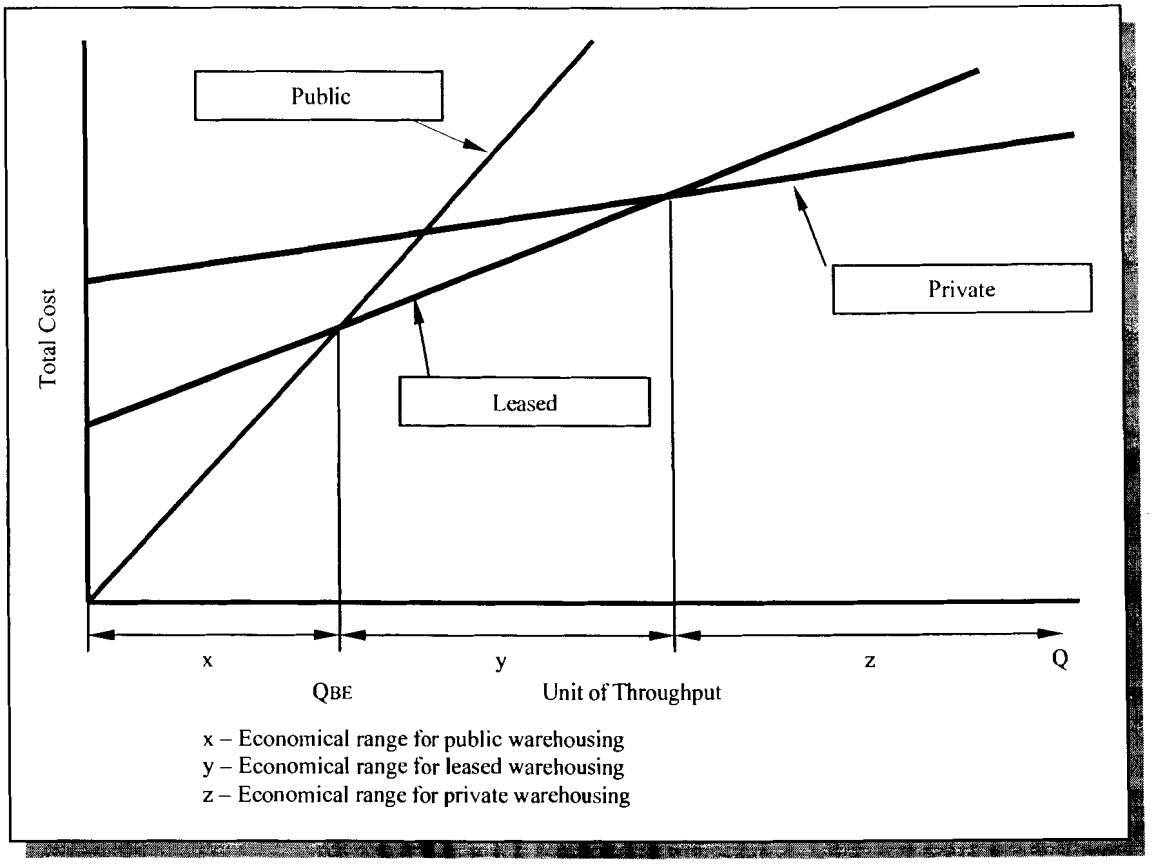
1. Public Warehousing – higher variable cost per unit but no fixed cost
   Total Cost $_{public} = {}_cQ$, where Q is the number of units of throughput, and c is the variable cost per unit in public warehouse.

2. Leased Warehousing – fixed cost but lower variable cost
   Total Cost $_{leased} = a + bQ$, where a and b are the fixed and variable cost of leased warehousing.

3. Break even throughput is where Total Cost $_{public}$ = Total Cost $_{leased}$, so that $Q_{BE} = a / (c-b)$

Figure 9 Generalized Total Cost Curves for Three Alternative Warehousing

(Source: Baliou, 2004)

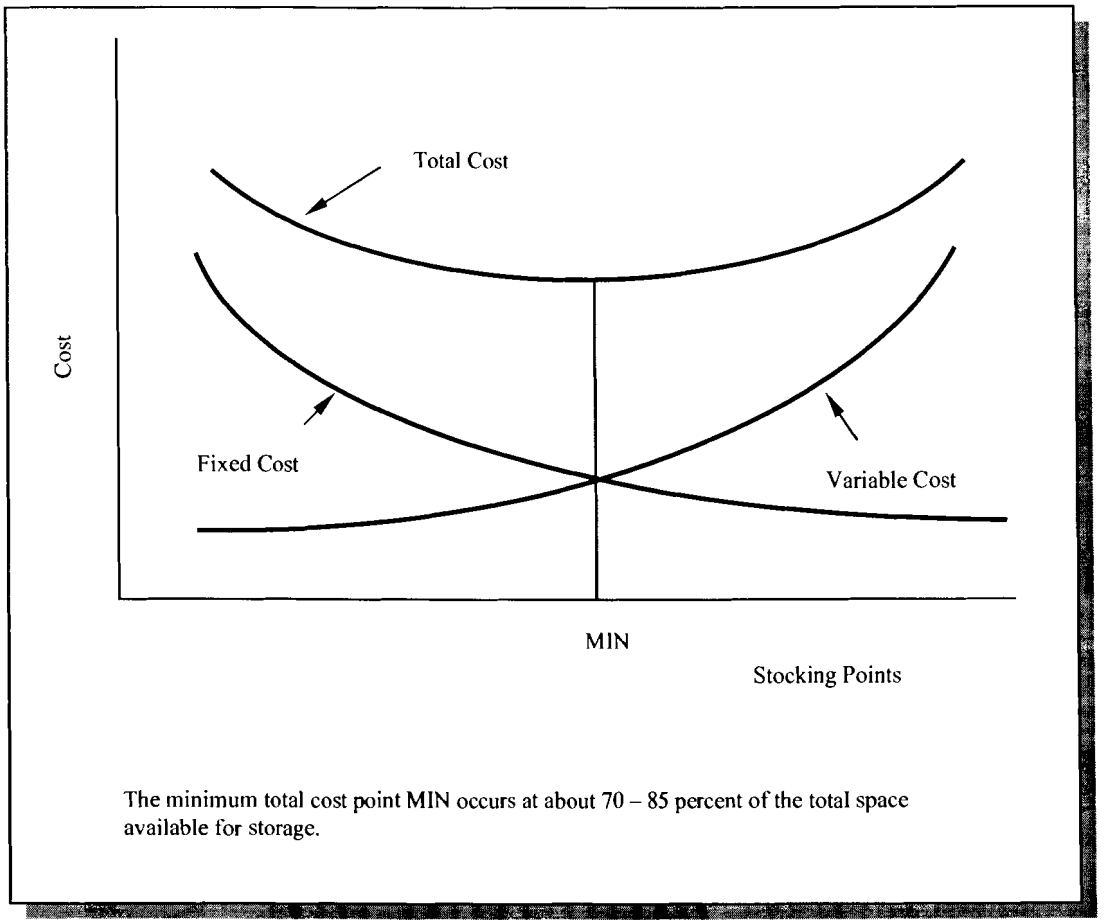


Accordingly to Baliou (2004), "Beyond simply comparing one warehousing system against another, it is useful for further analysis and control to break down total costs into the three basic cost components in a storage system: storage, handling, and clerical costs. For the public warehouse, these costs provide the basis for establishing rates and providing a ready comparison with the public warehousing alternative. In the private warehouse, they are valuable for controlling the various expenses." One allocation for Company A's judgment is illustrated in *Figure10*, which indicates that the minimum total

cost point MIN occurs at about 70-85 percent of the total space available for storage (Baliou, 2004).

