A STUDY OF THIRD PARTY LOGISTICS IN THAILAND : THE INFORMATION TECHNOLOGY PERSPECTIVE

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A THESIS SUBMITTED IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR
THE DEGREE OF MASTER OF SCIENCE
(TECHNOLOGY OF INFORMATION SYSTEM MANAGEMENT)
FACULTY OF GRADUATED STUDIES
MAHIDOL UNIVERSITY
2005

ISBN 974-04-6195-6

Thesis
Entitled

A STUDY OF THIRD PARTY LOGISTICS IN THAILAND : THE INFORMATION TECHNOLOGY PERSPECTIVE

was submitted to the Faculty of Graduate Studies, Mahidol University
for the degree of Master of Science
(Technology of Information System Management)
on
May 24, 2005

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ACKNOWLEDGEMENTS

The success of this thesis can been attributed to the extensive support and assistance from my major advisor, Lect. Thanakorn Naenna and my co-advisor, Assist. Prof. Duangpun Kritchanchai and Assist. Prof. Konglit Hunchangsith. I thank them deeply for their helpful guidance and suggestions through out this study.

I also would like to express my sincere gratitude to external examiner, Mr. Dale Lapthorne, Managing Director of DHL Solution Co. Ltd., for his guidance and recommendations. In addition, thank you to Lect. Albert Tan of University of Singapore for inspirations and guidance through this research.

I would like to thank DHL Co. Ltd., Exel Co. Ltd., Tokyo World Transport Co. Ltd., Blue & White Logistics Co. Ltd., Cementhai Logistics Co. Ltd., and JWD Info Logistics Co. Ltd. for great interview co-operation. Without that, thank you to third party logistics companies in Thailand that kindly filled in my questionnaires.

I would like to thank Sotarat and Thammabudsadee family for being my great social support, Nick Chaplin for English improvement, my roommates for miscellaneous help, Thammanit for his kind support, and all my friends for their encouragement. I wish to express my sincere thanks to all teachers and staffs in the Technology of Information System Management program and Industrial Engineering department of the Faculty of Engineering, Mahidol University for good teaching from teachers and for good co-operation and generous from all staffs. In addition, I cannot forget to thank the research fund of engineering faculty for my research enhancement.

Finally, I am grateful to my dear teacher Ms. Malinee Thongsing, my kindness aunt & uncle, and my love family for their encouragement, entirely care and love during study in this research and my entire life.

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A STUDY OF THIRD PARTY LOGISTICS IN THAILAND :
THE INFORMATION TECHNOLOGY PERSPECTIVE

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ABSTRACT

This paper presents research on third party logistics (3PLs) in Thailand. Third party logistics describes a situation where one company outsources its logistic requirements-things such as warehousing, transportation, inventory control, etc.-to another company. The purpose of this research is to provide insight into the current status of and use of Information Technology by 3PLs in Thailand to set an appropriate direction for the country's development.

The instruments used were a questionnaire and structured interviews. A questionnaire developed by The National University of Singapore to gather data about the current profile of companies, company strategies and directions for logistics service, IT applications, infrastructure deployment, company achievements and future directions was given to 500 managers of 3PLs in Thailand. A total of 6 leading 3PLs managers were interviewed, three from home grown Thailand 3PL firms, and three from foreign 3PL firms that are based in Thailand.

The research results show the current status of 3PLs in Thailand, and Thailand's competitiveness compared with other countries especially Singapore. Thailand's competitiveness in both IT and logistic activity services is lower than Singapore's. The results also show models of problems and potential solutions for customers of 3PLs in Thailand both in logistics activity and IT for logistic activity service

KEY WORDS: THIRD PARTY LOGISTICS (3PLs) / LOGISTICS / INFORMATION TECHNOLOGY (IT) / THAILAND / SINGAPORE

227 P. ISBN: 974-04-6195-6

การศึกษากลุ่มอุตสาหกรรม THIRD PARTY LOGISTICS ในประเทศไทย : มุมมองเทคโนโลยีสารสนเทศ (A STUDY OF THIRD PARTY LOGISTICS IN THAILAND : THE INFORMATION TECHNOLOGY PERSPECTIVE)

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บทคัดย่อ

งานวิจัยนี้เป็นการศึกษากลุ่มอุตสาหกรรม THIRD PARTY LOGISTICS (3PLs)ในประเทศไทยในมุมมองด้านเทคโนโลยีสารสนเทศ โดยมีวัตถุประสงค์เพื่อสำรวจสถานะปัจจุบันและบทบาทในการใช้เทคโนโลยีสารสนเทศของอุตสาหกรรม 3PLs ในประเทศไทยเพื่อค้นหาแนวทางที่เหมาะสมในการพัฒนาประเทศ

เครื่องมือที่ใช้ในการวิจัย คือ แบบสำรวจที่พัฒนามาจากแบบสำรวจของมหาวิทยาลัยแห่งชาติ ประเทศสิงคโปร์และการสัมภาษณ์เชิงโครงสร้าง ซึ่งแบบสำรวจนั้นใช้ข้อมูลปัจจุบันของบริษัท, กลยุทธ์และทิศทางในการให้บริการทางด้านลอจิสติกส์, การประยุกต์ใช้เทคโนโลยีสารสนเทศภายในองค์กรมและความสำเร็จของบริษัทกับทิศทางการพัฒนาองค์กรในอนาคต ซึ่งสำรวจจากบริษัท 3PLs ในประเทศไทยจำนวน 500 บริษัท ส่วนการสัมภาษณ์เชิงโครงสร้างนั้นเป็นการสัมภาษณ์บริษัท 3PLs ซึ่งเป็นแนวหน้าของอุตสาหกรรมจำนวน 6 บริษัท โดยแบ่งออกเป็นบริษัทที่เป็นของคนไทยจำนวน 3 บริษัทและบริษัทต่างชาติจำนวน 3 บริษัทเพื่อทราบทิศทางในการพัฒนาองค์กรของบริษัทซึ่งมีแนวโน้มที่จะส่งผลกระทบต่อประเทศมากกว่าบริษัทขนาดเล็ก

ผลการวิจัยแสดงให้เห็นถึงสถานะปัจจุบันของกลุ่มอุตสาหกรรม 3PLs ในประเทศไทย, ความสามารถในการแข่งขันกับประเทศอื่นๆโดยเฉพาะประเทศสิงคโปร์ซึ่งประเทศไทยยังคงล้าหลังกว่าสิงคโปร์ทั้งทางด้านการให้บริการลอจิสติกส์และเทคโนโลยีสารสนเทศ นอกจากนี้ยังมีการเสนอโมเดลของปัญหาและแนวทางแก้ไขของอุตสาหกรรม3PLs ทั้งทางด้านกลยุทธ์ในการให้บริการและเทคโนโลยีสารสนเทศเพื่อใช้ในการพัฒนาประเทศต่อไป

227 หน้า ISBN: 974-04-6195-6

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CHAPTER I
INTRODUCTION

1.1 Background and Statement of Problem

Logistics management is the part of the supply chain process that plans, implements and controls the efficient, effective flow and storage of goods, services, and related information from the point-of-origin to the point-of-consumption in order to meet customer ’s requirements. [1] Logistics can be the key to enhancing economic growth in 2 ways. [2]

Firstly, it has become an enormously important component of the gross domestic product (GDP) of industrialized nations. In the United States, for example, logistics contributes approximately 9.9 percent of GDP in 1999. There are was an estimated spending of $554 billion on freight transportation, more than $332 billion on warehousing, storage and inventory carrying costs, and more than $40 billion to administer, communicate and manage the logistics process – a total of $921 billion. Investment in transportation and distribution facilities, not including public sources, is estimated to be in the hundreds of billions dollars. Considering its consumption of land, labor and capital and its impact on the standard of living, logistics is clearly big business. As a significant component of GDP, logistics affects the rate of inflation, interest rates, productivity, energy cost and availability and other aspects of the economy.

Secondly, logistics also supports the movement and flow of many economic transactions, it is important activity in facilitating the sale of virtually all goods and services, consider that if goods do not arrive on time, customers cannot buy them. If goods do not arrive in the proper place, or in the proper condition, no sale can be made and thus all economic activity throughout the supply chain will suffer.

So the governments of many counties have come to focus on logistics and transportation to stimulate growth in their economies. Countries develop their

infrastructures strongly such as railway, train, river and sea while brainstorming researchers to find strategies in order to develop their logistics. [3]

Besides this, information technology has been developed rapidly and supported through logistics process such as EDI, Barcode, Point of Sale (POS) and sending data through the satellite. These technologies must be included into logistics plans to expand the accuracy of data and quality of customer service.

Logistics providers have become important in designing logistics systems because firms realize that they can not compete by designing and managing their own logistics systems. [4] Research of logistics providers in USA found that logistics provider services are critical factors in reducing logistics costs and developing their services include to expand supply chain management and logistics into organization. [5], [6] Singapore, which wants to be the leading logistics hub in Asia, has logistics providers which have higher development and higher growth than other countries in Asia. There is widespread use of e-commerce to expand customer relationships and increase efficiency of logistics operations. [3] The survey of logistics providers in Hong Kong which also has a policy to be a hub of logistics in Asia reports that Hong Kong has high competency in fundamental logistics services such as transportation, distribution and warehousing but lacks development in value-added logistics. [7] China wants to become a logistics hub in Asia by using logistics providers to be a key engine. The report found that logistics providers have a very high growth rate in Chinese industries but still needs development for services and IT. The key barrier in enhancing logistics in China its transportation infrastructure. [8] Thailand is one of countries that use logistics to enhance industry sectors and has a policy to be a logistics hub in Asia [9] like Singapore, Hong Kong and China and also focused on logistics providers to improve logistics activities too. There is a research report that the logistics provider sector in Thailand has a low growth rate and lack of e-commerce development. [10] But at present, the volume of transportation has been increased, [11], [12] and there is improvement of technology and continual enhancement of IT from the government [13]. These are indexes to show that there is a significant increase in the number of logistics providers and use of information technology so surveying current status and using IT of logistics provider in Thailand are needed to

improve logistics and Thai industries to be high quality and competitive in the global market place.

1.2 Objective

The objective of these dissertation are ;

1. To survey the current status of 3PLs in Thailand.
   - Sizes
   - Services
   - Strategies
2. To survey IT role of 3PLs firms in Thailand.
   - IT applications and infrastructure deployment
   - Motivations and barriers to adopting IT in organization
   - Company achievements through implementing IT and Important IT skill needs
3. To identify direction and policy trends of 3PLs leaders in Thailand.
4. To compare current status and IT role of 3PLs in Thailand with other countries focus on Singapore who is the leader of logistics hub in Asia.
5. To identify problems and solutions of 3PLs in Thailand.

1.3 Conceptual Framework

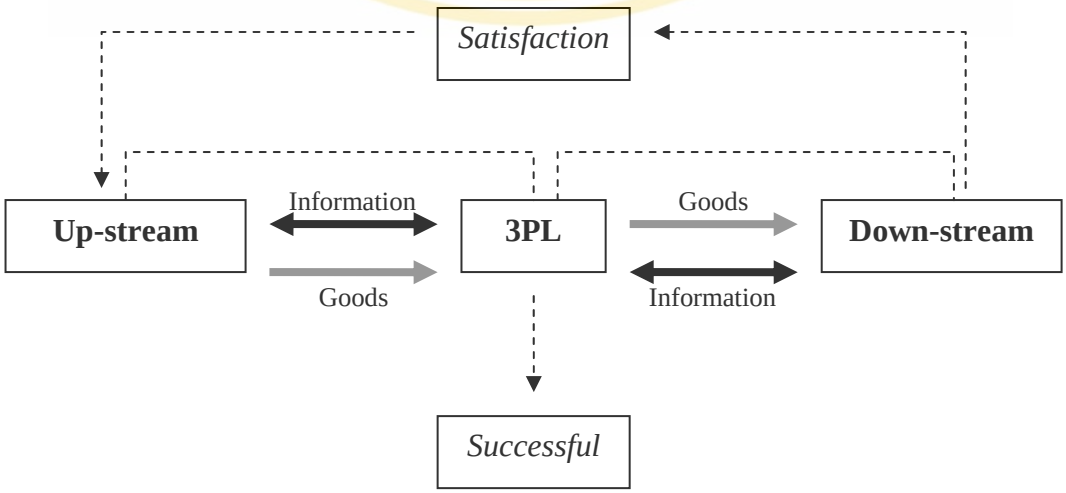

Figure 1.1 Conceptual Framework

1.4 Scope of Study

The scope of this study include ;

1. The research will study on strategic and policy level. The potential total logistics model will be based on 3PLs sector in year 2004.
2. Example Group :
   - Respondent of 3PLs in Thailand from sending 500 questionnaires.
   - Co-operating of 3PLs companies from 6 large companies in Thailand which are 3 local companies and 3 multinational companies.
3. This study is working in co-operative with “Albert Tan, a lecturer of The National University of Singapore (NUS)” so there is using Singapore data in order to compare current status and IT role of 3PLs in Singapore with Thailand.
4. The problem situation of 3PLs including IT adoption will be identified and the solution will be exist too.

1.5 Step of Research Methodology

1. Review literature on government/ country policies, logistics management and 3PLs sector in Thailand.
2. Identify potential issues for logistics study.
3. Select 3PLs companies for investigating logistics activities, its strengths and weaknesses.
4. Analyze all data.
5. Documentation.

1.6 Expected Result

1. Current status and IT trends of 3PLs sector in Thailand.
2. Direction and policy trends of large 3PLs in Thailand.
3. The conceptual gap of 3PLs sector between Thailand and Singapore.
4. Business developing problem of 3PLs sector in Thailand.
5. Suggest direction in logistics management of 3PLs in Thailand.

1.7 Definition of Terms

Logistics Total concept covering the planning and organizing of the supply and movement of materials/ goods, etc from original source through stages of production, assembly, packing, storage, handling and distribution to final consumer. Distribution is but one element of whole logistics concept and transport a single element only of a physical distribution. Logistics is an importance function within firms requiring professional management (eg. by those who are members of the Institute of Logistics and Transport - ILT)

Third – Party logistics (3PLs) In order to do this research, the three core logistics businesses are defined as the following;

- **Transportation** companies that provide transport service to customers;
- **Warehousing** companies that offer public, shared use, and/ or dedicated storage services;
- **Freight Forwarding** companies that coordinate freight movement and documentation for containerized cargo.

Information technology (IT) Computer – based technology to provide information to business and private users; includes Internet access to the WWW and e-mail.

Transaction system

- **Financial management system** The systems that offer a wide range of features and functionality, including general ledger, accounts payable and receivable, inventory, sales, purchasing, bank reconciliation, and fixed asset management. A tightly integrated system can help firm’s agency efficiently track and analyze key information, improve productivity, and drive smarter decisions.
- **Inventory management system** The system which provides a process used to ensure that the right items are in the right place at the right time.

- **Purchasing management system** The system that manages the complete procurement cycle from requisition entry through receiving, inventory and invoice matching.
- **Sales order processing system** Concept's Sales Order Processing module keeps a complete record of all company's sales commitments. Designed specifically for manufacturers, it is suitable for use in the sale of goods made to order with scheduled delivery dates or goods sold ex-stock.
- **Production control system**The system is automated and computerized systems which monitor processes. It collects and analyzes data, and provides information to people operating the system to help them decide what process changes to make.

Planning system

- **Finite scheduling system** The system that help firms generate realistic production sequences, see the effects of schedule changes, and provide more accurate delivery dates. The system can help companies to reduce cycle times for predictable delivery dates, manage multiple constraints and delivery schedules for JIT Just In Time manufacturing, helps reduce inventory and increase asset utilization.
- **Quality management system** It is a systematic way of ensuring that the activities necessary to design, develop, and deliver products and services which are more likely to be fit for there intended purpose, take place as planned and are carried out efficiently and effectively.
- **Maintenance management system** The system which is designed to provide maintenance planners with the necessary tools to plan, forecast, and schedule equipment maintenance while capturing equipment and component maintenance history and associated costs (material and labor).
- **Production data management system** The system which is designed to track all aspects of manufacturing production. It maintains historically accurate records of the production process including defect tracking and complete product genealogy.
- **Project management system** The tools that assist in planning, scheduling, tracking and analyzing a project.

- **Point of Sales Systems (POS)** The tools that utilize individual components such as touch screen display, barcode scanners, computer cash registers and cash drawer systems to operate as a point of sales operations as well as an inventory control system. POS software can automate daily sales transactions, track customers, provide an integrated web storefront as well as provide a real-time balance sheet and profit & loss statement at days end.

- **Forecasting** The tools are estimations of future demands. Most forecasts use historical demand to calculate future demand. Adjustments for seasonality and trend are often necessary.

- **Manufacturing Resource Planning (MRP II)** The process system helps to determine material, labor and machine requirements in a manufacturing environment. MRPII is the consolidation of Material Requirements Planning (MRP), Capacity Requirements Planning (CRP), and Master Production Scheduling (MPS). MRP was originally designed for materials planning only. When labor and machine (resources) planning were incorporated it became known as MRPII.

- **Capacity Management System** The system for determining amount of machine and labor resources required to meet production.

- **Activity Based Costing (ABC)** Costing system that breaks down overhead costs into specific activities (cost drivers) in order to more accurately distribute the costs in product costing. Has also been applied to customer and vendor management.

- **Master Production Scheduling System (MPS)** The system which production schedule specifying specific items, quantities, and dates at which production is expected to take place.

Logistics management system

- **Transportation management system** Category of operations software that may include products for shipment manifesting, rate shopping, routing, fleet management, yard management, carrier management, and freight cost management.

- **Distribution resource planning system** The system for determining labor, equipment, inventory requirements in a multiple plant/warehouse environment, and warehouse space requirements.

- **Warehousing management system** Computer software designed specifically for managing the movement and storage of materials throughout the warehouse. WMS functionality is generally broken down into the following three operations: Put away, Replenishment, and Picking. The key to these systems is the logic to direct these operations to specific locations based on user defined criteria.
- **Customer service and returns system** The system that customers can help themselves by providing access to edit information, view customer service requests and responses, renew or upgrade memberships, and search knowledge base and FAQ's including view order status and tracking data, the amount of return, and cause of return.

New applications

- **Time management system** The system that use to determine the tasks, responsible persons and amount time to finish these tasks.
- **Customer relationship management system** The system that help organizations could track and analyze shifting customer needs, link marketing campaigns to sales results, and monitor sales activities for improved forecasting accuracy and manufacturing demand.
- **Logistics network modeling system** The simulation that is one of the most extensively used operational research tools in the logistics industry. Currently, there are mainly three classes of models for logistics networks design:

1. Models based on the deterministic modeling paradigm, where all data are assumed to be discrete, deterministic and known a priori. These assumptions automatically place most of these problems in the area of combinatorial optimization.
2. Models based on the flow control approach. This approach uses a continuous-flow approximation to model the discrete flow of logistics materials in the logistics networks.
3. Models using artificial intelligence (AI) approaches such as expert system, genetic algorithm and neural networks.

- **Supply chain planning system** The system that make companies ability to make accurate forecasts regarding their demands in the near future.

- **Laboratory information management system** It is software that helps laboratories manage samples and analytical data. It helps to lower laboratory costs, facilitate tracking of thousands of samples per year, improve data quality by eliminating manual entry, and reduce data reporting efforts.

CHAPTER II
LITERATURE REVIEW

This chapter describe about logistics activities, logistics system, how logistics work, logistics and information technology, third party logistics provider, logistics service and performance measurement, emerging trends in logistics, Thailand and Singapore competitiveness, and related research.

2.1 Logistics Management

Logistics management is the part of the supply chain process that plan, implements, and controls the efficient, effective flow and storage of goods, services, and related information from the point – of – origin to the point – of – consumption in order to meet customers' requirement. [1]

2.1.1 Logistics Activities [14] [15]

The logistics definitions discussed earlier indicate activities for which the logistics manager may be responsible:

- Traffic and transportation
- Warehousing and storage
- Industrial packaging
- Materials handling
- Inventory control
- Order fulfillment
- Demand forecasting
- Production planning
- Purchasing
- Customer service levels
- Plant and warehouse site location
- Return goods handling

- Parts and service support
- Salvage and scrap disposal

This list is quite comprehensive; some companies with well-organized logistics areas may not place responsibility for all of these activities within the logistics area. For example, companies having a physical distribution focus may not include procurement in their logistics organization.

2.1.2 Scope of Activities [14] [15]

The development of interest in logistics after World War II contributed to the growth in activities associated with logistics. Given the scope of this growth, it is worthwhile to discuss these activities and their relationship to logistics.

Transportation

Transportation is a very important part of the logistics system. A major focus in logistics is upon the physical movement or flow of goods or upon the network that move the product. This network is composed of transportation agencies that provide the service for the firm. The logistics manager is responsible for selecting the modes of transportation used in moving the raw materials and finished goods or for developing private transportation as an alternative.

Storage

A second area, which has a trade-off relationship with transportation, is storage. It involves two separate but closely related activities: inventory management and warehousing. A direct relationship exists between transportation and the level of inventory and number of warehouses required. For example, if firms use a relatively slow means of transport, they usually have to keep higher inventory levels and usually have more warehousing space for this inventory. They may examine the possibility of using faster transport to eliminate some of these warehouses and the inventory stored there in.

A number of important decisions are related to storage activities (inventory and warehousing), including how many warehouses, how much inventory, where to locate the warehouses, what size the warehouse should be, and so on. Because decisions

related to transportation affect storage-related decisions, a decision framework to examine the trade-offs related to the various alternatives is essential to optimize the overall logistics system

Packaging

A third area of interest to logistics is industrial (exterior) packaging. The type of transportation selected affects packaging requirements both for moving the finished product to the market and for the inbound materials. For example, rail or water transportation usually requires additional packaging expenditures because of the greater possibility of damage. In analyzing trade-offs for proposed changes in transportation agencies, logistics personnel generally examine how the change will influence packaging costs. In many instances, changing to premium transport means, such as air, will reduce packaging costs because there is less risk of damage. In fact, some items may not be packaged when shipped via air freight; for example, clothing is frequently shipped on hangers.

Materials Handling

A fourth area to be considered is materials handling, which is also of interest to other areas in the typical manufacturing organization. Materials handling is important to efficient warehouse operation. Logistics managers are concerned with the movement of goods into a warehouse, the placement of goods in a warehouse, and the movement of goods from storage to order-picking areas and eventually to dock areas for transportation out of the warehouse.

Materials handling is usually concerned with mechanical equipment for short-distance movement; such equipment includes conveyors, forklift trucks, overhead cranes, and containers. Production managers may want a particular pallet or container type that is not compatible with logistics warehousing activities. Therefore, the materials-handling designs must be coordinated in order to ensure congruity between the types of equipment used. In addition, the company may find it economical to use the same type of forklift trucks in the plants and in the warehouse.

Order Fulfillment

Another activity area that logistics may control is order fulfillment, which generally consists of activities involved with completing customer orders. Initially, one might question why the logistics area would concern itself directly with order fulfillment. However, one important physical distribution factor is the time elapsing from the time when a customer decides to place an order for a product until the time that those goods are actually delivered in a satisfactory condition, that is, the lead time.

Forecasting

Another activity important to the logistics area is inventory forecasting. Accurate forecasting of inventory requirements and materials and parts is essential to effective inventory control. This is particularly true in companies using a just-in-time (JIT) or materials requirement planning (MRP) approach to control inventory. Logistics personnel should develop forecasts in those situations to ensure accuracy and effective control. Too frequently, forecasts developed by marketing staff reflect sales objectives rather than inventory requirements.

Production Planning

Another area of growing interest for logistics managers is production planning, which is closely related to forecasting in terms of effective inventory control. Once a forecast is developed and the current inventory on hand and usage rate is assessed, production managers can determine the number of units necessary to ensure adequate market converges. However, in multiple product firms, production process timing and certain product line relationships require close coordination with logistics or actual control of production planning by logistics. The integration of production planning into logistics is becoming increasingly common in large corporation.

Purchasing

Purchasing, or procurement, is another activity that we can include in logistics. The basic rationale for including purchasing in logistics is that transportation cost relates directly to the geographic location (distance) of raw materials and component parts purchased for a company's production needs. In terms of transportation and inventory costs, the quantities purchased would also affect logistics cost. Including

purchasing within the logistics area is primarily a matter of whether this more effectively coordinates and lowers costs for the firm. As was noted previously, a growing number of companies added purchasing to the logistics function during the 1970s and 1980s.

Customer Service

Another area of importance is customer service. Customer service is a complex topic and one that concerns other functional company areas. Customer service levels in many ways glue together logistics areas. Decisions about inventory, transportation, and warehousing relate to customer service requirements. While customarily the logistics area does not completely control customer service decisions, logistics plays an extremely important role in ensuring that the customer gets the right product at the right place and time. Logistics decisions about product availability and inventory lead time are critical to customer service.

Site Location

Another area that is important to logistics is plant and warehouse site location. A location change could alter time and place relationship between plants and markets or between supply points and plants. Such changes will affect transportation rates and service, customer service, inventory requirements, and possibly other areas. Therefore, the logistics manager is quite concerned about location decisions. In fact, plant location, as discussed in a subsequent chapter, is frequently as important as warehouse location. Transportation cost is frequently a very important factor in deciding on a location.

Other Activities

Other areas may be considered a part of logistics. Areas such as parts and service support, return goods handling, and salvage and scrap disposal indicate the reality of logistical activities managed in companies producing consumer durables or industrial product. Here, a very integrative approach is necessary. Logistics offers input into product design as well as into maintenance and supply services, since transportation and storage decisions affect this area. (the definitions of logistics and materials

management imply the importance of such activities to systemic logistics management in such companies.)

2.2 Logistics System [16], [17]

A logistics system is made up of a set of facilities linked by transportation services. Facilities are sites where materials are processed, e.g. manufactured, stored, sorted, sold or consumed. They include manufacturing and assembly centers, warehouses, distribution centers (DCs), transshipment points, transportation terminals, retail outlets, mail sorting centers, garbage incinerators, dump sites, etc. Transportation services move materials between facilities using vehicles and equipment such as trucks, tractors, trailers, crews, pallets, containers, cars and trains.

2.2.1 Supply Chains

A supply chain is a complex logistics system in which raw materials are converted into finished products and then distributed to the final users (consumers or companies). It includes suppliers, manufacturing centers, warehouses, DCs and retail outlets. Figure 2.1 shows a typical supply chain in which the production and distribution systems are made up of two stages each. In the production system, components and semi-finished parts are produced in two manufacturing centers while finished goods are assembled at a different plant. The distribution system consists of two central distribution centers (CDCs) supplied directly by the assembly centre, which in turn replenish two regional distribution centers (RDCs) each. Of course, depending on product and demand characteristics it may be more appropriate to design a supply chain without separate manufacturing and assembly centers (or even without an assembly phase), without RDCs or with different kinds of facilities (e.g. cross docks). Each of the transportation links in Figure 2.1 could be a simple transportation line (e.g. a truck line) or of a more complex transportation process involving additional facilities (e.g. port terminals) and companies (e.g. truck carriers). Similarly, each facility in Figure 2.1 comprises several devices and subsystems. For example, manufacturing plants contain machines, buffers, belt conveyors or other material handling equipment, while DCs include shelves, forklifts or automatic storage and retrieval systems. Logistics is not normally associated with the detailed planning of

material flows inside manufacturing and assembly plants. Strictly speaking, topics like aggregate production planning and machine scheduling are beyond the scope of logistics and are not examined in this textbook. The core logistics issues described in this book are the design and operations of DCs and transportation terminals.

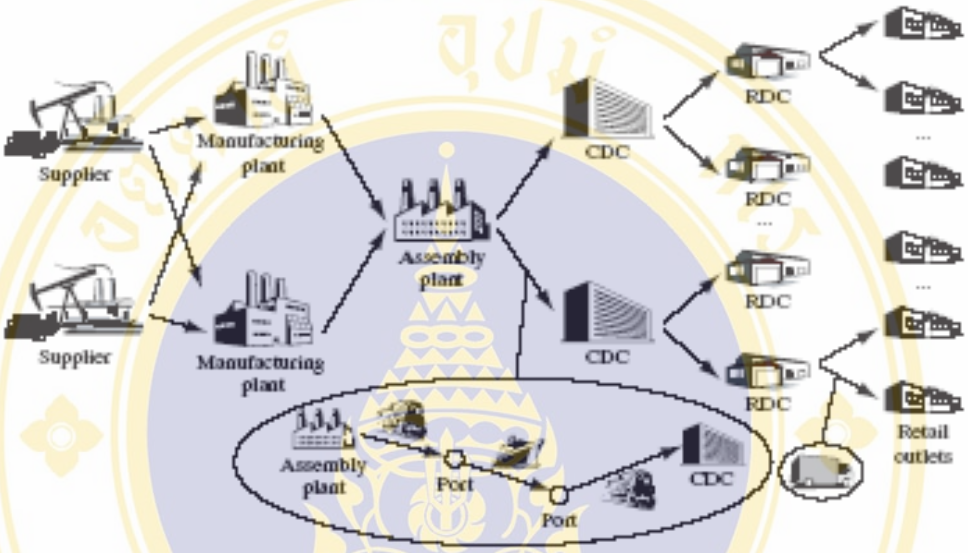

Figure 2.1 A Supply Chain [16]

2.2.2 Push versus Pull Supply Chains

Supply chains are often classified as push or pull systems. In a pull (or make-to-order (MTO)) system, finished products are manufactured only when customers require them. Hence, in principle, no inventories are needed at the manufacturer. In a push (or make-to-stock (MTS)) system, production and distribution decisions are based on forecasts. As a result, production anticipates effective demand, and inventories are held in warehouses and at the retailers. Whether a push system is more appropriate than a pull system depends on product features, manufacturing process characteristics, as well as demand volume and variability. MTO systems are more suitable whenever lead times are short, products are costly, and demand is low and highly variable. In some cases, a mixed approach can be used. For example, in make-to-assembly (MTA) systems components and semi-finished products are manufactured in a push-based manner while the final assembly stage is pull-based. Hence, the work-in-process inventory at the end of the first stage is used to assemble the finished

product as demand arises. These parts are then assembled as soon as customer orders are received.

2.2.3 Product and Information Flows in a Supply Chain

Products flow through the supply chain from raw material sources to customers, except for obsolete, damaged and nonfunctioning products which have to be returned to their sources for repair or disposal. Information follows a reverse path. It traverses the supply chain backward from customers to raw material suppliers. In an MTO system, end-user orders are collected by salesmen and then transmitted to manufacturers who in turn order the required components and semi-finished products from their suppliers. Similarly, in an MTS system, past sales are used to forecast future product demand and associated material requirements. Product and information flows cannot move instantaneously through the supply channel. First, freight transportation between raw material sources, production plants and consumption sites is usually time consuming. Second, manufacturing can take a long time, not only because of processing itself, but also because of the limited plant capacity (not all products in demand can be manufactured at once). Finally, information can flow slowly because order collection, transmission and processing take time, or because retailers place their orders periodically (e.g. once a week), and distributors make their replenishment decisions on a periodic basis (e.g. twice a week).

2.2.4 Degree of Vertical Integration and Third-Party Logistics

According to a classical economic concept, a supply chain is said to be vertically integrated if its components (raw material sources, plants, transportation system, etc.) belong to a single firm. Fully vertically integrated systems are quite rare. More frequently the supply chain is operated by several independent companies. This is the case of manufacturers buying raw materials from outside suppliers, or using contractors to perform particular services, such as container transportation and warehousing. The relationships between the companies of a supply chain may be transaction based and function specific (as those illustrated in the previous example), or they can be strategic alliances. Strategic alliances include third-party logistics (3PL) and vendor-managed re-supply. 3PL is a long-term commitment to use an outside

company to perform all or part of a company's product distribution. It allows the company to focus on its core business while leaving distribution to a logistics outsourcer. 3PL is suitable whenever the company is not willing to invest much in transportation and warehousing infrastructures, or whenever the company is unable to take advantage of economies of scale because of low-demand. On the other hand, 3PL causes the company to lose control of distribution and may possibly generate higher logistics costs.