Figure 10 Per Unit Cost Curves for Company A Privately Owned System

(Source: Baliou, 2004)



Phased Warehousing Design

In order to provide a better service with a lower cost at the first stage of Latin American market expansion, public warehousing offers many advantages along with cost benefit:

- Reduce fixed investment in storage facilities and re-direct revenue towards increased research and development, new market expansion and customer service (http://www.warehousenetwork.com).
- Reduce extensive inventory, out of stocks, order shortages and lost customer sales. (http://www.warehousenetwork.com).
- Improve seasonal demands, special handling, labeling or packaging needs and utilization of warehousing space only as required (http://www.warehousenetwork.com).

With the business growth in Latin America, leasing space for Company A can represent an intermediate choice between short-term space rental in public warehouse and the long-term commitment of the Company A privately owned warehouse (Baliou, 2004). The advantage of leasing storage for Company A is that the cost depends on volume and inventory fluctuations and may still be lower than that of privately owned warehouse.

In long-term, Company A privately owned warehouse has the potential of offering better ability to meet the specific needs of the company, greater control of the logistics operation, and better control of costs. The space may also serve as field sales office or field purchasing organization. In addition, the company has the potential use of existing human resources.

3.2.3 Transport Strategy

Because transportation costs for Company A typically range between one-third and two-thirds of total logistics costs (Baliou, 2004), improving efficiency of routing design is a major concern.

Although there are many variations of routing problems, according to Baliou (2004), we can reduce them to a few basic approaches for Company A so as to meet eight guideline principles outlined as follows:

1. Trunk routes should be formed around clusters of stops that are nearest each other in order to minimize the interstop travel between them.
2. When stops are to be served during different days of the week, the stops should be segmented into separate routing and scheduling problems for each day of the week.
3. Efficient routes can be developed through building stop clusters around the farthest stop from the depot and then working back toward the depot.
4. Stops should be sequenced so that no route paths cross, and the route appears to have a teardrop shape.
5. Ideally, using a vehicle large enough to handle all stops in one route will minimize total distance, or time, traveled to serve the stops.
6. Pickups should be made, as much as possible, during the course of the deliveries to minimize the amount of path crossing that can occur when such stops are served after all deliveries are made.

7. Stops that are isolated from the stop clusters, especially those with low volume, are served at great driver time and vehicle expense.
8. Time window restrictions on stops, where they are narrow, can force stop sequencing away from ideal patterns (Baliou, 2004, pp.236 – 238).

3.2.3.1 Routing Plan by Saving Method

Routing Planned by "Savings" Method for Global Logistic Network (Clarke and Wright, 1963)

The savings method (Clarke and Wright, 1963) allows for the generation of routing patterns in an expedient manner. "The objective of the 'savings' method is to minimize the total distance traveled by all vehicles and to minimize to the number of vehicles needed to serve all stops" (Baliou, 2004). The final routing is shown in *Figure 11*. The series of stops with the largest savings is selected after algebraic combination and the consideration of the type of commodity.

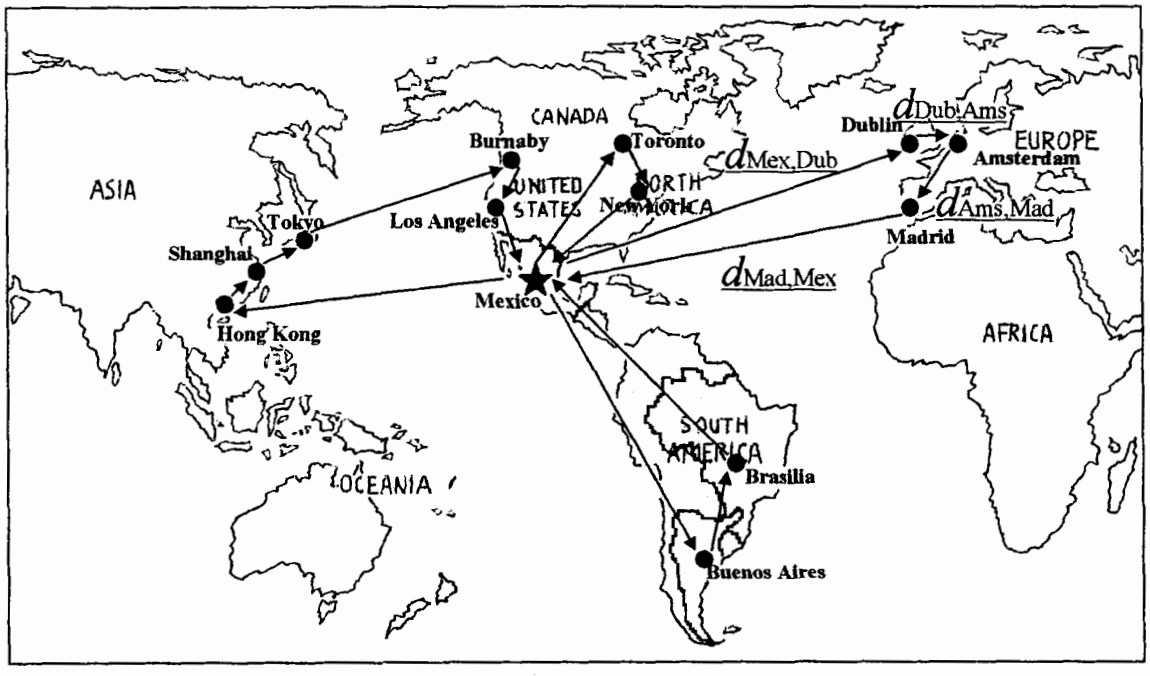
The logic of this configuration – The routing between Mexico Distribution Center and European Customers or Manufactures for example:

1. As for the routes among Mexico, Dublin and Madrid, the optimal distance is $d_{Mex,Dub} + d_{Dub,Mad} + d_{Mad,Mex,}$ which has a saving value of $S = d_{Mex,Dub} + d_{Mad,Mex} - d_{Dub,Mad}$, comparing with the maximum distance to be experienced in the configuration of $d_{Mex,Dub} + d_{Mad,Mex} + d_{Dub,Mex} + d_{Mex,Mad}$. Here, two

stops in Dublin and Madrid are combined together into one route so that one vehicle can be eliminated and the travel distance reduced (Baliou, 2004).

2. Once the city of Amsterdam is inserted between the city of Dublin and Madrid. The combining process continues. The savings value is computed as $S = d_{Mex,Ams} + d_{Ams,Mex} + d_{Dub,Mad} - d_{Dub,Ams} - d_{Ams,Mad}$.