2.2.5 Retailer-Managed versus Vendor-Managed Re-Supply

Traditionally, customers (both retailers or final consumers) have been in charge of monitoring their inventory levels and place purchase orders to vendors (retailer-managed systems). In recent years, there has been a growth in vendor-managed systems, in which vendors monitor customer sales (or consumption) and inventories through electronic data interchange (EDI), and decide when and how to replenish their customers. Vendors are thus able to achieve cost savings through a better coordination of customer deliveries while customers do not need to allocate costly resources to inventory management. Vendor-managed re-supply is popular in the gas and soft drink industries, although it is gaining in popularity in other sectors. In some vendor-managed systems, the retailer owns the goods sitting on the shelves, while in others the inventory belongs to the vendor. In the first case, the retailer is billed only at the time where it makes a sale to a customer.

2.3 How Logistics Systems Work [16], [17], [18]

Logistics systems are made up of three main activities: order processing, inventory management and freight transportation.

2.3.1 Order Processing

Order processing is strictly related to information flows in the logistics system and includes a number of operations. Customers may have to request the products by filling out an order form. These orders are transmitted and checked. The availability of the requested items and customer's credit status are then verified. Later on, items are retrieved from the stock (or produced), packed and delivered along with their shipping

documentation. Finally, customers have to be kept informed about the status of their orders. Traditionally, order processing has been a very time-consuming activity (up to 70% of the total order-cycle time). However, in recent years it has benefited greatly from advances in electronics and information technology. Bar code scanning allows retailers to rapidly identify the required products and update inventory level records. Laptop computers and modems allow salespeople to check in real time whether a product is available in stock and to enter orders instantaneously. EDI allows companies to enter orders for industrial goods directly in the seller's computer without any paperwork.

2.3.2 Inventory Management

Inventory management is a key issue in logistics system planning and operations. Inventories are stockpiles of goods waiting to be manufactured, transported or sold. Typical examples are ;

1) components and semi-finished products (work-in-process) waiting to be manufactured or assembled in a plant; merchandise (raw-material, components, finished products) transported through the supply chain (in-transit inventory);

2) finished products stocked in a DC prior to being sold;

3) finished products stored by end-users (consumers or industrial users) to satisfy future needs. There are several reasons why a logistician may wish to hold inventories in some facilities of the supply chain.

- **Improving Service Level** Having a stock of finished goods in warehouses close to customers yields shorter lead times.
- **Reducing Overall Logistics Cost** Freight transportation is characterized by economies of scale because of high fixed costs. As a result, rather than frequently delivering small orders over long distances, a company may find it more convenient to satisfy customer demand from local warehouses (replenished at low frequency).
- **Coping with Randomness in Customer Demand and Lead Times** Inventories of finished goods (safety stocks) help satisfy customer demand even if

unexpected peaks of demand or delivery delays occur (due, for example, to unfavorable weather or traffic conditions).

- **Making Seasonal Items Available Throughout the Year** Seasonal products can be stored in warehouses at production time and sold in subsequent months.

- **Speculating on Price Patterns** Merchandise whose price varies greatly during the year can be purchased when prices are low, then stored and finally sold when prices go up.

- **Overcoming Inefficiencies in Managing the Logistics System** Inventories may be used to overcome inefficiencies in managing the logistics system (e.g. a distribution company may hold a stock because it is unable to coordinate supply and demand). Holding an inventory can, however, be very expensive for a number of reasons. First, a company that keeps stocks incurs an opportunity (or capital) cost represented by the return on investment the firm would have realized if money had been better invested. Second, warehousing costs must be incurred, whether the warehouse is privately owned, leased or public. The aim of inventory management is to determine stock levels in order to minimize total operating cost while satisfying customer service requirements. In practice, a good inventory management policy should take into account five issues: (1) the relative importance of customers; (2) the economic significance of the different products; (3) transportation policies; (4) production process flexibility; (5) competitors' policies.

- **Inventory and Transportation Strategies** Inventory and transportation policies are intertwined. When distributing a product, three main strategies can be used: direct shipment, warehousing, cross-docking. If a direct shipment strategy is used, goods are shipped directly from the manufacturer to the end-user (the retailers in the case of retail goods) (see Figure 2.2a). Direct shipments eliminate the expenses of operating a DC and reduce lead times. On the other hand, if a typical customer shipment size is small and customers are dispersed over a wide geographic area, a large fleet of small trucks may be required. As a result, direct shipment is common when fully loaded trucks are required by customers or when perishable goods have to be delivered timely.

- **Warehousing** is a traditional approach in which goods are received by warehouses and stored in tanks, pallet racks or on shelves (see Figure 2.2b).When an order arrives, items are retrieved, packed and shipped to the customer. Warehousing consists of four major functions: reception of the incoming goods, storage, order picking and shipping. Out of these four functions, storage and order picking are the most expensive because of inventory holding costs and labour costs, respectively.

- **Cross-Docking** (also referred to as just-in-time distribution) is a relatively new logistics technique that has been successfully applied by several retail chains (see Figure 2.2c). A cross-dock is a transshipment facility in which incoming shipments (possibly originating from several manufacturers) are sorted, consolidated with other products and transferred directly to outgoing trailers without intermediate storage or order picking. As a result, shipments spend just a few hours at the facility. In pre-distribution cross-docking, goods are assigned to a retail outlet before the shipment leaves the vendor. In post-distribution cross-docking, the cross-dock itself allocates goods to the retail outlets. In order to work properly, cross-docking requires high volume and low variability of demand (otherwise it is difficult to match supply and demand) as well as easy-to-handle products. Moreover, a suitable information system is needed to coordinate inbound and outbound flows.

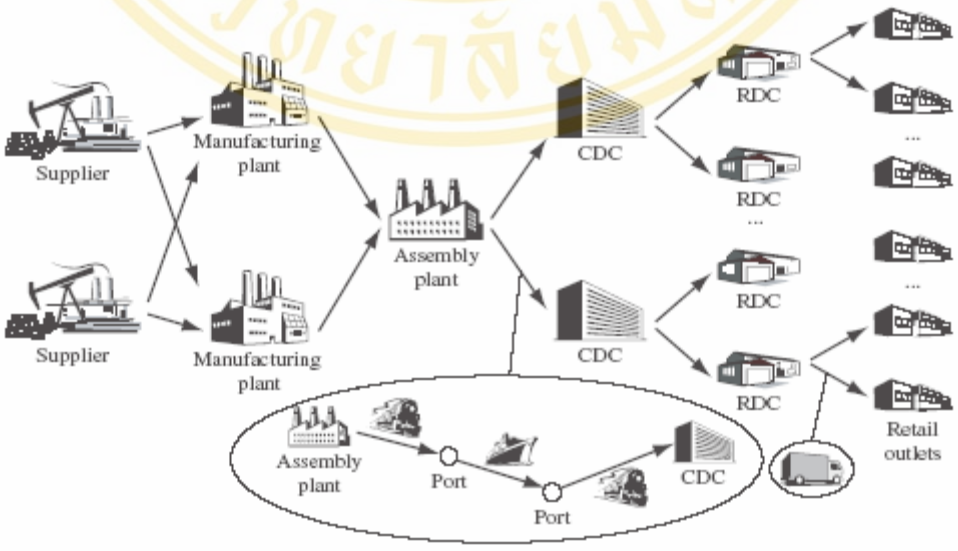

Figure 2.2 Distribution strategies:
(a) direct shipment (b) warehousing (c) cross-docking. [16]

- **Centralized versus Decentralized Warehousing** If a warehousing strategy is used, one has to decide whether to select a centralized or a decentralized system. In centralized warehousing, a single-warehouse serves the whole market, while in decentralized warehousing the market is divided into different zones, each of which is served by a different (smaller) warehouse. Decentralized warehousing leads to reduced lead times since warehouses are much closer to customers. On the other hand, centralized warehousing is characterized by lower facility costs because of larger economies of scale. In addition, if customers' demands are uncorrelated, the aggregate safety stock required by a centralized system is significantly smaller than the sum of the safety stocks in a decentralized system. This phenomenon (known as risk pooling) can be explained qualitatively as follows: under the above hypotheses, if the demand from a customer zone is higher than the average, then there will probably be a customer zone whose demand is below average. Hence, demand originally allocated to a zone can be reallocated to the other and, as a result, lower safety stocks are required. Finally, inbound transportation costs (the costs of shipping the goods from manufacturing plants to warehouses) are lower in a centralized system while outbound transportation costs (the costs of delivering the goods from the warehouses to the customers) are lower in a decentralized system.

2.3.3 Freight Transportation [2], [14], [16], [17], [18], [19]

Freight transportation plays a key role in today's economies as it allows production and consumption to take place at locations that are several hundreds or thousands of kilometers away from each other. As a result, markets are wider, thus stimulating direct competition among manufacturers from different countries and encouraging companies to exploit economies of scale. Moreover, companies in developed countries can take advantage of lower manufacturing wages in developing countries. Finally, perishable goods can be made available in the worldwide market. Freight transportation often accounts for even two-thirds of the total logistics cost and has a major impact on the level of customer service. It is therefore not surprising that transportation planning plays a key role in logistics system management.

A manufacturer or a distributor can choose among three alternatives to transport its materials. First, the company may operate a private fleet of owned or rented

vehicles (private transportation). Second, a carrier may be in charge of transporting materials through direct shipments regulated by a contract (contract transportation). Third, the company can resort to a carrier that uses common resources (vehicles, crews, terminals) to fulfill several client transportation needs (common transportation).

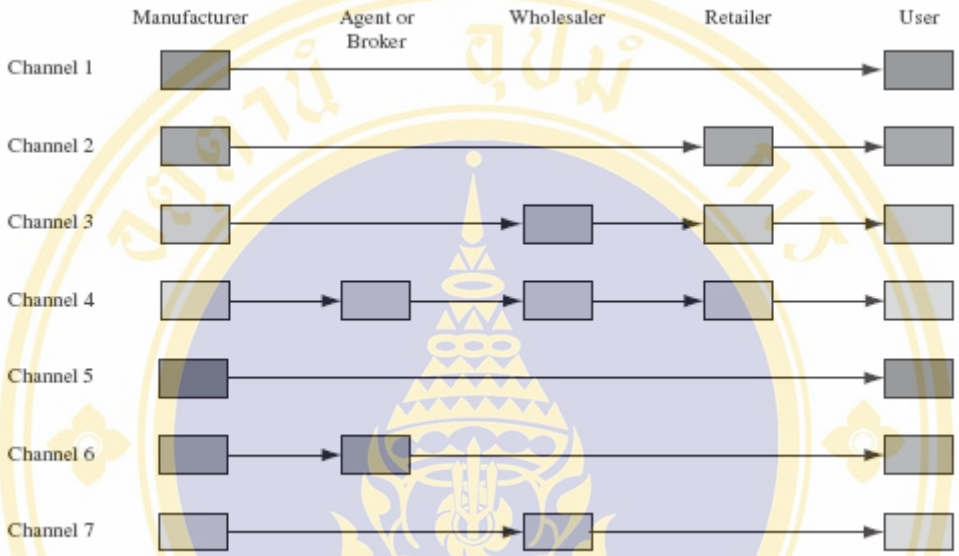

Figure 2.3 Channels of Distribution [16]

- **Distribution Channels** Bringing products to end-users or into retail stores may be a complex process. While a few manufacturing firms sell their own products to end users directly, in most cases intermediaries participate in product distribution. These can be sales agents or brokers, who act for the manufacturer, or wholesalers, who purchase products from manufacturers and resell them to retailers, who in turn sell them to end-users. Intermediaries add a markup to the cost of a product but on the whole they benefit consumers because they provide lower transportation unit costs than manufacturers would be able to achieve. A distribution channel is a path followed by a product from the manufacturer to the end-user. A relevant marketing decision is to select an appropriate combination of distribution channels for each product. Figure 2.3 illustrates the main distribution channels. Channels 1–4 correspond to consumer goods while channels 5–7 correspond to industrial goods. In channel 1, there are no intermediaries. This approach is suitable for a restricted number of products (cosmetics and encyclopedias sold door-to-door,

handicraft sold at local flea markets, etc.). In channel 2, producers distribute their products through retailers (e.g. in the tire industry). Channel 3 is popular whenever manufacturers distribute their products only in large quantities and retailers cannot afford to purchase large quantities of goods (e.g. in the food industry). Channel 4 is similar to channel 3 except that manufacturers are represented by sales agents or brokers (e.g. in the clothing industry). Channel 5 is used for most industrial goods (raw material, equipment, etc.). Goods are sold in large quantities so that wholesalers are useless. Channel 6 is the same as channel 5, except that manufacturers are represented by sales agents or brokers. Finally, channel 7 is used for small accessories (paper clips, etc.).

- **Freight Consolidation** A common way to achieve considerable logistics cost savings is to take advantage of economies of scale in transportation by consolidating small shipments into larger ones. Consolidation can be achieved in three ways. First, small shipments that have to be transported over long distances may be consolidated so as to transport large shipments over long distances and small shipments over short distances (facility consolidation). Second, less-than-truckload pick-up and deliveries associated with different locations may be served by the same vehicle on a multi-stop route (multi-stop consolidation). Third, shipment schedules may be adjusted forward or backward so as to make a single large shipment rather than several small ones (temporal consolidation).

- **Modes of Transportation** Transportation services come in a large number of variants. There are five basic modes (ship, rail, truck, air and pipeline), which can be combined in several ways in order to obtain door-to-door services such as those provided, for example, by inter modal carriers and small shipment carriers. Merchandise is often consolidated into pallets or containers in order to protect it and facilitate handling at terminals. Common pallet sizes are 100*120 cm^2, 80*100 cm^2, 90*110 cm^2 and 120*120 cm^2. Containers may be refrigerated, ventilated, closed or with upper openings, etc. Containers for transporting liquids have capacities between 14,000 and 20,000 liters. The features of the most common containers for transporting solid goods are given in Table 2.1. When selecting a carrier, a shipper must take two fundamental parameters into account: price (or cost) and transit time. The cost of a shipper's operated transportation service is the sum of all costs associated with

operating terminals and vehicles. The price of a transportation service is simply the rate charged by the carrier to the shipper. Air is the most expensive mode of transportation, followed by truck, rail, pipeline and ship. According to recent surveys, transportation by truck is approximately seven times more expensive than by train, which is four times more costly than by ship.

Table 2.1 Main features of the most common containers used for transporting solid goods [16]

Type	Size (m^3)	Tare (kg)	Capacity (kg)	Capacity (m^3)
ISO 20	5.899 × 2.352 × 2.388	2300	21 700	33.13
ISO 40	12.069 × 2.373 × 2.405	3850	26 630	67.80

Transit time is the time a shipment takes to move between its origin to its destination. It is a random variable influenced by weather and traffic conditions. A comparison between the average transit times of the five basic modes is provided in Figure 2.4 One must bear in mind that some modes (e.g. air) have to be used jointly with other modes (e.g. truck) to provide door-to-door transportation. The standard deviation and the coefficient of variation (standard deviation over average transit time) of the transit time are two measures of the reliability of a transportation service (see Table 2.2).