Figure 11 Mexico-based Distribution Network Routing and Sequencing



3.2.3.2 Routing Plan by Seep Method

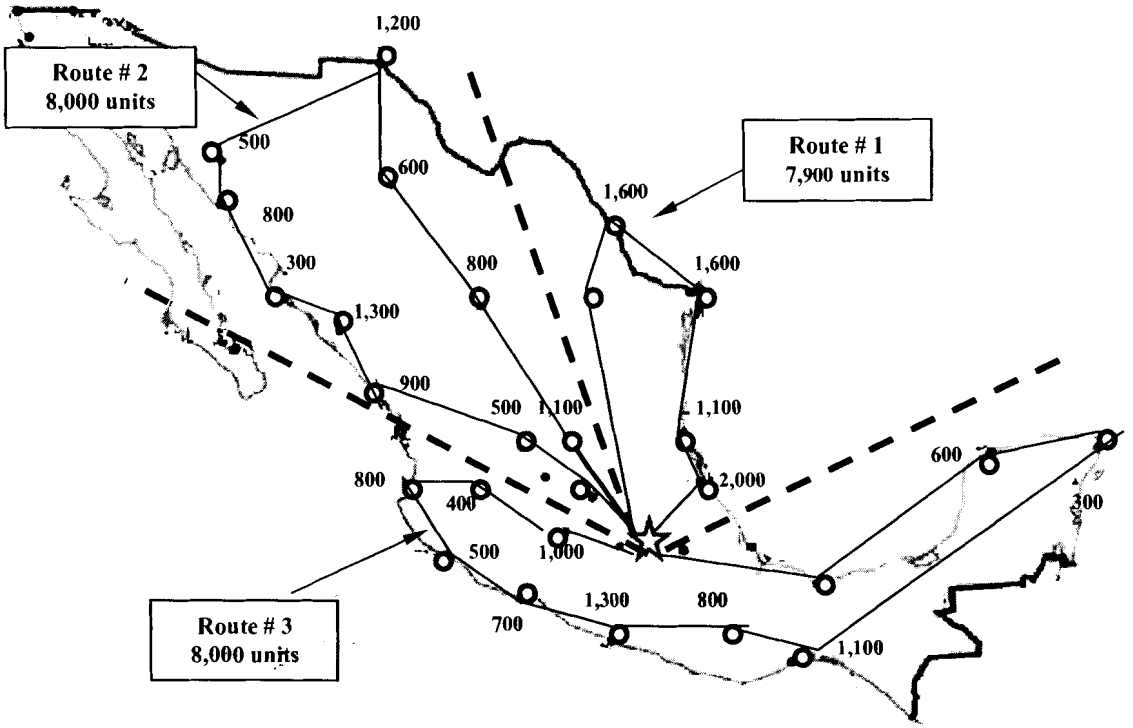
Routing Planned by "Sweep" Method for Mexico Logistic Network

Upon assumption that neither the capacity nor the time window constraints are violated, Company A uses vehicles that can haul 8,000 units of Advanced Power Electronics Equipment. These units can serve one certain area of Mexico; hence three routes are formed, covering all the country. The route design is shown in *Figure 4-6*. This strategy can be illustrated by the "Sweep" algorithm of Gillett and Miller (1974).

The logic of this configuration – Mexico for example:

As for Mexico Market, Company A needs to determine how many routes are required, and which stops at cities should be on the routes. Truck delivers Power Electronics Goods to outlying customers and returns to the Mexico Distribution Center over each route. The capacity of the truck is 8,000 units. The line of route # 1 sweeps clockwise over the stops adding them to the route. This process continues until the capacity is reached. A new stop is selected and the process continues until all of the stops have been assigned to routes. This approach can easily be extended to the linehaul-backhaul problem by truncating the stops when either linehaul or backhaul capacity is exceeded. Linehaul (delivery) points are stops that are to receive a quantity of goods from the Mexico DC. Backhaul (pickup) points are stops that send a quantity of goods back to the DC. This development of a set of vehicle routes assures that all delivery points in Mexico are serviced, the demands of the points assigned to route # 1, 2, & 3 do not violate the capacity of the vehicle that services the route, and the total distance traveled by all vehicles is minimized.

Figure 12 Route Consolidations in Mexico Distribution Network



3.3 Issues Related to In-house Built Logistics

Thus far, the topic of logistics built in-house has been fully discussed. In real world practice, however, there are several issues related to this fully owned logistics function that should be noted.

- **Geographic Complexity**

The idea of in-house built logistics faces serious challenges where company expansion overseas is concerned. As the number of new markets a company plans to enter increases, the more complex the logistics operation becomes. Company A's suppliers cover three continents and their target markets involve three distinct countries with the potential to

expand to other neighboring markets surrounding these key countries in the long run. With such highly complicated inbound and outbound route plans, Company A needs to secure experience and resources where logistics operations is concerned if an in-house built logistics solution is chosen.

- **Political Instability**

Generally, any country's political climate is highly dynamic and continuously changing. Although the macro political environment within the country may remain stable, the trade policy and customs regulations may change according to the variation of bilateral relationship and trade status between countries. To avoid interruptions in logistics operations, companies need to update their understanding of customs requests in real time with respect to documentation, labeling, quotas, import/export limits, industry standards and so on. The company may elect to assign resources to communicate with import/export brokers and keep up to date but by doing so the company may find it almost impossible to view the logistics function as efficient.

- **Economical Uncertainty**

No matter whether a private warehouse is built or whether a public warehouse is rented or leased, in-house built logistics mean a large amount of capital to be spent. This financial commitment means inflexibility where a company's operations are concerned – especially when the company enters a new and unstable market. Company A may have thousands of reasons as to why they regard the Latin American market as important, however, from the logistics point of view, it's far more risky to have the logistics function built in-house than outsourced to a third party logistics company in this case.

4 OUTSOURCING LOGISTICS - THIRD PARTY LOGISTICS

4.1 Third Party Logistics (3PL) Analysis

4.1.1 Typical Advantage of Third Party Logistics Service

4.1.1.1 Logistics Cost Saving

Cost savings are significant when a company outsources its logistics functions to other third party logistics service firms. The cost saving in transportation is the most obvious among all cost savings. Besides the reduced transportation charge, there are other costs as labor cost, operations cost and investment in fixed assets (Gardner 2004,) that could significant impact the logistics cost structure. These savings may be categorized as follows.

- **Transportation Costs and Customs-related Costs**

Direct transportation expenses are the first and most obvious benefit a 3PL provider can offer Company A. As mentioned previously, with economies of scale, 3PL firms are able to offer greater discounts than Company A can negotiate for themselves. This reduced transportation cost could have a direct, positive impact on the company's financial statements. Where customs-related costs are concerned, 3PL firms are in a better position to achieve further savings using their knowledge, experience, and technology to their advantage (Gardner 2004). Because most 3PL companies have a better knowledge of local customs regulations and restrictions, combined with the experience interpreting

Harmonized System Code as it aligns with local customs authorities (Gardener 2004), Company A, whose overseas orders normally cover over 1000 items from components to finished products, could accurately locate the right tariff more frequently thus reducing the lead time with the assistance of 3PL firms.