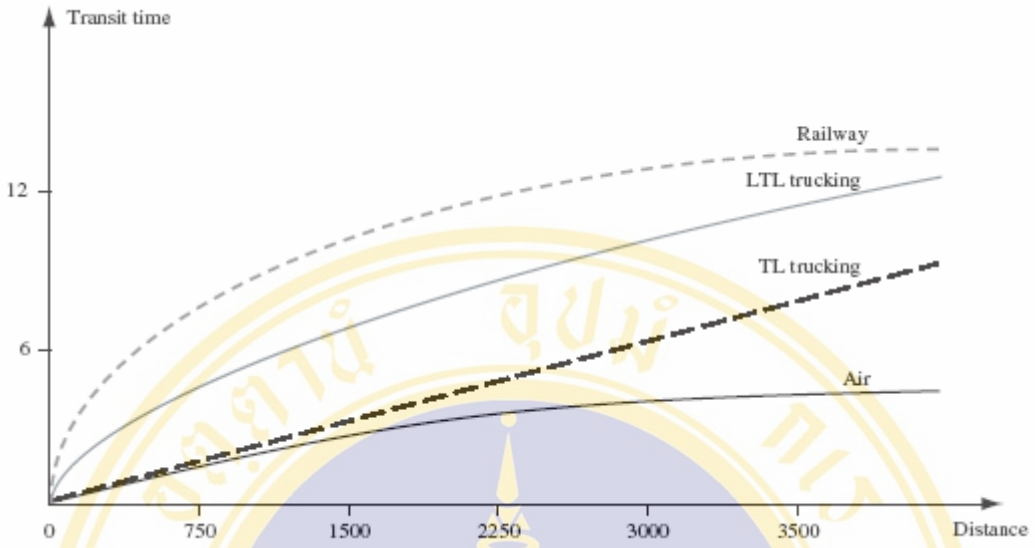

Figure 2.4 Average transit time (in days) as a function of distance (in kilometers) between origin and destination. [16]

Table 2.2 Reliability of the five basic modes of transportation expressed by the standard deviation and the coefficient of variation of the transit time [16]

Ranking	Standard deviation	Coefficient of variation
1	Pipeline	Pipeline
2	Airplane	Airplane
3	Truck	Train
4	Train	Truck
5	Ship	Ship

1. Rail Rail transportation is inexpensive (especially for long-distance movements), relatively slow and quite unreliable. As a result, the railroad is a slow mover of raw materials (coal, chemicals, etc.) and of low-value finished products (paper, tinned food, etc.). This is due mainly to three reasons:

- convoys transporting freight have low priority compared to trains transporting passengers;
- direct train connections are quite rare;
- a convoy must include tens of cars in order to be worth operating.

2. Truck Trucks are used mainly for moving semi-finished and finished products. Road transportation can be truckload (TL) or less-than-truckload (LTL). A TL service moves a full load directly from its origin to its destination in a single trip (see Figure 2.5). If shipments add up to much less than the vehicle capacity (LTL loads), it is more convenient to resort to several trucking services in conjunction with consolidation terminals rather than use direct shipments (see Figure 2.6). As a result, LTL trucking is slower than TL trucking.

Figure 2.5 Example of TL transportation. [16]

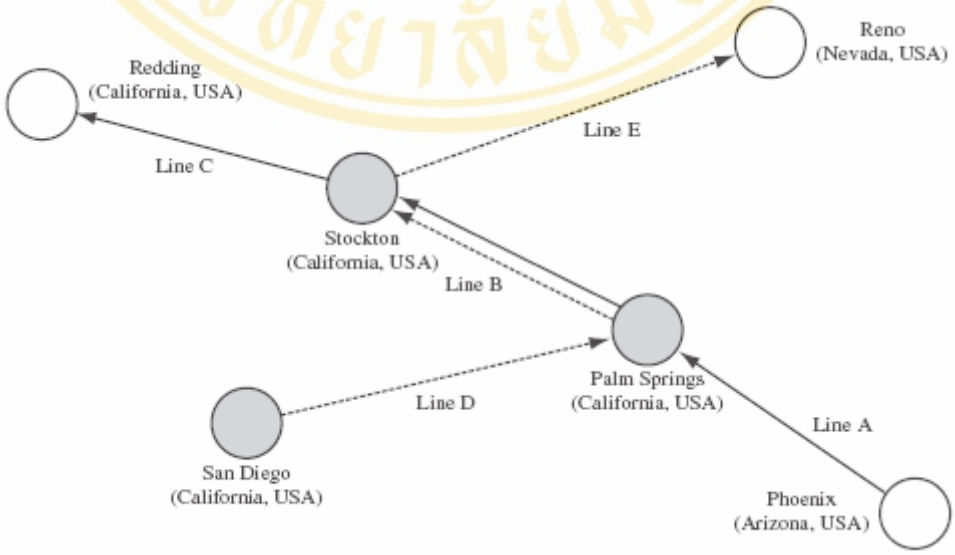

Figure 2.6 Example of LTL transportation. [16]

3. Air Air transportation is often used along with road transportation in order to provide door-to-door services. While air transportation is in principle very fast, it is slowed down in practice by freight handling at airports. Consequently, air transportation is not competitive for short and medium haul shipments. In contrast, it is quite popular for the transportation of high-value products over long distances.

4. Intermodal Transportation Using more than one mode of transportation can lead to transportation services having a reasonable trade-off between cost and transit time. Although there are in principle several combinations of the five basic modes of transportation, in practice only a few of them turn out to be convenient. The most frequent intermodal services are air–truck (birdyback) transportation, train–truck (piggyback) transportation, ship–truck (fishyback) transportation. Containers are the most common load units in intermodal transportation and can be moved in two ways:

- containers are loaded on a truck and the truck is then loaded onto a train, a ship or an airplane (trailer on flatcar);
- containers are loaded directly on a train, a ship or an airplane (container on flatcar).

2.4 Logistics and Information Technology [15], [20], [21], [22]

2.4.1 General Types of Information Management Systems [23]

Professor Steven Alter has identified six different types of information systems that are applicable to every business function. These six categories, summarized in table 2.3, form the basis of the discussion in this section.

Office Automation System

Office automation systems provide effective ways to process personal and organizational business data, to perform calculations, and to create documents.[4] Included in office automation systems are general software packages –world processing, spreadsheet, presentation, and database management applications- that most students probably learned n an introductory computer class.

The most relevant general software package for logisticians is the spreadsheet. Whereas early spreadsheet programs for personal computers were little more than

speedy calculators, today's spreadsheets have a multitude of capabilities that allow managers to solve a variety of business problems relatively quickly and inexpensively.

Indeed, logistics spreadsheet applications into the early 1990s tended to reflect the rather limited capabilities of the existing software packages. For example, representative topics included economic order quantity (EOQ) calculations, warehouse sizing, transportation modal and carrier decisions, production planning, and center of gravity location decisions, among others.[5] As we moved through the 1990s, increased spreadsheet capabilities allowed organizations to analyze issues that had traditionally been solved by specially designed computer programs. In this vein, the classic issue of transportation cost minimization –transporting products form multiple sources to multiple destinations, at a minimum transportation cost- could be analyzed using spreadsheet software. More recently, spreadsheets have been used to determine the optimal number of warehouse locations for key customers of a regional chemical distributor.

Communication System

Communication systems help various stakeholders – employees, suppliers, and customers- work together by interacting and sharing information in many different forms. Form a logistical perspective, the importance of well-defined and well executed communication systems was highlighted by the events of September 11, 2001, especially for companies that use or provide airfreight services. Because of the total shutdown of the U.S. aviation system for several days following the terrorist attacks, many air shipments were diverted onto trucks, thus delaying many shipment deliveries. As such, airfreight providers such as FedEx worked feverishly to inform customers when their shipments would be arriving. [24]

Table 2.3 General Types of Information Management Systems [15]

System Type	Logistics Examples
Office Automation System: provides effective ways to process personal and organizational, and to create documents	Spreadsheet applications to calculate optimal order quantities, facility location, transport cost minimization, among others
Communication System: helps people work together by interacting and sharing information in many different forms	Virtual meetings via computer technology Voice-based order picking
Transaction Processing System (TPS): collects and stores information about transactions; controls some aspects of transactions	Electronic data interchange Automatic identification technologies such as bar codes Point-of-sale systems
Management Information System (MIS) and Executive Information System (EIS): converts TPS data into information for monitoring performance and managing an organization; provides executives information in a readily accessible format	Logistics information system
Decision Support System (DSS): helps people make decisions by providing information, models, or analysis tools	Simulation Application-specific software such as warehouse management systems Data mining
Enterprise System: creates and maintains consistent data processing methods and an integrated database across multiple business functions	Logistics modules of enterprise resource planning systems

Many advances in telecommunication technology –such as fax machines, electronic mail, cellular phones, among others- have occurred in the not-too-distant past. As recently as the 1990s, some of these technologies were considered workplace

"luxuries." Today, by contrast, many of these technologies are essential for enabling the contemporary logistician to perform his or her job.

For example, companies with global logistics operations are now using technology to assist with virtual meetings in which employees located around the world can simultaneously "attend" a particular meeting. One manager can lead the meeting with information transmitted to all attendees via computer, and each attendee has the opportunity to contribute individual insights through online feedback.

Moreover, the effectiveness and efficiency of logistics communications continues to be enhanced with evolutions in telecommunication technology. For instance, an emerging technology as this book is being prepared involves the ability for managers to access e-mail through cell phones. However, in the not-too-distant future, it may be possible to conduct video conferencing through cell phones, thus reducing the maze of communication difficulties that confront any global logistics operation.

Voice-based order picking represents another example of how an organizational communication system can improve logistical effectiveness and efficiency. Early voice-based picking systems were characterized by high adoption costs, poor voice quality, and systems that were easily disrupted by other noises. Contemporary voice-based systems, by contrast, are less costly, more powerful, have better voice quality, and are less cumbersome for workers to use. Companies that have adopted newer-generation voice-based technology have reported productivity increases in terms of lower employee turnover and higher pick accuracy.

Transaction Processing System (TPS)

- **A Transaction Processing System** collects and stores information about transactions and may also control some aspects of transactions. The primary objective of a TPS is the efficient processing of transactions, and to this end, organizations can choose to do batch or real-time processing. With batch processing, data are collected and stored for processing at a later time, with the later time perhaps being based on schedule (e.g., process every 6 hours) or volume (e.g. process once 25 transactions have accumulated) considerations. Real-time processing, not surprisingly, means that transactions are processed as they are received. Although batch processing might be

somewhat out of step with the contemporary emphasis on speed and time reduction, it can be quite effective when real-time processing is not necessary. Moreover, in comparison with real-time systems, batch processing tends to be less costly and easier for employees to learn.

A prominent example of a logistics-related TPS is electronic data interchange (EDI), the computer-to-computer transmission of business data in a structured format. Since EDI provides for the seamless transmission of data across companies (assuming technological compatibility), it can facilitate the integration of, and coordination between, supply-chain participants. Thus, firms with strong EDI links to both suppliers and customers have s substantial advantage over supply-chain arrangements without good EDI implementations. Common uses of EDI include invoicing, purchase orders, pricing, advanced shipment notices, electronic funds transfer, and bill payment.

EDI has a number of benefits, including reductions in document preparation and processing time, inventory carrying costs, personnel costs, information float shipping EDI may lead to increases in cash flow, billing accuracy, productivity, and customer satisfaction. Potential drawbacks to EDI include a lack of awareness of its benefits, high setup costs, lack of standard formats, and incompatibility of computer hardware and software.

These drawbacks, and the dramatic rise of the Internet, have resulted in speculation that EDI is an obsolete technology and unlikely to be relevant to logistics and supply-chain management in the future. In reality, many supply -chain professionals argue that EDI will continue to play a key role in logistics and supply-chain management, in part because it reduces costs associated with inventory, order management, and transportation. Moreover, the internet may actually be a complement to, rather than substitute for, EDI, in that current users indicate their future EDI transactions are likely to involve a combination of the more traditional value-added networks and the Internet- as opposed to solely using the Internet for EDI transactions.

Widespread global usage of EDI in the foreseeable future may be limited by several factors. First, approximately two-thirds of the world's population lacks access to telephones; as a result, EDI will be used primarily in developed countries. Moreover, EDI standards are not uniform across countries, and the situation has been complicated in recent years with the growth of the Internet and XML (extensible

markup language). Importantly, however, the two most prominent global EDI standards – ANSI and EDIFACT – have agreed to work with the Electronic Business XML initiative "to establish a set of core components for global business-process integration." [25]

- **Automatic Identification Technologies,** another type of logistics-related TPS, include optical character recognition (which can read letters, words, and numbers), machine vision (which can scan, inspect, and interpret what it views), voice-data entry (which can record and interpret a human voice), radio-frequency identification (which is used where there is no line of sight between scanner and label), and magnetic strips.

Nevertheless, bar code scanners currently remain the most popular automatic identification system in use. They work to integrate suppliers and customers along the supply chain because all parties read the same labels; in addition, the transfer of goods between parties can be recorded by simple electronic means. Tranditionally, laser scanners have been used to read bar codes. The scanners record inventory data and may be directly attached to a computer that uses the data to adjust inventory records and track product movement.

Numerous advances have been made in recent years in bar code technology. For example, the traditional 12-digit universal product code (UPC), while well suited to products in packaged units (e.g., box of cereal, DVD player), is somewhat lacking with respect to products that are sold by weight (e.g., hamburger, fish, deli items). Because these products typically need more detail than can be provided by the 12-digit UPC-modified bar code symbology, in the form Reduced Space Symbology (RSS), has been developed. The RSS allows for more data to be included on the bar code. [17] The different advances in bar code technology often require a generation of bar code readers beyond the laser scanner. So-called "smart cameras" are an especially popular choice in the early years of the twenty-first century because of their ability to read traditional as well as two-dimensional bar codes-something that cannot be done by laser scanners.

Automatic identification systems are an essential component in point-of-safe (POS) systems. Operationally, POS systems involve scanning UPC labels, either by

passing the product over an optical scanner or recording it with a handheld scanner. The UPC is read and recorded into a database that supplies information such as the product's price, applicable taxes, whether food stamps can be used, and so on. The specific price of each product and its description are also flashed on a monitor screen positioned near the counter. When all the products have been recorded, the customer receives verification that lists the products purchased, the price of each article, and the total bill.

Ultimately, the idea behind POS systems is to provide data to guide and enhance managerial decision making, as illustrated by the variety of ways that POS data can be used in the restaurant industry. One restaurant with multiple dining areas, for example, uses POS data to identify potential no-shows by analyzing customers who have reserved tables in the same evening for two (or more) of the dining areas. Another restaurant implemented a POS system that resulted in a substantial improvement in order fulfillment; the POS system virtually eliminated the largest cause of mistakes: handwritten orders.

Management Information System (MIS) and Executive Information System (EIS)

These systems convert TPS data into information for monitoring performance and managing an organization, with the objective of providing managers and executives with the information they really need. To this end, a logistics information system (LIS) can be defined as the people, equipment, and procedures to gather, sort, analyze, evaluate, and distribute needed, timely, and accurate information to logistics decision makers.

An LIS begins with a logistics manager requesting information and ends with the manager receiving regular and customized reports. In order for logistics managers to receive needed information, it's important that they be fairly specific when submitting requests. For example, if a logistics manager wants information about a specific warehouse or distribution center, then she or he needs to request information on, say, "the Chicago warehouse" rather than information on "corporate warehouses".

Timely information would appear to be incumbent upon the effectiveness and efficiency of a company's particular LIS, and timely information can encompass

several dimensions. On the one hand, timely can refer to the up-to-date status of information, which can be influenced by a company's collection and analysis procedures. Information collection should emphasize both internal and external sources; unfortunately, internal sources of logistics information are not always as plentiful as desired. Indeed, research into the business value attributable to logistics discovered that "logistics measurement is happening much less frequently than one might imagine." External sources focus on information from outside the company and include information about customers, competitors, and suppliers, along with information about economic, technological, political, legal, and sociocultural environments.

With respect to information analyses, the POS systems described in the previous section are excellent for collecting data –but the data also must be analyzed to be of any value to managers. Consider the following quote from a restaurant consultant: "When restaurants come to us with financial problems, the first thing I ask to see is the data. When they show me a year's worth of numbers, many times no one has really looked at it (authors' emphasis). The following section on decision support systems provides more about information analyses.