- **Labor cost, operations cost and fixed capital investment**

According to Denial L. Gardner (2004), payroll, as a large portion of the operating expenses in logistics, could be significantly reduced if the operation is outsourced to a 3PL service company. Although Company A still needs to keep monitoring the overall distribution processes and financial transactions, the number of employees hired in inventory management and material handling plus the manpower related to finance and transportation will no longer be necessary. Significant costs in international telephone calls and faxes, traveling expenses and other operating costs could also be greatly reduced. Rather than sinking a great amount of capital in overseas warehouses, equipment and systems (whether building a privately owned warehouse or renting/leasing a public warehouse a fixed amount of capital is tied up as long as the contract is signed), Company A need only pay the amount of cubic feet allocated to its products. This obviously not only ensures a certain level of flexibility in business operations, but also minimizes the fixed asset investment in inventory management and material handling.

- **Reduced cost previously ties up in the inventory**

Along with the above-mentioned costs, there is another cost that could be saved if Company A hires a professional 3PL firm to handle its logistics distribution functions. An international 3PL company, which provides integrated service from transportation to

customs clearance, stands a better chance of providing reliable service over small brokers or courier agents. According to Denial L, Gardner (2004), the reasons are:

1. Company A and 3PL firms are able to share information about the production and shipping plans as well as cargo information. A shortened transportation scheduling process saves the company time in preparing the order.

2. A 3PL firm could consolidate its clients' different delivery requirements and seasonality, which would enable a higher frequency of delivery due to economies of scale. Thus, Company A stands a better chance to be guaranteed enough cargo space especially when the shipping is provided by 3PL's own fleet.

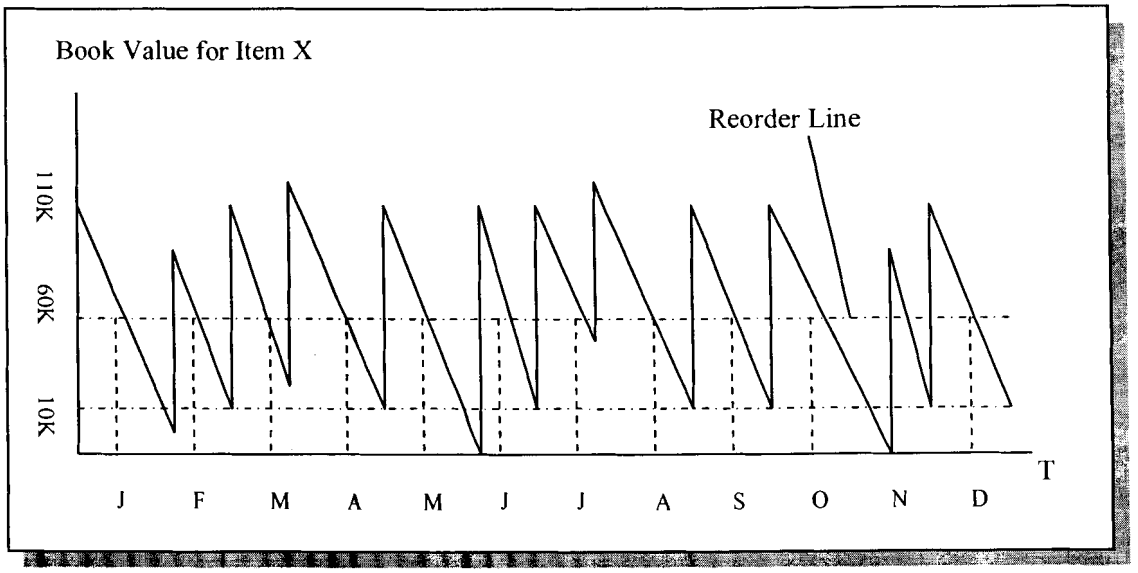
3. Experience and knowledge with respect to local customs authority helps 3PL companies to expedite the custom clearance process. Local branches of 3PL companies also help the delivery throughout Company A's local distribution network.

Thus, 3PL firms could provide more reliable logistics solutions than solutions built in-house. This reliability has a significant impact on the company's inventory management. The following scenarios are designed to show how company A could take the advantage of a more reliable 3PL logistics to reduce the safe stock and therefore release cash from the inventory.

Figure 13 shows the reorder cycles under ordinary transportation conditions. Under these conditions, the delivery time cannot be guaranteed and sometimes the company may face serious delays even for individual shipments. The only way the company can offset this

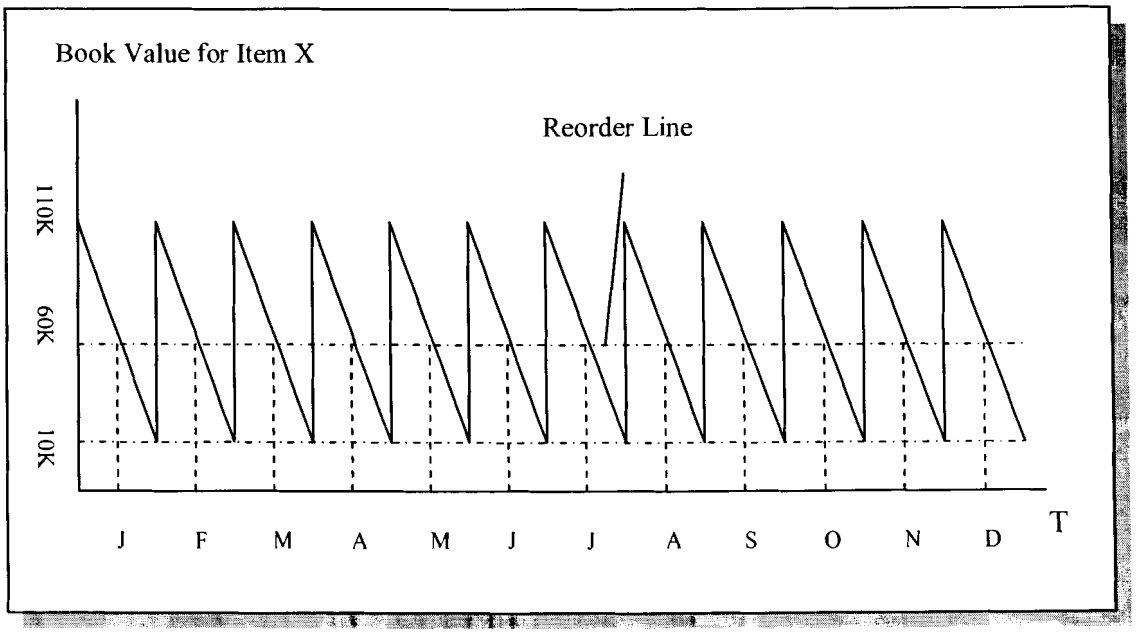
undesired logistics backlog is to prepare a higher safe stock to cover the delay and maintain the service level (the zigzag shown in Figure 12 only reflects the unpredictable shipment under ordinary cross-ocean transportation. It doesn't present the real market demand. Although there are always safe stocks for unpredicted market demand, it's not discussed in this paper). For example, the stock level for company A's product X is 100 units at the beginning of the year and the reorder cycle is once every month. Average year round stock level is 50 units per month. Because of the unreliable delivery, safe stock has been added to offset the unstable delivery (without this safe stock, the company would have run out of stock in May and November as the figure shows). For simplicity, we assume that the safe stock is 10 units and this safe stock is enough to cover the uncertainty associated with delivery throughout the year. If the book value for X is 1000 dollars per unit, the total amount of cash tied up in inventory for a whole year is: 100units/2 * $1000*12month+10units*$1000*12month=$720,000