Timely also can refer to how quickly managers receive the information requested; this is impacted by each company's retrieval and dissemination procedures. A manager's ability to quickly receive information can be impacted by computer hardware and software, and faster and more powerful microchips have helped to reduce retrieval and dissemination times. In a similar vein, timely dissemination of information has been facilitated by advances in personal digital assistants and cell phones. Alternatively, retrieval and dissemination can be slowed by hardware and software glitches, including power outages, system crashes, and computer viruses.

Accurate information may also reflect the effectiveness and efficiency of a company's logistics information system. As such, an LIS must be concerned with the nature and quality of the relevant data; for instance, while the Internet can provide access to tremendous amounts of external information at a very low cost, the validity of some Internet information is suspect. Keep in mind the GIGO-garbage in/garage out- principle: Information that is erroneous, misrepresented, and/or unclear will likely result in poor decisions by logisticians.

Decision Support Systems (DSS)

Decision Support Systems help managers make decisions by providing information, models, or analysis tools, and they can be widely applied and used by logisticians. Several of the more prominent logistics-related DSS techniques are discussed in the following paragraphs.

Simulation involves a computer model that is a series of mathematical relationships, often expressed as a series of linear equations. Simulation reliability is achieved by making the model as akin to the real world as possible. Such factors as transport mode availability, transportation costs, location of vendors, warehouse locations, customer locations, customer service requirements, and plant locations must all be accurately reflected in the model.

The primary advantage of simulation is that it enables the firm to test the feasibility of proposed changes at relatively little expense. In addition, it prevents firms form experiencing the public embarrassment of making a major change in their logistics system that might result in a deterioration of customer service levels or and increase in total operating expense.

Many logistics system simulation models exist, and they differ according to mathematical approach, computer capacity needed, and amount of data input. Many of the programs have as their initial focus the improvement of customer service. A second focus is to integrate inbound and outbound logistics functions. Although simulation can be a powerful analytic tool, a poorly constructed simulation involving bad data or inaccurate assumptions about the relationships among variables can deliver suboptimal or unworkable solutions to logistics problems. Insights gleaned from simulation experts provide a list of what not to do:

1. Performing a simulation without a clear definition of the objectives
2. Believing that the model itself can compensate for poor data collection
3. Lacking an understanding of statistical processes
4. Failing to do order profiling
5. Ignoring the effects of randomness
6. Incorporating randomness inappropriately
7. Failing to consider down time

8. Making illogical assumptions
9. Failing to question the results
10. Failing to recognize that simulations is a study tool[2]

Artificial Intelligence (AI) is a branch of computer science that studies the computational requirements for tasks such as perception, reasoning, and learning, and develops systems to perform those tasks. AI is a highly sophisticated use of the computer in which it can be programmed to "think" as a trained, skilled human would in specific situations, and AI encompasses a number of different areas such as expert systems, fuzzy logic, and neural networks. Anyone who is familiar with computers knows computers can be programmed to respond to different questions, often by asking more definitive questions. In theory, one needs to know the questions to ask, when and how to ask them, and also the various relationships among all possible answer-a difficult but not impossible task.

Seminal AI research in logistics involved the development of AI system for managing certain parts inventories of the United Sates Air Force. This research utilized eight human experts to develop and develop and critique a long list of decision rules that a computer model had to follow to answer questions regarding inventory stocking levels. The magnitude of the task is illustrated by the fact that the final expert a system that was devised contained nearly 450 separate decisions rules. One of the more popular recent applications of AI in logistics is focused on select issues with highway traffic, to include predicting urban traffic flows and managing traffic congestion.

A third type of DSS is what can be broadly labeled as application-specific software, which has been developed to help managers deal with specific logistics functions or activities. This software can focus on either planning or operational (execution) capabilities and includes, but is not limited to, supply-chain management (SCM) software, transportation management system (TMS), and warehouse management systems (WMS).

Although growth in the global economy has been slow in the early part of the twenty-first century, rapid growth (in excess of 10 percent per annum) has occurred in the usage of application –specific software in logistics, particularly among those

packages with an operational (execution) emphasis.[29] Some of the more prominent vendors of application-specific software include i2 Technologies, SAP, Manugistics, and Manhattan Associates.

Data Mining, which can be defined as the application of mathematical tools to large bodies of data in order to extract correlations and rules, is a DSS technique that has grown in popularity in recent years. Data mining utilizes sophisticated quantitative techniques to find "hidden" patterns in large volumes of data; hopefully, these patterns will allow managers to improve their decision making abilities. Although data mining has been characterized as a "fishing expedition" of sorts –in the sense of applying sophisticated quantitative techniques merely to find relationships, whether meaningful or not- data mining, in reality, should follow a well-defined methodology.

Data mining has experienced widespread applications in terms of customer satisfaction and customer relationship management. In this vein, logistical benefits form data mining canaries when supply and demand data demand data are analyzed together, rather than separately. Analysis f a grocery chain's frequent shopper programs, for example, might reveal that several slower-selling items are consistently purchased by high-spending households. Rather than eliminating these slow-moving items, stores might continue to stock limited quantities of them deference to the high-spending households.

Enterprise System

Enterprise systems, the final general type of information management system to be discussed, create and maintain consistent data processing methods and an integrated database across multiple business functions. The most prominent example of enterprise systems are probably **enterprise resource planning (ERP) systems**, with Baan, J.D. Edwards, Oracle, PeopleSoft, and SAP considered as the leading providers of these systems. The attractiveness of ERP systems comes from their potential for lower costs as well as increased productivity and customer satisfaction.

Although contemporary ERP systems encompass a firmwide perspective, their origins can be traced back to logistics and manufacturing in the form of inventory

control and materials requirement planning programs. Unlike these earlier programs, today's ERP systems (conceptually, at least) provide and opportunity for all functional areas within a firm to access and analyze an common database-which might not have been previously possible because certain data was proprietary to a particular functional area.

Theoretically, the goal of ERP systems is enterprisewide coordination of relevant business processed. However, this is a task of monumental proportions, so most contemporary ERP systems focus on achieving three objectives: integrating financial data, standardizing manufacturing processes, and standardizing human resource data.

These three objectives tend to reflect the specific competencies of important ERP providers; for example, PeopleSoft's historical expertise (perhaps not surprisingly, given its name) has been in human resource management issues.

One of the most frequently mentioned shortcomings of ERP systems involves the costs of installation. It's common knowledge that ERP software is relatively expensive; for many years, ERP systems were only affordable to high-revenue organizations (e.g., Fortune 500). However, the software is only one part of ERP implementation costs. For example, the vast amounts of data necessary for ERP systems may necessitate new or upgraded computer hardware. Other hidden or frequently overlooked costs of ERP implementation include employee training, data conversion (converting existing data into a usable and consistent format), and integrating and testing a new system.

A second shortcoming is that implementation of ERP systems can be a very time-consuming process. Indeed, many of the hidden costs of ERP implementation mentioned in the previous paragraph are the result of hidden time associated with ERP implementation. Foe instance, employee training, data conversion, and integrating and testing the new system all require time beyond the installation of the ERP software itself. A general rule of thumb is that actual time to implement ERP systems may range from two to four times longer than the time period specified by the ERP vendor.

The preceding discussion on costs and time suggests that some ERP implementations may not go as smoothly as planned. Moreover, glitches in ERP implementation often have led to multiple logistical problems. For example, one industrial supplier's botched ERP implementation resulted in its having to use manual

documentation for customer shipments for several months after installation. To compound matters, this company was unable to bill its customers- and thus collect revenues- for approximately a four-mouth period. In a similar fashion, ERP implementation at a large chemical company resulted in over twice as much inventory and poorer on-time delivery performance when compare to pre-ERP times-and the company continues to struggle to achieve pre-ERP inventory and delivery performance.

The logistical capabilities of today's ERP systems might be characterized as uneven. Because the core competencies of key ERP providers have tended to be in areas outside of logistic (such as PeopleSoft's human resources focus), some early ERP programs did not offer logistics modules. While logistics modules are now available with some of the more prominent ERP programs (such as SAP R/3), these modules may not always be installed when individual companies adopt a particular ERP system.

Some organizations choose to address the logistical deficiencies of ERP systems by linking or attaching specialized logistics software such as WMS and/or TMS to the chosen ERP system. This is not always a smooth and seamless process; it can require large amounts of computer code and can be both costly and time-consuming.

2.4.2 Electronic Commerce and Logistics

Electronic commerce has been defined as any form of economic activity that can be conducted via electronic connections. Although electronic connections can include phone and telegraph lines, electronic communications are most commonly associated with computer-to-computer connections, such as EDI and the Internet. This section focuses on electronic connections via the Internet, in part because of suggestions that the Internet will because the only medium for electronic transactions within the next decade. Certainly the Internet can influence logistical strategies and tactics with respect to both business-to-consumer (B2C) and business-to-business (B2B) transactions.

The Internet has had profound impacts upon individual logistics functions as well as upon channel design. With respect to the former, the Internet offers the potential for both cost reduction and service improvement across and within logistics

functions. Research by Professor Lancioni and colleagues found transportation and order management to be the two logistics functions with the highest amount of Internet usage. Within transportation, the Internet can be used to monitor the on-time performance of carriers and to monitor claims; the Internet's use within order management includes customer order placement and providing customer price quotes [26]. These are just a few of the ways in which the Internet can be used for transportation and order management. Numerous examples also demonstrate how the Internet can be utilized in other logistics functions.

As for channel design, the Internet slows companies to offer an alternate distribution channel to already existing channels. In some cases, this alternate channel is direct (i.e., no intermediaries between the producer and final customer) in nature because the final customer orders directly from the producer rather than through an intermediary. The logistical challenges of direct channels can be quite different from those of indirect channels; for example, individual customers are likely to order in much smaller quantities than are intermediaries. These smaller quantities require different packaging, materials handling, and transportation capabilities than do larger quantities.

Logistical Intermediaries. While the Internet is thought to result in channel disintermediation -that is, the removal of intermediaries between producer and consumer – it has spawned several new types of logistical intermediaries. These intermediaries are particularly prevalent in B2B transactions. Two of the more prominent examples are logistics exchanges and application service providers.

At the present time, there does not appear to be a consensus definition of what is meant by a logistics exchange. However, there is general agreement that logistics exchanges are online portals offering services in at least one of four categories: (1) enhancing procurement services though posting and sharing general information; (2) matching shippers and carriers; (3) executing relevant transactions; and (4) helping companies transact with their partners.[42] National Transportation Exchange (NTE) is often credited as being the first online logistics exchange; it started in the mid-1990s as an auction site where shippers could find carriers for their freight. Other logistics exchanges, to name just a few, include Celarix, Logistics.com, and Nistevo.

Even though there is general agreement that the long-term future for logistics exchanges is bright, there has been a noticeable contraction in their ranks during the early years of the twenty-first century. This contraction among logistics exchanger, which is expected to continue, takes several forms. For example, some logistics exchanges ceased operations due to lack of customers, lack of sufficient funding, or poorly thought out value propositions. A second method of contraction involves merger or acquisition; for example, in late 2002 Manhattan Associates announced its intentions to acquire Logistics.com.

As is the case with logistics exchanges, the relative newness of application service providers (ASP) has yet to generate a consensus definition of the concept. In this text, an ASP refers to a company that offers individuals or enterprises access over the Internet to applications and related services that would otherwise have to be located in their own personal or enterprise computers. ASPs allow individuals or enterprises to rent or lease particular software applications for a particular period of time, thus avoiding capital expenditures for purchasing computer hardware, software, and other necessities. A number of logistics exchanges offer their services through applications service providers.

ASPs offer numerous advantages to potential customers. As pointed out in the previous paragraph, customers avoid capital investment, which should speed up their return on investment. In addition, many of the service agreements specify that ASPs provide software applications, Web servers, and around-the –clock customer support. Importantly, software upgrades are the ASP's responsibility, meaning that customers should have access to the latest software at a relatively low cost.

Although ASPs appear to be quite attractive, particularly from a financial perspective, they have potential drawbacks. For example, because the Internet is the primary transaction medium, sensitive or proprietary data might not be as secure as would be the case wit other mediums. Another potential problem is that response time may be slower if there is heavy Internet volume. Moreover, because of the growing number of ASPs, it is important for customers to use those ASPs that will best serve their needs.

E-Fulfillment

The growth of electronic commerce has spawned a number of associated concepts, with one of the most important for our purposes being **e-fulfillment**. Like many other concepts related to electronic commerce, a myriad of definitions are currently in use for e-fulfillment. Recent capstone logistics classes taught by one of this text's authors have come up with nearly 25 distinct definitions, ranging from providing customers with a high level of service to satisfy their needs to coordinated inbound and outbound logistics functions that facilitate the management and delivery of customer orders placed online. The latter definition guides this text's discussion of e-fulfillment.

The importance of e-fulfillment was highlighted, in rather unfortunate fashion, by some egregious retailer failures during the 1999 holiday season. A number of online retailers proved that, while they were quite good at stimulating demand and receiving orders for certain products, they were far less adept at delivering the orders in a timely fashion. Orders that were supposed to be delivered before Hanukkah or Christmas arrived weeks or months late –if they arrived at all. The promises made versus actual performance disconnect of some online companies during that season was so pronounced that several ending up paying fines to the U.S Federal Trade Commission

A postmortem of the 1999 holiday season indicated two primary problems. Fist, a number of "pure" dot-com companies (i.e., those without alternate distribution channels) had limited knowledge of logistics and quickly became overwhelmed with having to satisfy customer demands once orders were received. Second, some of the "hybrid" companies (i.e., those with multiple retailing channels) had difficulties adapting their logistics systems to fit the nuances of online commerce. These companies were attempting to apply one-size-first- all logistics strategies and tactics (or, mass logistics) to a situation that requires different types of logistics strategies and tactics.

One key decision concerns how e-fulfillment activities and practices will be integrated with the activities and practices of traditional fulfillment. Should an organization modify existing operating procedures? Should it expand existing facilities to incorporate e-fulfillment areas? Should it design and build a facility solely

dedicated to e-fulfillment? Should it use an external e-fulfillment specialist? Should it require suppliers to ship orders directly to customers? As noted previously, there is no single right or wrong answer, but it's important for an organization to carefully weigh the advantages and disadvantages f each alternative.

The logistics of both e-fulfillment and traditional fulfillment contain similarities. Foe example, many logistical functions and activities –such as transportation, warehousing, materials handling, and order management- occur in both e-fulfillment and traditional fulfillment. Likewise, both may use the same type of equipment and materials, such as bar coding and warehouse management systems.

Alternatively, powerful differences exist between e-fulfillment and traditional fulfillment with respect to the execution of logistics functions and activities. For example, the orders associated with e-fulfillment tend to be more plentiful and in much smaller quantities than those associated with traditional fulfillment. As such, e-fulfillment requires an order management system capable of handing high volumes of orders, and it's also essential that the information management system be capable of correctly transmitting each order so that it can be filled in a timely fashion.

Some experts believe that two of the primary logistical impacts of e-fulfillment involve order picking and packaging. Because of smaller order quantities, e-fulfillment is characterized by open-case, rather than full-case, picking; open-case picking is facilitated by materials handling equipment, such as totes and push carts. Moreover, open-case picking necessitates that products be slotted (place) in locations that facilitate picking effectiveness and efficiency. Not surprisingly, e-fulfillment's smaller order quantities have important packaging implications as well, in the sense that companies need containers –small cartons, envelopes, bags- that are well suited to holding small quantities of product.

Two other key logistical considerations for e-fulfillment involve transportation and returned orders. The smaller order quantities occasioned by e-commerce tend to favor transport companies with extensive delivery networks and expertise in parcel shipments. This, in turn, suggests that outbound shipments tend to be picked up at a loading dock by small-capacity vehicles, such as delivery vans.

While returned orders are an issue in all types of retailing, the return rates associated with e-commerce tend to be much higher than with other types of retailing;

one estimate suggests 10 percent return rates for traditional forms of retailing, compared to approximately 30 percent for online purchases. Because many of these returns are form individual customers, not businesses or organizations, companies engaged in e-commerce should attempt to make the return process as painless as possible, in part because many individual customers have limited, if any, knowledge about reverse logistics. As such, when online customers receive their orders, the might also receive information on how to return the order, return labeling, and a return container, such as an envelope or bag.

2.5 Third - Party Logistics (3PLs)

Third – Party Logistics is simply the use of an outside company to perform all part of the firm's material management and product distribution function. 3PL relationships are typically more complex than traditional logistics supplier relationship.

2.5.1 Types of 3PL Providers [14], [27], [28]

Although most 3PL firms promote themselves as providers of a comprehensive range of logistics services, it is useful to categorize them in one of several ways. Included are transportation – based, warehouse/ distribution – based, forwarder – based, shipper/ management – based, financial – based and information – based firms. Each of these is discussed briefly in the following paragraphs.

Transportation Based.

Included among the transportation – based suppliers are firm such as Schneider Logistics, FedEx Logistics and UPS Logistics, most of which are subsidiaries or major division of large transportation firms. Some of the services provided by these firms are leveraged, in that they utilize the assets of other companies; and some are non-leveraged, where the principal emphasis is on the utilizing the transportation – based assets of parent organization. In all instances, these firms extend beyond the transportation activity to provide a more comprehensive set of logistics offerings.

In early 2000, Transplace was formed through the merger of the logistics business unit of several of the largest publicly held truckload carriers in the United States. While this new company is transportation based in that major elements of its

corporate heritage do involve the commercial transportation industry, its approaches to operations, management and planning significantly utilize and leverage information technologies. For this reason, a more comprehensive description of this company is found later in this section under the topic of information – based providers.

Warehouse/ Distribution Based.

Traditionally, most warehouse/ distribution – based logistics suppliers have been in the public or contract warehousing business and have expanded into a broader range of logistics services. Examples of such firm include DSC Logistics, USCO and Exel. The latter firm, Exel has a much broader range of expertise, considering the 2000 merger of the former Exel Logistics (predominantly a warehousing/ distribution – based firm) and MSAS (having strength in the forwarding and ocean shipping areas).

Based on their traditional orientation, these firms have already been involved in logistics activities such as inventory management, warehousing, distribution and so on. Experience has indicated that these facility – based operators have found the transition to integrated logistics services to be less complex than have the transportation providers.

This category also should include a number of 3PL firms that have emerged from larger corporate logistics organizations. Prominent among these are Caterpillar Logistics Services (Caterpillar, Inc.), Intral Corporation (Gillette) and IBM (IBM Corporation). These providers have significant experience in managing the logistics operations of such services to external customers.

Forwarder Based.

This category include companies, such as Kuehne & Nagel, Fritz, C. H. Robinson and Hub Group, that have extended their middleman roles as forwarder and/ or brokers into the broader range of 3PL services. Essentially, these firms are non – asset owners, are very independent, and deal with a wide range of suppliers of logistics services. They have proven quite capable at putting together packages of logistics services that meet customer needs.

Financial Based.

This category of 3PL provider includes firms such as Cass Information Systems (a division of Cass Commercial Corporation), CTC (Commercial Traffic Corporation), GE Information Services (General Electric) and FleetBoston Financial Corporation. These firms provide services such as fright payment and auditing; cost accounting and control; and logistics management tools for monitoring, booking, tracking, tracing and managing inventory.

Information Based.

In the present, there existed significant growth and development of internet – based, business – to – business, electronic markets for transportation and logistics services. Since these resources effectively represent alternative sources for those in need of purchasing transportation and logistics services, they may be thought of as a newer, innovative type of third – party provider. Example of two firms that would be representative of this category follow:

- **Transplace** is an Internet – based company that represents the merger of the 3PL business unit from six of the largest publicly held truckload carriers in the United States. The founding carriers are Covenant Transport, Inc.; J.B. Hunt Transport Service, Inc.; M.S. Carriers, Inc. (since merged with Swift Transportation Co., Inc.); Swift Transportation Co., Inc.; U.S. Xpress Enterprises, Inc.; and Werner Enterprises, Inc. Transplace offers a Web – enabled platform to bring together shippers and carriers worldwide to collaborate on their transportation logistics planning and execution in the most efficient and effective manner.

- **Nistevo** is a leading provider of an Internet – based, collaborative logistics network. Nistevo's collaborative network is an internet service that allows shippers and carriers to improve profitability and performance. Among the results experienced by both shippers and carriers through use of Nistevo's capabilities are : improved operating performance through on – line, real - time network visibility; management of the entire procurement, service and delivery cycle from a single application ; and improve contract and relationship management.

2.5.2 3PL Issues and Requirements [27], [29], [30]

A third – party logistics contract is typically a major and complex business decision. Other than the pros and cons listed above, there are many considerations that are critical in deciding whether an agreement should be entered into a particular 3PL provider.

1. Know Your Own Costs.

Among the most basic issues to consider in selecting a 3PL provider is to know your own costs so they can be compared with the cost of using an outsourcing firm. Often it is necessary to use activity – based costing techniques, which involve tracing overhead and direct costs to specific products and services.

2. Customer Orientation of the 3PL.

Of course, it is not enough to select a provider based on cost alone. Many of the advantages listed above involve intangibles such as flexibility. Therefore, the strategic logistics plan of the company and how a 3PL provider would fit in to this plan must be considered carefully. A 1995 survey of 3PL provider [31] identified the following characteristics as most critical to the success of a 3PL agreement. The most important was the customer orientation of the provider; that is, the value of the 3PL relationship is directly related to the ability of the provider to understand the needs of the hiring firm and to adapt its services to the special requirements of that firm. The second most important factor was reliability. The flexibility of the provider, or its ability to react to the changing needs of the hiring firm and the needs of that firm's customers, was third. Significantly further down the list were cost savings.

3. Specialization of the 3PL.

When choosing of the potential 3PL provider, some experts suggest that companies should consider firms whose roots lie in the particular area of logistics that is the most relevant to the logistics requirements in question. For example, Roadway Logistics, Menlo Logistics, and Yellow Logistics evolved from major LTL carriers; Exel Logistics, GATX, and USCO started as warehouse managers; and UPS and Federal Express have expertise in the timely handling of small packages. Some firms have even more specialized requirements, and these should be considered carefully when choosing a 3PL partner [32]. Sometimes, a firm can use one of its trusted core

carriers as its third – party logistics provider. For example, Schneider National, a firm that already worked closely with Baxter Healthcare Corp., recently agreed to take over Baxter's dedicated fleet routes [33].

4. Asset – Owning versus Non – Asset – Owning 3PL

There are also advantages to utilizing an asset – owning versus a non – asset – owning 3PL company. Asset – owning companies have significant size, access to human resources, a large customer base, economies of scope and scale, and systems in place, but they may tend to favor their own divisions in awarding work, to be bureaucratic, and to have a long decision – making cycle. Non – asset – owning companies may be more flexible and able to tailor services and have the freedom to mix and match providers. They also may have low overhead costs and specialized industry expertise at the same time, but limited resources and lower bargaining power.

2.5.3 Advantages of Logistics Out – Sourcing [34]

Since the late 1970s the quality of logistics service providers has improved significantly and the range of services they offer has greatly expanded. Many factors have encouraged manufacturers, wholesalers, and retailers to out – source some or all of their logistics activities to logistics services providers. These include:

1. The standards of logistics service providers have risen and their efficiency has improved greatly. The specialist management and knowledge – based skills and operational experience offered by third – party operators may result in improved services at lower costs.

2. Gaining access to the latest technology and equipment employed by the third – party provider.

3. Financial conditions in the 1980s encouraged firm to concentrate capital investment in their core competencies and to pay for ancillary activities, such as distribution, on the current cost basis.

4. There is one less business variable to worry about. By subcontracting apportion of the business and ensuring that acceptable standards are built into the contract, senior management can focus their attention on their core competencies.

5. There are potential cost reductions, for example:

- shared use many give butter utilization of vehicles and warehouses, leading to lower unit costs due to the consolidation of different customer's demand;
- the specialization of the contractor may allow volume buying of vehicles, warehouses, and mechanical handling equipment and systems;
- the labor costs of the third – party operator may be lower; and
- third – party companies may exist on the lower return on capital than that expected of major manufacturing and retailing companies.

6. There is increased flexibility in terms of short-term changes in locations, fleet mix, warehouse types, and staffing levels. This allows retailers and manufacturers to be more responsive as market or customer need change. (e.g., during seasonal peaks).
7. The need for investment in new equipment and premises is avoided.
8. There has been a proliferation of regulations relating to vehicle operations and product handling.
9. There has been a rapid rate of technological change.
10. Internal industrial relations problems can be overcome.
11. There are external back-up systems in the event of strikes.

The larger grocery retailers in the U.K. were among the first to realize the benefits of out- sourcing part of their logistics activities. The growth of centralization during the 1970s and 1980s stimulated the demand for third-party logistics services in the sector and established many of the logistics service providers as major companies in their own right. The close, long-standing relationships that have developed between the retailers and the logistics companies are argued to be one of the main reasons why the retail distribution activity of the major multiples is so effective [35].

2.5.4 Disadvantages of Logistics Out-Sourcing [34], [36]

Although the dominant trend since the 1980s has been towards the out-sourcing of road transport and other logistics activities, many companies still choose to operate rather all or part of their logistics operations in-house. The decision to retain logistics activities in-house has not been widely addressed in much of the literature. However, Fernie [37] has highlighted the main reasons for keeping some in –house logistics activities:

1. **Cost Issues:**

- operations at cost plus could be run more cheaply in-house, assuming other variables remain equal, because the third-party logistics company needs to make a profit on its operations;
- switching costs will be incurred by contracting out (e.g., redundancy costs, asset disposals or write-offs);
- monitoring and control of costs is easier when the distribution function remains in-house (good information system and clearly agreed service standards with the third-party operator may overcome this issue, but most of the large multiple retailers still retain an in-house presence to provide a benchmark of costs and operations for their contracted distributions operations);
- the cost of monitoring the performance of the logistics can be high and is also sometimes difficult to achieve effectively; and
- some companies do not have the necessary information or expertise to assess which logistics providers are offering good services at competitive prices.

2. **Control Issue :**

The view is that in-house logistics and distribution operations can provide the company with more control over important customer service considerations, such as delivery reliability, and a degree of compatibility with other company activities and practices. Flexibility of operations is also seen as a possible advantage of retaining an in-house distribution function, with the loyalty of the distribution operation not torn between several customers. There is also the concern that out-sourcing could result in a loss of security and that confidential information will be passed to competitors.

3. **Economies of Scale :**

Many in-house operations are large enough to benefit from economies and derive similar buying power over their suppliers that the third-party specialists enjoy.

4. **Innovation through specific expertise :**

Larger or specialist in-house operators can claim to have much more expertise in particular sectors than logistics specialist. For example, distribution of frozen foods or deliveries to special delivery locations.

The last two disadvantages (economies of scale and innovation) also appeared under the advantages of using third-party services, illustrating that it is not often a simple clear cut decision between in-house and out-sourced logistics operations. Indeed, the two types of service can be viewed as complementary and are often used in conjunction with each other. Many companies operating in-house services for the purpose of transporting goods from one place to another supplement this with contract logistics services, on either an occasional or regular basis. There are several important advantages for companies supplementing in-house operations with out-sourced operations.

1. parallel logistics services can help ensure that no disruptions occur in supply of goods;
2. geographical expansion of a company's market can often be met more economically by a contractor than in-house, especially in the early stages when sales in the new area are low;
3. diversification into products with different handling and marketing requirements can benefit from the use of a contractor with the correct equipment and expertise;
4. companies with significant fluctuations in sales during the year can use contractors to meet demand during the peaks and operate own account distribution throughout the year at a stable level; and
5. Partial use of contractors can help to provide the own account operator with a benchmark against which to compare the own account service.

2.5.5 Success Factors in Logistics Out – Sourcing [4],[27],[29],[31],[38], [39]

Despite the trend towards increased out – sourcing, it is important to recognize that the contracting out of non – core activities does not always prove to be a successful strategy [40]. Some research has suggested that a majority of managers who have logistics out – source activities have been dissatisfied with the outcome. However, rather than this being due to an inherent problem with out – sourcing itself, it is more likely to be due to one or more of the following factors :

1. making the wrong decision to out – source a logistics activity in the first place (i.e., the activity should have been kept in - house) ;

2. poor selection of the third – party logistics provider ;

3. poor management of the relationship with the third – party ; and/ or

4. a lack of suitable performance measurement tools (i.e., method with which to monitor the success of out - sourcing).

Table 2.4 Factors that are frequently included in the evaluation of third – party logistics companies [39]

- Ability to provide suitable logistics data before, during, and after goods shipments
- Business arrangements (e.g., performance incentives, short and long – term plans of the company)
- Business experience and qualities (e.g., company history, quality of employees)
- Capabilities and competencies (i.e., ability to meet company's needs)
- Compatibility of technology for the required service
- Financial strength and stability
- Standards (i.e., Are they sufficiently high and are they improving?)
- Location/ coverage (i.e., Does the provider's network match the requirements?)
- Management structure
- Opportunities to develop long – term relationships
- Price
- Reliability
- Reputation
- Service quality
- Speed
- Supplier certification
- Support services
- System flexibility and capacity

In approaching the decision of selecting logistics activities that could be out – sourced and the logistics companies that could perform these activities on their behalf (table 2.4), companies need to address the following issues :

1. identification of the specific logistics activities that could potentially be out – sourced ;

2. evaluation of which of these activities should be out – sourced;

3. appraisal of the likely positive and negative effects of out – sourcing these activities on the company and its core business;

4. specification of the level of service required from a logistics company with respect to each activity to be out – sourced;

5. identification of the logistics companies with the necessary capabilities to provide these services; and

6. negotiation with short listed logistics companies to required service standard at a competitive price.

2.6 Logistics Service and Performance Measurement [16], [42], [43]

Logistics is an aspect of management that has developed as a recognized field in business only in the last 40 years. The use of the term "logistics management" in manufacturing and distribution organizations has been popular in Europe and North America only since the mid-1980s. Its recent and slow recognition is in part because it delivers a service that is multifaceted and largely in tangible. The important of inter-organizational relationships in logistics has led to use of the term "supply chain management" to ensure attention to the challenges that arise from complex organizational structures. These characteristics and the recent development of logistics have implication for approaches to logistics performance.

1. The Aspects of Logistics in an Economy

For a long time, the integrated contribution of logistics activities was not recognized, let alone measured. Measurement was of individual components such as transportation costs, the value of inventory, and warehouse costs. The individual components were viewed as cost centers, with the performance of the activities judged on the basis of cost levels. Interpretation of cost-based results had to be made taking into account required changes in service levels and the scale and geographical extent of the services, to mention just a few variables affecting costs.

Recognition of the greater value associated with recognition of contributions of logistics to creating value through enhanced customer service. Logistics has shifted from a purely cost center to a center creating value. This makes the range of service attributes required to meet logistics requirement greater and their measurement more difficult.

As use of the term “logistics management” has gained acceptance, and as various factors have contributes to the use of out-sourcing, so a market has grown up for “logistics services”. Some third party logistics providers are freight forwarders who have traditionally provided a mix of services designed to meet a variety of logistics needs. Previously, their services were not structured and marketed as logistics services. The main other source of 3PLs is companies who have had assets and related management capabilities in a part of logistics to which they have added other capabilities. They have done this particularly through the addition of information-system assets and knowledge based expertise. A good American example is Ryder System Inc., which has incorporated additional information technologies and logistics management skills in its fleet management expertise to become a major logistics service provider. Many transportation companies have operating divisions or subsidiaries providing logistics service to complement their carrier activities.

Thus, logistics in the economy has two dimensions : logistics management manufacturing and distribution organizations, and logistics organizations providing services to the manufacturing and logistics companies, the characteristics and performance of the two sectors are generally treated quite separately. However, both of effected by the varied activities that make up logistics.