Figure 13 Re-order Cycles for Item X in 12 Months under Ordinary Shipment Condition



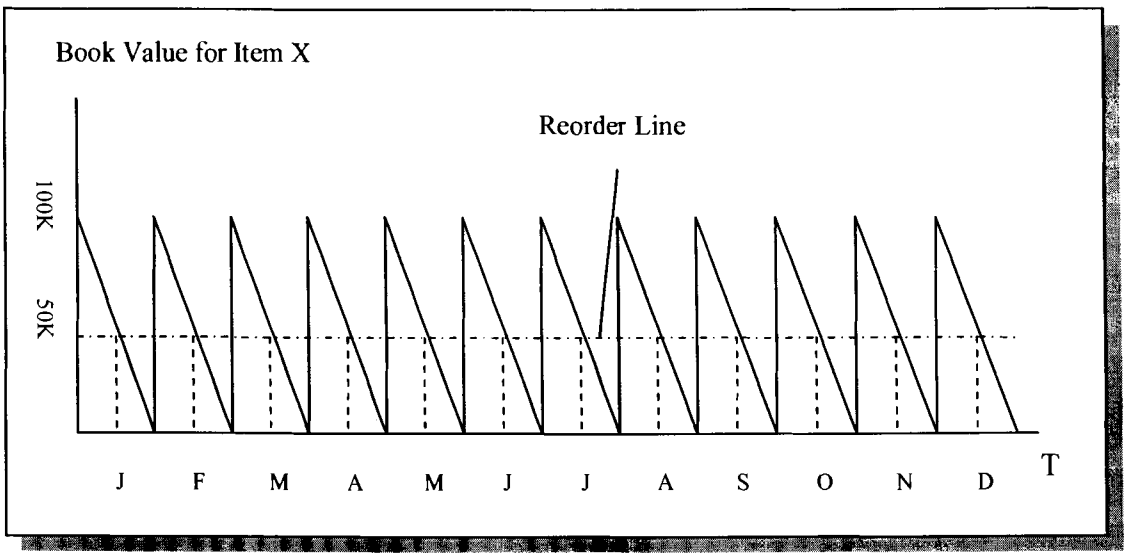
If Company A uses a 3PL firm to handle the whole logistics distribution, as discussed beforehand, Company A can expect much more regular reorder cycles as shown in Figure 14.

Figure 14 Re-order Cycles for Item X in 12 Months under Reliable Shipment Condition



Obviously, Company A could now eliminate the safe stock under such a scenario and the new reorder cycles looks like figure 15.

Figure 15 Re-order Cycles for Item X in 12 Months under Cost-saving Mode



The total amount of cash tied up in Figure 5-3 is about 100units/2*$1000*12=$600,000. Total savings are $720,000-$600,000=$120,000. The percentage of savings retained under this mode is 16.7%. For Company A, which normally holds over 1000 SKU numbers in its warehouse, 16.7% worth of savings released from the inventory could significantly improve the overall financial performance. If one considers that a 3PL firm's logistic network can cover from the supplier's factory outlet all the way down to the final customer, one quickly realizes the saving during the process is even larger.

The results of the survey conducted by Dr. Robert Lieb, professor of Supply Chain Management College of Business Administration, Northeastern University, for U.S.

manufacturers describes the comparative structure in logistics function areas which have achieved logistics cost benefits from 3PL. (See Table 3)

Table 2 3PL Services Yielding Greatest Logistics Cost Benefits (Source: The use of third party logistics services by large American manufactures, the 2003 survey)

3PL Services Yielding Greatest Logistics Cost Benefits	
3PL Service	% indicating it yielded greatest cost benefits
Warehouse management	30%
Rate negotiation	16%
Shipment consolidation	14%
Freight payment service	10%
Direct transportation service	10%
Fleet management/operations	8%
Carrier selection	6%

4.1.1.2 Logistics Service Enhancement

- **Reduced Paper Work**

In chapters 3 and 4, we discussed country's customs regulations and trade policy. Basically, the requirements vary from one country to the next. If one considers the import/export documentation for example – a key documents package for international trade should at least consists of the commercial invoice, packing list, certificate of origin, and ocean bill of landing (Hinkelman, 2002, chpt.1). Even for a commercial invoice, the requirements of Brazil customs are quite different from Mexico's. In Mexico, commercial invoices should be written in Spanish when the value of the transaction exceeds US$300 or its equivalent in foreign currency. The invoice should include the

shipper's and seller's addresses along with the delivery and buyer's addresses, description of goods and numbering and marking (http://infoexport.gc.ca/ie-en/DisplayDocument.jsp?did=24197, pp. 17,18). In Brazil, invoices must include the date and place of shipment, markings and numerical order of packages, an exact description of the goods, country of origin, weight and prices plus shipping, insurance and other charges. (http://www.infoexport.gc.ca/ie-en/DisplayDocument.jsp?did=5097, pp. 27, 28)

The documentation that used in international trade and transportation have to be precise and consistent. Any missing or incompliance of these documents could cause significant delay or a large amount of fine when declare customs clearance. Daniel L. Gardner used an example to descript the strictness of international trade documentation management (Gardner 2004, chpt.6): if the consignee address on the commercial invoice does not match the address on a certificate of origin, then delay becomes inevitable with the possibility of fines or product confiscation very real -- depending on the country with which one is dealing. The key to successful document management is to ensure the documents are complete, consistent and correct -- which means the documents list must match the customs requirements and all documents are consistent with the physical merchandise.

With a realistic understanding of the importance of proper documentation, the value that 3PL firms can bring to this element of overseas distribution is unimpeachable. For example, in the real world practice, after Company A placed a order for a shipment to Latin American, its 3PL partner received all the merchandise and documentation then start to operate within its own system. It is at this point that the 3PL firm generates its

own transport documentation, matching it to the commercial set provided by Company A, and checks the documentation against the labels, marks and numbers on the merchandise itself in order to minimize at origin the probability of problems farther down the supply chain. From printing label to customs clearance, almost all the documentations are generated and managed by one company (could even be one project team), and this obviously could reduce the risk of delay or fine caused by interior document management or complex transaction from one agent to another.

- **Smoothed Customs Clearance Process**

International transportation and documentation management is only a part of the integrated services provided by 3PL firms. Another core service offered by most 3PL firms is customhouse brokerage.

One major customs clearance problem for goods imported to a new country is the classification problems that happen when the customs authority has different identification for the same goods. Classification involves the proper identification of products based on the product description included in the supplier's commercial invoice. The information taken from the invoice allows the customs broker to "classify" the product according to the explanation of the customs entity in the country of importation. Sharing product information and involving 3PL firms in the preparation of documentation before hand can clearly be beneficiary here at the customs clearance level. Wrong classification also impacts the duty rate. Since it is common to see duty rates vary significantly between similar line items, the financial impacts of classification are also considerable.

According to Daniel L. Gardner, 3PL has been a growing force in logistics services recently (Gardner 2004). Growth in the 3PL business implies having operations in major commercial areas around the world -- a setup that can be very beneficial to both importers and exporters alike. Depending on their own scope of operations, these organizations see considerable value in working with a company that has a global network featuring local expertise, key government or business contacts, knowledge of customs procedures, logistics infrastructure and other capabilities.

The results of the survey conducted by Dr. Robert Lieb, professor of Supply Chain Management College of Business Administration, Northeastern University, for the U.S. manufactures, detail the comparative structure in logistics function areas, which have inherited logistics service benefits from 3PL. (See Table 4)

Table 3 3PL Services Yielding Greatest Logistics Service Improvements (Source: The use of third party logistics services by large American manufactures, the 2003 survey)

3PL Services Yielding Greatest Logistics Service Improvements	
3PL Service	% indicating it yielded greatest logistics service improvements
Warehouse management	22%
Order fulfillment	11%
Freight payment	9%
Direct transportation services	9%
Fleet management/operations	9%
Tracking/tracing	7%

4.1.1.3 Value Added Services from Third-Party Logistics Company

According to Croucher, Rushton and Oxley (2000), "There are also many other services offered by 3PL service firms. Some of these are known as 'value added' services because they reflect, in particular, those items or services that add a lot of additional value to the product being distributed". For Company A, potential value added services from 3PL could be:

- **Assembly** - Sub-assembly of advanced power electronics is initially distributed to the relevant market before being finally made ready for the end user. This includes the badging of these equipments with Company A's name and the installation of the final language software (Croucher, Rushton and Oxley, 2000).
- **Repacking** – According to marketing promotions for different markets, Company A may need to blister-pack two different items that are to go out as distinct retail products – for example, a mobile power unit with a bulb. This service could be undertaken by the third-party logistics firm (Croucher, Rushton and Oxley, 2000).
- **Recycling** – Linked to environmental legislation in certain countries, there is a need to collect packaging for disposal or reuse. A number of third-party logistics firms have set up reverse logistics operations for recycling. They have established recycling centers for the disposal of waste (Croucher, Rushton and Oxley, 2000).

4.2 Third Party Logistics Vs. In House Logistics

4.2.1 Comprehensive Judgment Criteria

Criteria used to make a judgment between third-party logistics and in-house logistics could be grouped into four categories:

1. **Cost Considerations**

Transportation Cost – At a particular customer service level, a reduction of transportation cost is indicated by Company A's ability to effectively consolidate the cargo between shipping points around the world.

Capital Investment – The ideal situation for Company A may be one where its fixed costs are eliminated completely when huge capital investments in land, physical plant, handling equipment and trucks are no longer part of its logistics model, with no additional depreciation (Croucher, Rushton and Oxley, 2000).

Other Operating Expenses – The expenses related to logistics manpower, overhead, and other fixed and variable costs running the entire logistics operation need to be controlled below the cost of goods sold line.

Cash Flow and ROI – From both a cash flow and return on investment perspective, inventories that hit the balance sheet is sooner than they need to have an adverse effect on multiple financial ratios. Once the point of the goods title transfer is established, transportation lead times play a role to the operational and financial benefit of Company A (Gardner, 2004).

Economies of Scale – Economies of scale provide savings in overhead, better utilization of equipment, and the sharing of information, etc. If Company A's own-account logistics operations are small it is unlikely they will run economically (Croucher, Rushton and Oxley, 2000).

2. **Customer Satisfaction**

Delivery Cycle Time – The delivery cycle time is crucial to accessing the new Latin American markets and in order to maintain high customer satisfaction.

Customer Service – Customer satisfaction occurs when a certain customer service level target is met.

3. **Operations Management**

Inventory Level Control – In global logistics, safety stock is carried to cover forecast errors, transit time variance, customs clearance delays and supplier problems. Company A will be better off if a reduction or even an elimination of safety stocks can be reached, with the desired effect of reducing overall inventory levels.

Flexibility – Changes in customs duty rates, currency fluctuations, Latin American political stability, and changes in target market tastes all require that Company A be

extraordinarily flexible with no worries of having a trail of unused fixed assets in their wake.

Customs Clearance – The customs clearance process is complex but vital when power electronics goods are entering into the importing country. Proper handling of the "classification and valuation" can avoid inflated landed costs and unnecessary lead-time troubles (Gardner, 2004).

Logistics System Control – Logistics System Control indicates the competence of Company A in terms of defining the number, type or size of DC, or vehicle types and sizes, monitoring the performance of the services provided, and owning the distributing systems and resources (Croucher, Rushton and Oxley, 2000).

System Technical Support – The integrity of the logistics management system is essential in order for Company A to monitor and track supply chain in real time and take advantage of new market demand.

Document Flows – Successful logistics management revolves around the proper handling of paperwork. Any incorrect, incomplete or inconsistent handling of both commercial (invoice, packing list, etc.) and transport (bill of lading or airway bill) documents is the fastest route to paralyzing the entire supply chain of Company A (Gardner, 2004).

4. Risk Management

Employee Morale – The employee morale tends to be influenced by a downsizing of Company A's logistics workforce that typically accompanies a decision to outsource logistics functions (Gardner, 2004).

Supply Chain Risk – Given that Company A lacks local market expertise and the ability to secure the licenses and permits necessary to operate in Latin America, the supply chain risk would be high if the company maintains a company-centric model (Gardner, 2004).

Corporate Image – The value of advertising on a vehicle with Company A's own livery and brand name may be considered to be important for the brand integrity as per marketing (Croucher, Rushton and Oxley, 2000).

Confidentiality – The confidentiality of information may be managed by avoiding Company A's products from being mixed with those of its rivals (Croucher, Rushton and Oxley, 2000).

Table 4 In-house/3PL Assessment Grid

	Criteria	Quantitative /Qualitative	In-house	3PL
Cost	Transportation Cost	#	-	+
	Capital Investment	#	-	+
	Other Operating Expenses	#	-	+
	Cash Flow	#	-	+
	Return On Investment	#	-	+
	Economic of Scale	*	-	+
Operations Management	Inventory Level Control	#	-	+
	Customs Clearance	*	-	+
	Flexibility	*	-	+
	Logistics System Control	*	+	-
	Document Flows	*	-	+
	System Technical Support	*	-	+
Customer Satisfaction	Delivery Cycle Time	#	-	+
	Customer Service	*	-	+
Risk Management	Corporate Image	*	+	N
	Confidentiality	*	+	-
	Employee Morale	*	+	-
	Supply Chain Risk	*	-	+
Recommend			No	Yes

Note:

 # : Quantitative *** : Qualitative**

Overall, Third-Party Logistics can help Company A meet increasing customer order and delivery requirements, increase inventory turns, manage a complex international and domestic supply chain, and balance the conflicting challenges of costs and service. These advantages would better equip the company in the power electronics industry especially when Company A intends to compete in a new and complex Latin American environment. The future logistics success requires this for both profitability and survival. Third-Party Logistics can be viewed as the carrier to reduce Company A's logistics costs, provide needed logistics information technology without requiring fixed investment, and improve the logistics processes more quickly than can be done internally.