2. The Multifaceted and Intangible Nature of Logistics

Logistics delivers a service that is multifaceted and largely intangible. “Good service” can be hard to define and difficult to measure, while the magnitude of its effects on the corporate supply chain and national objectives are given harder in quantify.

Logistics contributes to the creation of time, place, and even form utility through the management of processes that enable companies to get the right good to the right place at the right time in the right condition and at the right cost. The basic utilities have been recognized for many years. Of course, the changing costs of resource inputs and changing technology and concepts have meant that the characteristics of logistics systems have changed radically in physical and organization terms. The levels of service expected of logistics systems have increased as response time have had to be reduced and made more reliable and flexible, while the pressures to reduce costs have

persisted. The developments are reflected in new practices such as cross-docking and efficient customer response and in new organizational structure evident in the term "supply chain management" and in the growth of 3PLs. The changes in concepts, technologies, practices, and organization structures pose new challenges for government trying to improve the contributions of logistics to corporate performance.

The objective of logistics must be aligned with corporate goals, within the influences of national interests and regulations. The goals of companies are diverse, reflecting different market conditions and corporate priorities. They are affected by the various economic, political, social, and environmental conditions under which companies operate. Goals can include return on capital, customer satisfaction, employee satisfaction, growth, cost reduction, environmental quality, and others. It is not appropriate here to explore the extent to which these objectives have interdependencies and conflicts. The reality is that multiple objectives co-exist and must be reflected in the structure of logistics services and in the measure of performance. The existence of diverse objectives precludes the possibility of "one best way" of defining performance. It is not surprising, then, that there is no universally accepted measure of logistics performance.

3. Issues in the Pursuit of Good Logistics Performance

In a field as wide as logistics and with diverse objectives, a wide array of issues is to be expected. Three are discussed here : the role of public policy in logistics, the role of co-operation and competition among companies, and the challenges in matching human resource capabilities to the information technology requirement of the new environment.

A. The Roles of Public Policy in Logistics

Governments have various roles to play in logistics performance. Some of these are associated with traditional roles in the provision of transport infrastructure. Others are new, arising from recognition of new concerns, such as the environment. Finally, the government is faced with which improved logistics is associated.

- **The Regulation of Logistics Services**

Until recently, public policies relevant to logistics have focused primarily on transport services, for various reasons. Transport was seen as an important cost center by companies and by governments. Also, transport was a sector of the economy in which public investment and regulation were important in most countries. Variations among countries have been matters of the form and extent of public intervention. The evolution of corporate transport management to logistics management has gone hand in hand with deregulation of the transport industry, more by accident than design. The deregulation of transport was needed for different reasons by mode and country but, generally, the objectives were to improve the efficiency of the modes and to cause the investment in the sector to reflect economies potential and not be constrained by the limitations of public funds. What was not anticipated was the effect of deregulation on shippers, who needed improved decision-making in order to optimize the use of new services available from carriers. The deregulation of carriers has coincided with improvement in information system and the adoption of new and more integrated approaches to logistics, such as just in time replenishment management. The new environment was a great stimulus to improved management and performance by carriers and shippers.

The success of the move to deregulate carriers does not mean that regulatory issues have disappeared or will disappear. Two types of issue persist and are likely to do so. First, there remain pockets of regulation and government monopolies the continuation of which should be challenged. They exist in the telecommunication industry, which is under going rapid technological and organizational change, as well as in transport. Government regulations and licensing arrangements affect the level of competition in many countries. Examples include telephone and other information technologies, postal-type services, rail freight, and international liner shipping. Second, issues will continue to arise over the preservation of efficient market structures in the face of merger and other consolidation initiatives. Such initiatives have conflicting potential effects through the benefits of economies of scale and scope and the disadvantages of the diminished effectiveness of competition.

- **Investment In and Pricing of Infrastructure**

Governments also face logistics-related issues in the provision and pricing of infrastructure and related services. The efficiencies in logistics through faster and more reliable transport have increase truck use, which aggravates the pressures for road investments, and heightens environmental concerns associated with trucking and highway congestion. The alternatives of greater rail and water transport are caught up with a range of issues associated with the role of public support in the modes. The pressures on governments for optimal investment policies among the modes come when governments face constraints on expenditures and international pressures for efficient and fair public polices. The issues are evident in the efforts of the European Union to implement a common transport policy. The investment and pricing decisions will affect the character and performance of logistics. Whether the outcome will be optimal depends on the ability to make decisions accurately reflecting the logistical and other consequences.

- **Environmental Protection**

The role of environmental concerns associated with logistics is a relatively new influence on industry structure. The issues of air pollution associated with the use of fossil fuels are greater now than formerly, but the direct effects on logistics of measures such as tax rates on fuels and requirements for cleaner fuels and more efficient vehicles are difficult to identify at this time. Nevertheless, they are present and are likely to become more significant. Currently, the more easily identified effect of environmental concerns on logistics has been the problem of waste disposal. It has given rise to the concept of “reverse logistics.” Requirements for recycling have not just given rise to new recycling logistics businesses in many countries, but have also led to new product life cycle strategies that affect the basic design of products and the location of plants. The opportunity to gain value through metal recycling has long been a factor in the steel and other metal industries, but the process of recycling is having new effects in other sectors. For example, places with lots of trees used to be the only location for paper plants. Now, cities can be an attractive alternative, by transporting a small quantity of wood product to be added to recycled paper in an urban location.

- **The Appreciation of Logistics by Governments**

The improvements that have taken place in logistics performance for over a decade have had a material effect on the performance of most economies. Resources are used more efficiently, as evidenced by the reduced needs for inventory to support a given level of economic activity, and inventory adjustments to changes in demand have become less dramatic so that the economies are less volatile. The adoptions of new concepts such as supply chain management and of new technologies such as business-to-business e-commerce are having material effects benefiting most economies. It is important that the contributions of logistics to a country's economic performance are seen as wider and more complex than when the focus was largely on transport.

There are two reasons why industries are interested in governments' appreciation of the new efficiency of logistics internationally. First, government departments are often a part of supply chains. An example is the role of customs in international trade. Customs have numerous functions to perform for imports and exports in most countries. However, they need to approach these tasks as service suppliers in international supply chains. In Europe, for example, where the efficiency of international logistics services affects not only the local manufacturing industries but also can affect the gateway role of the economy, customs in the U.K. and The Netherlands have demonstrated a high level of innovation. They have provided model roles in the adoption of new technologists and approaches, and have promoted change (rather than lagging or delaying change to suit slow companies and industries).

Companies have a second, more general, interest in the appreciation of logistics conditions by governments. They seek to ensure that governments fully appreciate that the new efficiency of logistics contributes significantly to the increased mobility of industry, maybe across oceans and certainly across boarders. Consequently, the whole range of government policies and the manner of their implementation need to be aligned with the competitive realities, Often, the concern is not with the nature of a decision or with its effect when made, but with the protracted and uncertain nature of the decision-making process. In a competitive environment where charge happens quickly, time is important, and first movers gain momentum. This can be important in the development of gateway services for which volumes affect service and cost levels.

B. The Roles of Co-Operation and Rivalry among Companies

There are a vast number of particular technical issues affecting the logistics performance of companies. What software and information technologies should be used? How much out-sourcing should be practiced? What should be the roles of vertical and horizontal decision structures within organizations or of functional management along traditional departmental lines and process management requiring inputs form across departments? Such issues are important and affect businesses generally. The wide issue with particular importance for logistics relates to the amount of co-operation and rivalry to be expected in supply chains.

Co-operation and rivalry are present in most business relationships. Exchange is beneficial to both parties, but each has selfish interests in the size of its share of the benefits. In western societies, greater weight has been given to rivalry and competition among independent companies than in Asia. For buyers, the threat of using alternative suppliers was seen as the best way to ensure effective price and service competition among suppliers. However, as the service dimensions of logistics have gained more recognition and the opportunities for better integrated operations have been enhanced by new information technologies, so the benefits of dealing more co-operatively with fewer suppliers has come to the fore. Shifts from short-term transactional relationships to long-term “partnerships” have become common. The notion of supply chain management promotes close relationships between the participants in the supply chain. It is not uncommon for the supplier of a logistics service to have one or more of its employees working out of its customer’s facilities. The expected benefits of partnership relationships include better and faster product or service innovation, greater reliability of supply, and lower costs (through the joint optimization, rater than sub-optimization, and through the benefits of specialization, scale and scope).

Technology is allowing markets to function more effectively. e-Commerce is facilitating markets where goods and services with prescribed characteristics can be traded. Truckload movements may be traded as a commodity. While specialized service requirements preclude the use of such transactional relationships in all situations, they may still have a role in well-managed supply chains. Furthermore, integration in some supply chains has been mandated by a large organization with buying power. Some just-in-time contract requirements may essentially push inventory

down the supply chain. It may be difficult to judge in a dynamic environment whether the dominant company is optimizing or sub-optimizing. Certainly a case can be made that there are opportunities for companies to benefit from leveraging power to get suppliers to eradicate waste companies are able, they will make and capture rents. So, the interplay of cooperation and rivalry can be expected to persist in the pursuit of improved performance.

C. Human Resource Capabilities and Information Technology

Information technologies have had radical effects on the organization structure of supply chains and on the ability of managers to make improved choices between logistical alternatives. However, the superior performance and sustained competitive advantage linked with the use of new technologies are dependent on the strategic role of people. There is, therefore, a challenge for organizations to seek out individuals with the vision to translate the potential for supply chain integration into dynamic reality and to continually push the applications of new technologies. This also creates a challenge, for educational institutions have to adjust existing programs or develop new ones to meet the new needs in executive development and degree programs targeted at entry-level management positions.

Briefly, the challenges for education are to provide mixes of education in technical expertise in areas such as information technology, inventory management, and transport management, while ensuring cross-functional knowledge and skills across business areas and within a supply chain context. Evidence of the change is to be found in programs in transport or operations management shifting to logistics or supply chain management. The challenges are difficult to meet within the tightening budge and time constraints of education. Perhaps a more effective “supply chain approach” in which the buyers (employers) are more involved with the suppliers (educators) is required.

2.7 Emerging Trends in Logistics [16], [44], [45]

In recent years, several strategic and technological changes have had a marked impact on logistics. Among these, three are worthy of mention: globalization, new information technologies and e-commerce.

- **Globalization** An increasing number of companies operate at the world level in order to take advantage of lower manufacturing costs or cheap raw materials available in some countries. This is sometimes achieved through acquisitions or strategic alliances with other firms. As a result of globalization, transportation needs have increased. More parts and semi-finished products have to be moved between production sites, and transportation to markets tends to be more complex and costly. The increase in multimodal container transportation is a direct consequence of globalization. Also, as a result of globalization, more emphasis must be put on the efficient design and management of supply chains, sometimes at the world level.

- **Information Technologies.** Suppliers and manufacturers make use of EDI. This enables them to share data on stock levels, timing of deliveries, positioning of intransit goods in the supply chain, etc. At the operational level, geographic information systems (GISs), global positioning systems (GPSs) and on-board computers allow dispatchers to keep track of the current position of vehicles and to communicate with drivers. Such technologies are essential to firms engaged in express pick-up and delivery operations, and to long-haul trucking companies.

- **E-Commerce.** An increasing number of companies make commercial transactions through the internet. It is common to distinguish between business-to-business (B2B) and business-to-consumers (B2C) transactions. The growth of e-commerce parallels that of globalization and information technologies. As a result of e-commerce the volume of goods between producers and retailers should go down while more direct deliveries should be expected between manufacturers and end-users. E-commerce leads to a more complex organization of the entire logistics system (e-logistics), which should be able to manage small- and medium-size shipments to a large number of customers, sometimes scattered around the world. Furthermore, the return flow of defective (or rejected) goods becomes a major issue (reverse logistics). Table 2.5 reports the main differences between traditional logistics and e-logistics.

Table 2.5 Main differences between traditional logistics and e-logistics. [45]

	Traditional logistics	E-logistics
Type of load	High volumes	Parcels
Customer	Known	Unknown
Average order value	>$1000	<$100
Destinations	Concentrated	Highly scattered
Demand trend	Regular	Lumpy

In an e-logistics system different approaches for operating warehouses and distribution are generally adopted. The virtual warehouse and the Points Of Presence In The Territory (POPITT) are just a few examples. A virtual warehouse is a facility where suppliers and distributors keep their goods in stock in such a way that the e-commerce company can fulfill its orders. A POPITT is a company-owned facility where customers may go either for purchasing and fetching the ordered goods, or for returning defective products. Unlike traditional shops, a POPITT only stores already sold goods waiting to be picked up by customers and defective products waiting to be returned to the manufacturers. This solution simplifies distribution management but reduces customer service level since it does not allow for home deliveries.

2.8 Thailand and Singapore Competitiveness

2.8.1 GDP (Gross Domestics Product) [46]

GDP is the monetary value of all the goods and services produced by an economy over a specified period that includes consumption, government purchases, investments, and exports minus imports. GDP of Thailand (Figure 2.7) is in the moderate level that higher than Korea, Japan, and USA and its trend determine that the index will be increased in the future though growth will be lower than last year's that means economic in Thailand trend is going to increase too, it can estimate that the there will be more consumption, investment, exports minus imports so logistics service usage will has a great impact. While Singapore has decreasing trend of GDP but the index is still high and higher than Korea, Japan, USA including Thailand.

Singapore has good connectivity so it is not surprised that Singapore has high investment, export and import, and consumption.

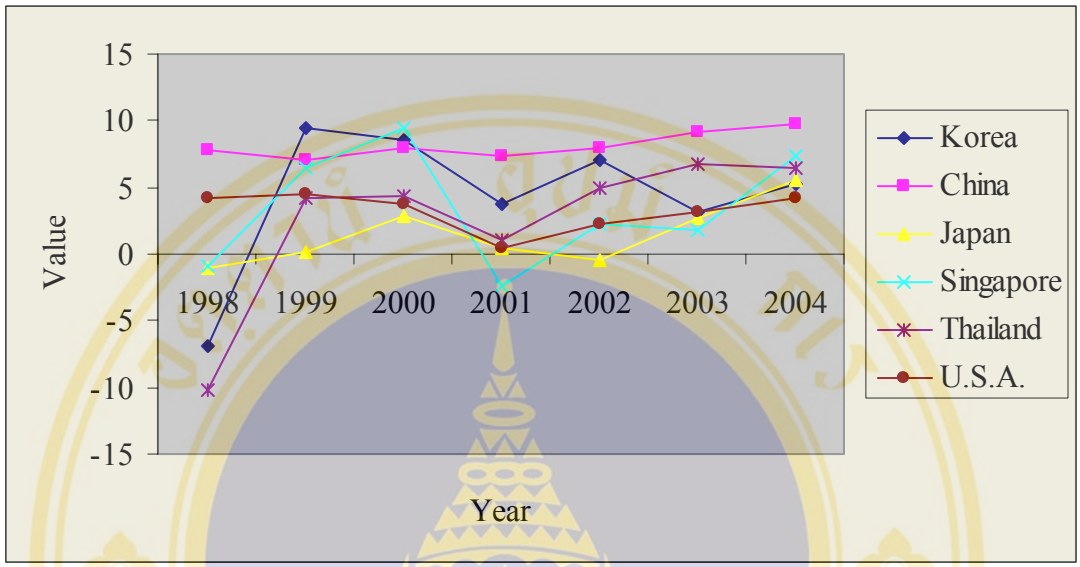

Figure 2.7 Gross Domestics Product between 1998 – 2004 [46]

2.8.2 Growth Competitiveness Indexes (GCI) [47]

The World Economic Forum (WEF) 's Growth Competitiveness Index (GCI) consists of three sub-indexes: the level of technology in an economy, the quality of public institutions and the macro-economic conditions related to growth. The overall Growth Competitiveness Index (GCI) aims to measure the capacity of the national economy to achieve sustained economic growth over the medium and long term, taking into account the current level of development. The Index is tested each year to confirm that it does indeed correlate with rates of economic growth from the recent past. Thailand has GCI ranking in the 32th (Figure 2.8), it means Thailand has capacity of the national economy to achieve sustained economic growth lower than USA, Singapore, Japan, Korea, Hong Kong, and Malaysia but higher than China, and India while Singapore has GCI ranking in the 6th which has capacity of the national economy to achieve sustained economic growth lower than USA but higher than Japan, Korea, Hong Kong, Malaysia, China, India, and Thailand.