5 SUMMARIES AND RECOMMENDATION

After a sale triggers an ordering process, Company A needs to respond by delivering power electronics goods and/or services to its customers in Latin America from its worldwide suppliers through its international logistics. Chapter 2 explains the rationale for global supply chain management by illustrating the dimensions of logistics and the implications of tradeoffs between cost-saving measures and other driving forces such as political, geographical and economical factors.

Supply chain development in the Latin American market involves many risks other than those of cost constraints such as the country risk, the currency exchange risk, and the fact that the logistics integration environment is still in its early stages in Latin American business society. These uncertainties would affect Company A's logistical strategic decisions. After carefully considering various factors in Chapter 3 for Mexico, Brazil and Argentina, an in-house Latin American distribution network with its hub in Mexico is recommended.

In Chapter 4, second thought reveals that outsourcing Company A's logistics function to third party logistics service providers has certain advantages over building an in-house logistical system. Third-party logistics services can help Company A integrate its global logistics, lower costs, work together with suppliers, and satisfy customers better and faster. The requirement to not only reduce supply chain assets, costs and risks, but also increase customer service has resulted in the need for outsourcing logistics. Thus, the increased focus on core competence, additional complexity of the logistics function, and

added sophistication of multi-modal transport and international trade rules compliance have led Company A to outsource logistics to 3PL, hence the general recommendations.

5.1 Third Party Logistics in Latin America

Third Party Logistics, a newly emerging service industry, requires various logistics services for Latin America ranging from freight forwarding and customs clearance to warehousing and local distribution. According to an industry surrey directed by John Price, President and Director of the Transportation & Logistics Industries Practice for InfoAmericas, the original driving force for these requirements was Foreign Direct Investment involving a stable number of international shipments. Now, more and more domestic companies have realized the advantage of 3PL and started to adopt the use of outsourced logistics to develop their own overseas markets (John Price, 2004). Some global 3PL providers have established their own network in Latin America; others have acquired or joint-ventured with local warehousing/distribution companies. Major 3PL players of the Latin American Market are: APL, DHL/DANZAS, Eagle, Fedex, Kuehne & Nagel, Maersk, Menlo, Panalpina, Ryde, Schenker, TNT Logistics, and UPS-SCS (http://www.researchandmarkets.com) as shown in Table 6.

Table 5 Major 3PL Companies at Latin American Market and Their Services

3PL Company List	Warehouse /Distribution	Custom Service	Freight Finance	IT support Service	Product Support Service	Logistics Consulting
APL Logistics			√		√	
DHL/DANZAS	√	√		√	√	√
EGL, Inc. (Eagle)			√		√	
Fedex Logistics			√		√	
Maersk Logistics	√	√		√		√
Menlo Logistics	√		√	√	√	√
Ryder Systems, Inc.	√		√	√	√	√
Schenker	√	√		√		√
TNT Logistics	√	√		√		√
UPS	√		√	√	√	√

Note:

1) This list includes major 3PL companies that have operations in the Latin American Market;

2) The '√' indicates the major service category in which the company is involved in its current American Market. Transportation and distribution is not listed on the table because it is a fundamental service provided by all candidates,

3) The information is summarized from the Internet and may be subject to change at any time.

Logistical demands among Latin America's 20 countries are different. These countries could be roughly grouped into two tiers. Tier I, consisting of Mexico, Porto Rico and Brazil, represents 79% of the total regional demand. Tier II, comprising of the rest of the regions, is largely formed by Argentina, Chile, Republic of Dominica, and other countries

(John Price, 2004). Apparently, 3PL has higher exposure at the hot spots in Tier I and some major Tier II countries. The networks within those countries are comparatively more mature.

5.2 Implementation Plan

Company A should implement its logistics outsourcing in accordance with the following steps.

Step 1 Define the objectives that logistics outsourcing needs to achieve

Understanding logistical requirements is a primary objective for Company A to seek a 3PL solution. Only after outlining the goal could the company develop the selection criteria for the most suitable 3PL candidate for the Latin American Market. At the operational level, different functional departments could provide specific objectives that the company's logistics function should achieve. For example, Company A has very clear short-term and long-term market development plans for the Latin American market. These plans are good guides when the desired distribution networks are to be designed based on a timeline. Sales and service departments could specify customer service requirements (pre and after sales service) for the logistics. Financial management and budget control of logistical operations are additional main objectives to be provided by the company's finance controlling function. A cross function team is needed to draw the picture of what the logistics approach should be from their own perspective. At a higher strategic level, the executive team needs to align the logistics goal with the company's long-term business strategy.

Step 2 Develop third party logistics-provider selection criteria

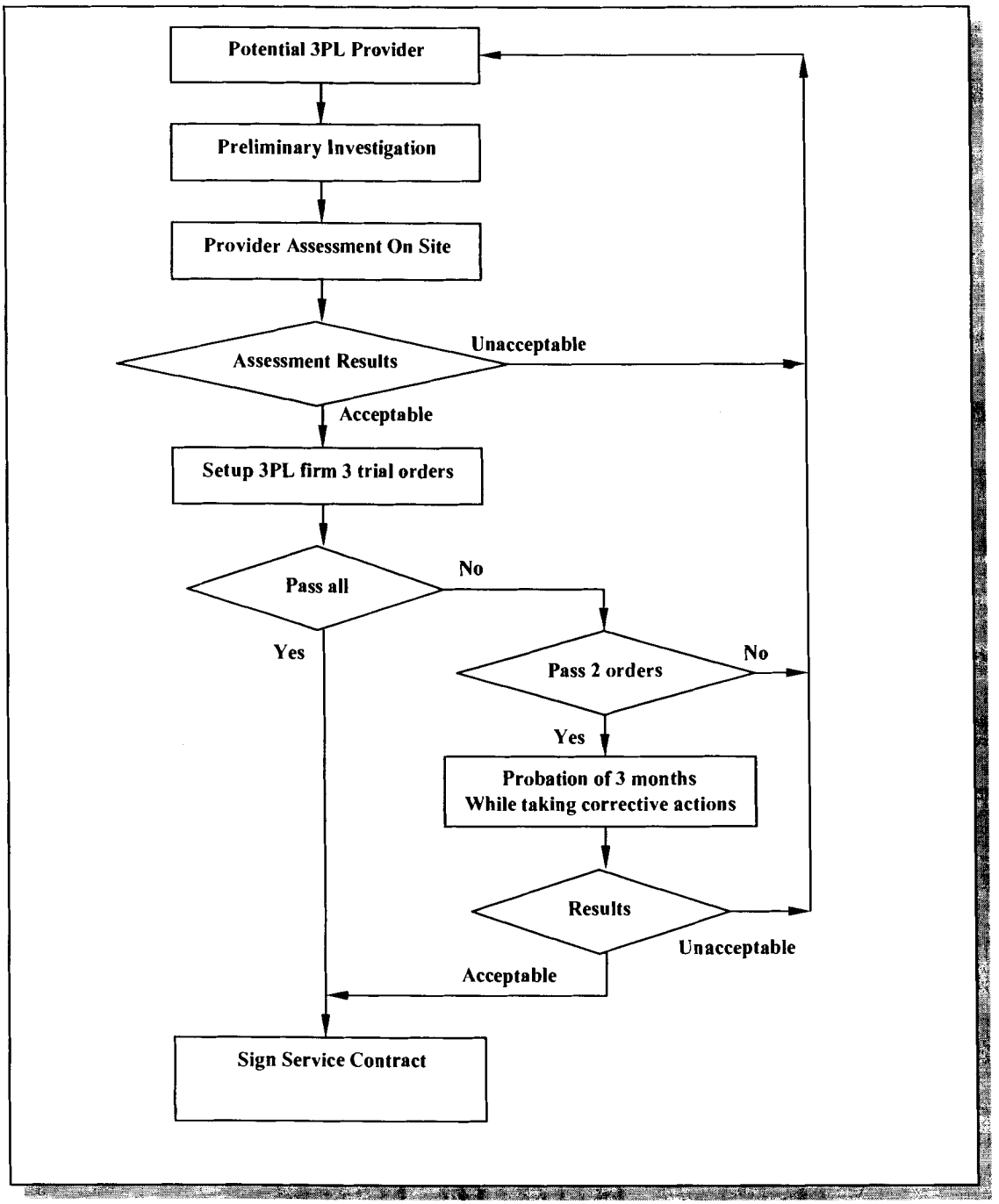
Based on the pre-defined logistics objectives, the company will be able to develop the selection criteria. Some basic criteria are easy to define. Key factors like service quality, cost, capacity and delivery capability need to be quantified wherever possible. Other criteria focus more on the 3PL providers' ability to help the company manage the process----the number of branches and warehouse facilities that should be in the desired locations, the system to be used to provide an information platform that can be shared by the both companies (hidden cost may apply if company A needs to update its system to monitor the orders through 3PL provider's system), etc. Brainstorming is needed for a more complete list of weighted criteria.

Step 3 Choose the right 3PL provider

Collect the data from 3PL companies' proposals and search out candidates for preliminary investigation. In addition to reviewing the hard data, Company A needs to seek information from the candidates' current clients. Feedback from those clients in the same power industry would provide a comprehensive understanding of the biding company's ability to meet the needs of Company A. If the outcome from the preliminary investigation is positive, Company A should carry out an on-site assessment of the provider's facility, information system and throughput capacity. If the provider passes the assessment, three trial orders will be given to the provider. Company A should then sign a service contract only if a qualified provider passes all three trial orders. Figure 15 illustrates the procedure of choosing a qualified 3PL provider. A reasonably high

standard should be set to determine the most suitable candidate because changing a 3PL partner could be costly.

Figure 16 Procedure of Choosing A 3PL Provider



5.3 Risk Management for Outsourcing Logistics

Although successful logistics outsourcing to a 3PL firm can provide significant benefits to Company A, there are some hidden risks in this approach. In 3PL outsourcing arrangements, partial control of the supply chain inevitably passes from Company A to the 3PL firm. In order to properly evaluate the function of a third party logistics provider, Company A must develop clear guidelines for appraising third party logistics provider outcomes (Wang and Regan, 2003). Monitoring logistics outsourcing is often a difficult and complex task. In order to ensure that the business carried out by the third party logistics provider meets the required standards, resources such as money, time, and expertise are needed to establish an effective monitoring system (Wang and Regan, 2003).

To ensure effective service for Company A, maximize operational efficiency for third party logistics service providers, and minimize the uncertainties associated with logistics outsourcing, measures should be implemented to mitigate supply chain risk.

- **Dual sourcing** – contracting between two or more 3PL service providers could be a conventional strategy for Company A.
- **3PL service provider audit** – some of the risks identified in the supply chain may be associated with a particular 3PL provider. Hence, further investigation and due diligence may be required (http://www.crg.com).
- **A clean comparison** – implement a full fiscal year calendar cycle; e.g. begin January 1st as opposed to January 12th to make the monthly, quarterly or year-to-year managerial accounting comparisons cleaner (Telfer, 2004).

- **A singular leadership** – assign singular project leadership to the 3PL service provider, with joint direction from Company A's directorate (Telfer, 2004).
- **A contingency plan** – a contingency plan on operational and business case in order to avoid unforeseen delays that could dilute or delay savings (Telfer, 2004).
- **Revisit risk evaluation** – revisit risk evaluation, probabilities, impacts, and mitigation actions for the details of the implementation plans (Telfer, 2004).

Overall, this recommendation can help Company A decide how to successfully outsource logistics for its Latin American market so as to take advantage of the services provided by a 3PL firm. This can be accomplished regardless of whether the objective is short-term use to provide flexible capacity, an interim approach to penetrating the Latin American market, or a long-term strategy of distribution for market expansion. In conjunction with 3PL's future evolution, operational excellence, and information technology, Company A would make logistics an integral part of its globalization strategy to be better positioned for a continually changing marketplace resulting in maximum contribution in value creation for its shareholders, customers and suppliers, and the supply chain.

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APPENDICES

Summarized PESTEL Framework

Table 6 Impact of PESTEL Factors and Their Implications

The PESTEL framework is a scan of the external macro-environment in which the firm can be expressed in terms of six main types: political, economic, social, technological, environmental and legal (Johnson and Scholes, 2002).

Factor	Driver	Impact	Implication
Political	Energy Policy and Regulation	+/-	Policy goals favor advanced energy; Different regulation focus has two-side effect
	Carbon Taxation	+/-	Increases in carbon tax stimulate renewable energy adoption; Negative impact on fuel-driven adoption
	Government Subsidy	+	Accelerate a decline the costs of advanced power technology
Economic	Moderate growing economy	+	Increase the demand of energy
	Interest rate/Capital investment	+/-	Higher rate stimulates the investment
Sociocultural	Computer and Internet	+	[illegible]
	Telecommunication	+	Need reliable power supply
	Automotive Electronics	+	Advanced power is cleaner than engine-driven
	Recreational Activity	+	Need clean, mobile advanced energy
Technological	Government support	+	lower the capital cost of R&D
	New technology	+	More efficient and environment-friendly
Environmental	Waste disposal insurance	-	Negative impact on physical battery disposal
	Incentive for renewable energy	+	Positive for environment protection
Legal	Deregulation on electric power	+	More room for advanced energy development

With electric utility restructuring, unique opportunities exist for new approaches to generating electricity and satisfying on-site customer energy needs using advanced power electronics systems (Liss, 1999). Energy economics cannot support significantly high capital investment. This places a challenge on equipment suppliers to squeeze out value in the form of lower capital costs, lower operating costs, or lower maintenance costs. Existing advanced power products are well positioned to provide cost-effective onsite and grid-connected power in many regions. Technological progress has a way of reducing the capital cost of new energy technologies, and increasing their efficiency. Government action can be a catalyst towards advanced power electronics industry. The substitution of old polluting diesel generator with cleaner technologies constitute an important opportunity for the implementation of advanced power electronics technologies. Overall, advanced power generation is cleaner than conventional methods.