Due to technologies index (Figure 2.8), the level of technology in the economy of Thailand is rank in the 39th behind USA, Singapore, Japan, Korea, Hong Kong, and Malaysia but ahead China, and India while Singapore is rank in the 12th ahead Hong

Kong, Malaysia, China, India, Philippine, Indonesia, and Thailand but behind USA, Japan, and Korea.

According to public institutions index (Figure 2.8), the quality of public institutions of Thailand is rank in the 37th behind USA, Singapore, Japan, Korea, Hong Kong, and Malaysia but ahead China, and India while Singapore has very high quality of public institutions which is rank in the 6th ahead USA, Japan, Korea, Hong Kong, Malaysia, China, India, and Thailand.

The macro-economic environment index (Figure 2.8) that focus on the macro-economic conditions related to growth, Thailand is in the 26th lower than USA, Singapore, Japan, Korea, and Hong Kong but higher than Malaysia, China, and India while Singapore performs the best in this factor.

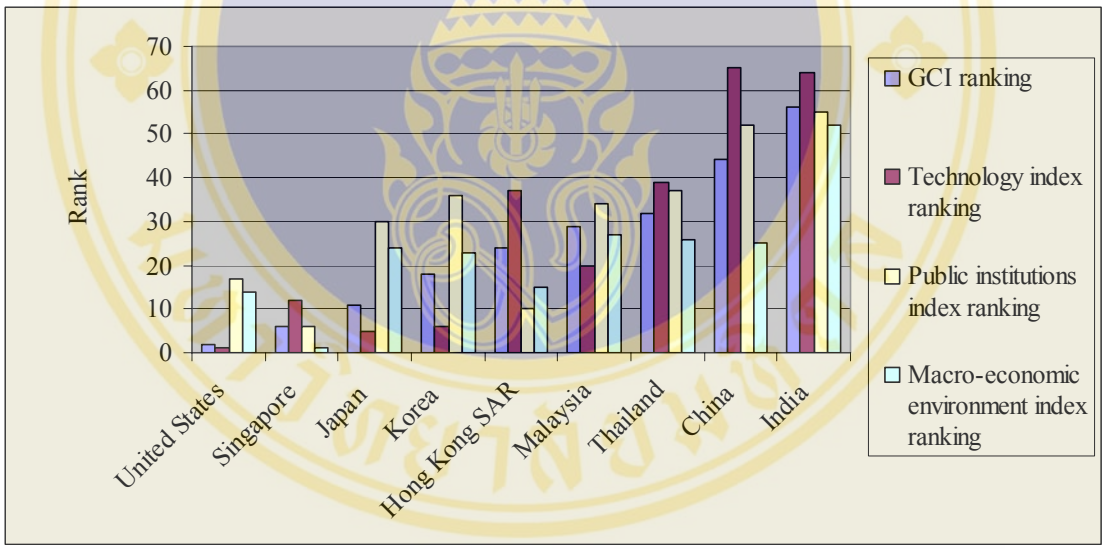

Figure 2.8 Growth Competitiveness Component Indexes 2003 [47]

2.8.3 Foreign Direct Investment (FDI) [48]

Foreign direct investment (FDI) is the movement of capital across national frontiers in a manner that grants the investor control over the acquired asset. Thus it is distinct from portfolio investment which may cross borders, but does not offer such control. Firms which source FDI are known as 'multinational enterprises' (MNEs). In this case control is defined as owning 10% or greater of the ordinary shares of an incorporated firm, having 10% or more of the voting power for an unincorporated firm

or development of a green field branch plant that is a permanent establishment of the originating firm.

In 2004, Thailand has FDI confidence index as 20th in the world (Figure 2.9)which lower performance from 2003 index that was 16th while Singapore is ranked in the 18th which is better performance from 2003 index that was 28th.

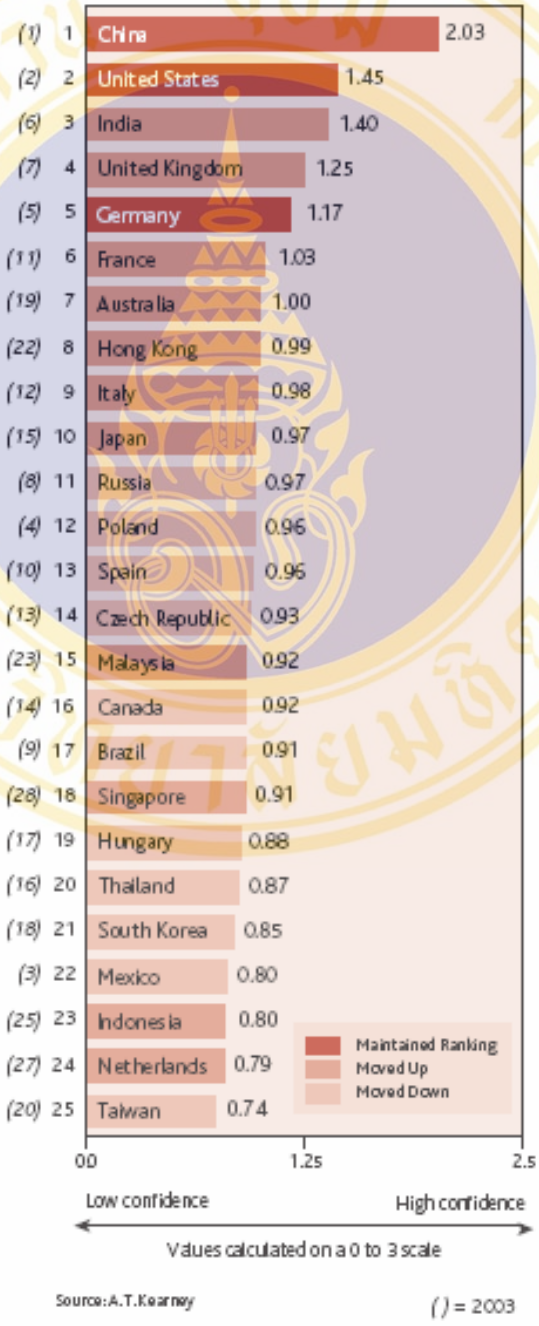

Figure 2.9 FDI Confidence Index [48]

However on April 14, 2004 UNCTAD (United Nations Conference on Trade and Development) and the British magazine Corporate Location released the key findings of a worldwide survey of 87 international location experts in foreign direct investment (FDI). The report, known as the Global Investment Prospects Assessment (GIPA), is designed to equip governments and businesses alike with a critical instrument to analyze future patterns of FDI flows at global, regional, national, and industry levels in order to develop policies and investment strategies. The report ranks Thailand as one of the four top hot spots for FDI in the world over the next four years (Table 2.6), preceded only by China, India, and the United States. Thailand is ranked as the "Top 3" most attractive country for FDI flows in two separate categories - "Asia" and "Developing Economies" -listed (Table 2.7) only behind China and India while Singapore is in the 9th of global ranking.

Reflecting broad-based bullish sentiments for FDI prospects in the Asia-Pacific, GIPA predicts almost all sectors in Asia and the Pacific to profit from an increase in FDI. Heading the list were vehicle production, machinery & equipment and chemicals. The report further identifies the developed countries and Asia as possessing the most balanced profiles, implying that these regions are expected to attract FDI in all the different corporate functions.

Table 2.6 Global FDI prospective over the next 4 years [49]

	Global Ranking
Top 1	China
Top 2	India
Top 3	USA
Top 4	**Thailand**
Top 5	Poland Czech Republic
Top 6	
Top 7	Mexico, Malaysia
Top 8	
Top 9	UK Singapore South-Korea

Table 2.7 The most attractive countries for FDI flows [49]

The most attractive countries for FDI flows

	Africa	Asia	Latin America	Developing Economies	Central & Eastern Europe	Developed Economies
Top 1	South-Africa	China	Mexico	China	Czech Republic	USA
Top 2	Angola Tanzania	India	Brazil Chile	India		UK
Top 3		**Thailand**		**Thailand**	Romania Russia	Canada France

Source: UNCTAD-DITE, GLOBAL Investments Prospects Assessment (GIPA) 2004

2.8.4 The IMD World Competitiveness Indexes [50]

The IMD World Competitiveness Center surveyed the world competitiveness into 4 factors which are economics performance, government efficiency, business efficiency, and infrastructure. The ranking of world competitiveness in year 2004 in each area are shown in the below ;

The economics performance is ranked to considerate in domestic economy, international trade, international investment , employment , prices of each country in year 2004 (Figure 2.10) presents that Thailand has well rank in the 9th ahead Hong Kong, India, Malaysia, Japan, and Korea but behind USA, China, and Singapore while Singapore ranked in the 5th ahead Thailand, Hong Kong, India, Malaysia, Japan, and Korea but behind USA and China.

The government efficiency is ranked to considerate in public finance, fiscal policy, institutional framework, business legislation, and societal framework of each country in year 2004 (Figure 2.11) shows that Thailand is ranked in the 20th ahead China, India, Korea, and Japan but behind Singapore, Hong Kong, USA, and Malaysia while Singapore has the best performance in this factor.

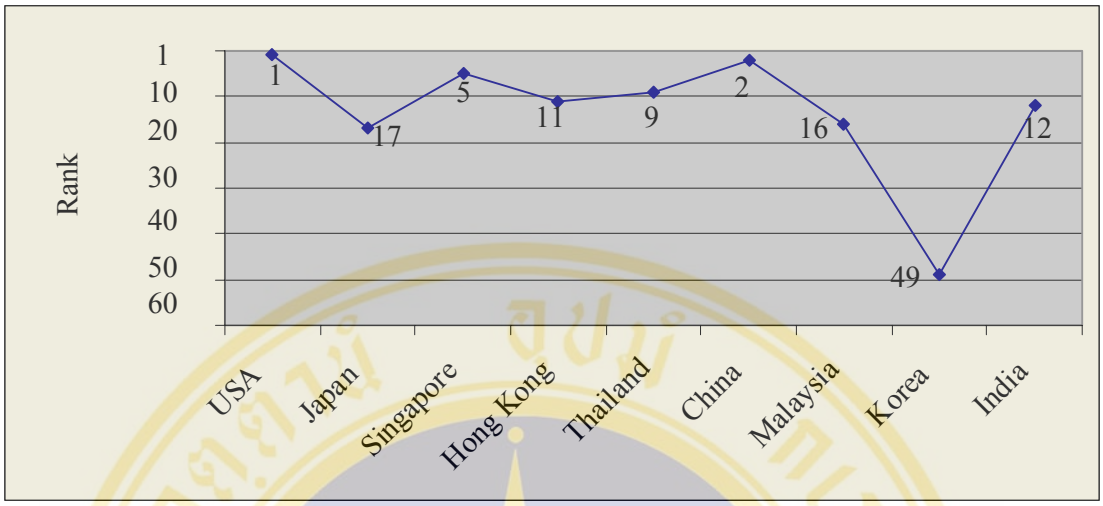

Figure 2.10 Economics Performance 2004 [50]

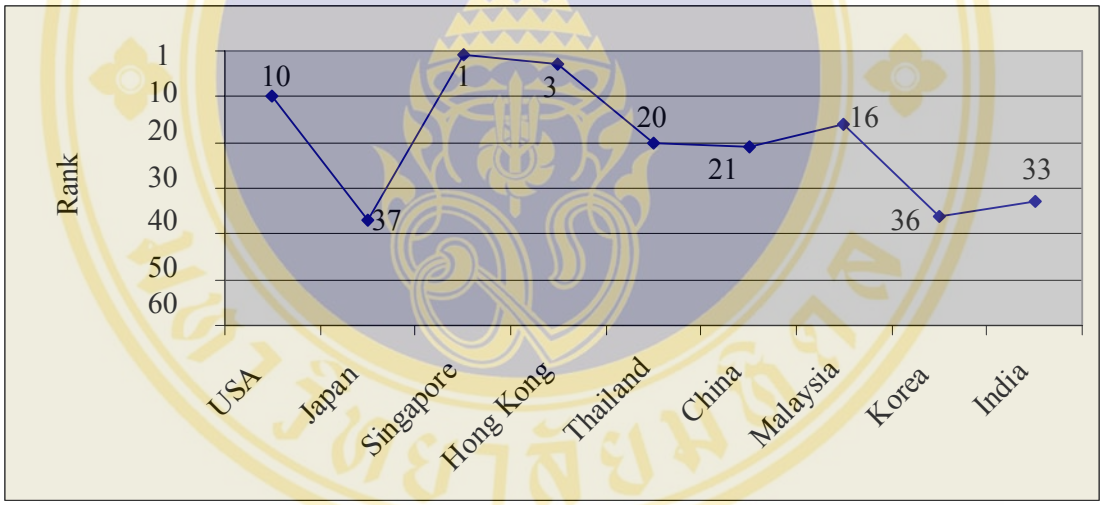

Figure 2.11 Government Efficiency 2004 [50]

The business efficiency is ranked to considerate in productivity, labor market, finance, management practices, and attitudes & values of each country in year 2004 (Figure 2.12) shows that Thailand is ranked in the 23th ahead Korea, China, and Japan but behind USA, Singapore, Hong Kong, Malaysia, and India while Singapore is the 6th ahead Japan, China, Malaysia, Korea, India, and Thailand but behind USA and Hong Kong.

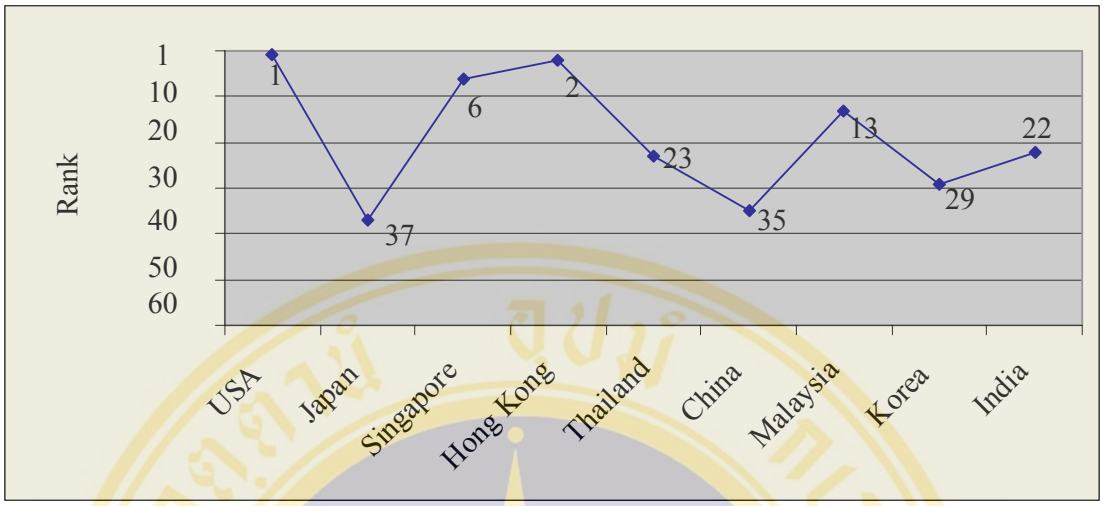

Figure 2.12 Business Efficiency 2004 [50]

The infrastructure is ranked to considerate in basic infrastructure, technological infrastructure, scientific infrastructure, health and environment, education of each country in year 2004 (Figure 2.13) presents that Thailand is ranked in the 50th behind USA, Japan, Singapore, Hong Kong, China, Malaysia, and Korea but ahead India while Singapore is the 9th ahead Hong Kong, China, Malaysia, Korea, India, and Thailand but behind USA and Japan.

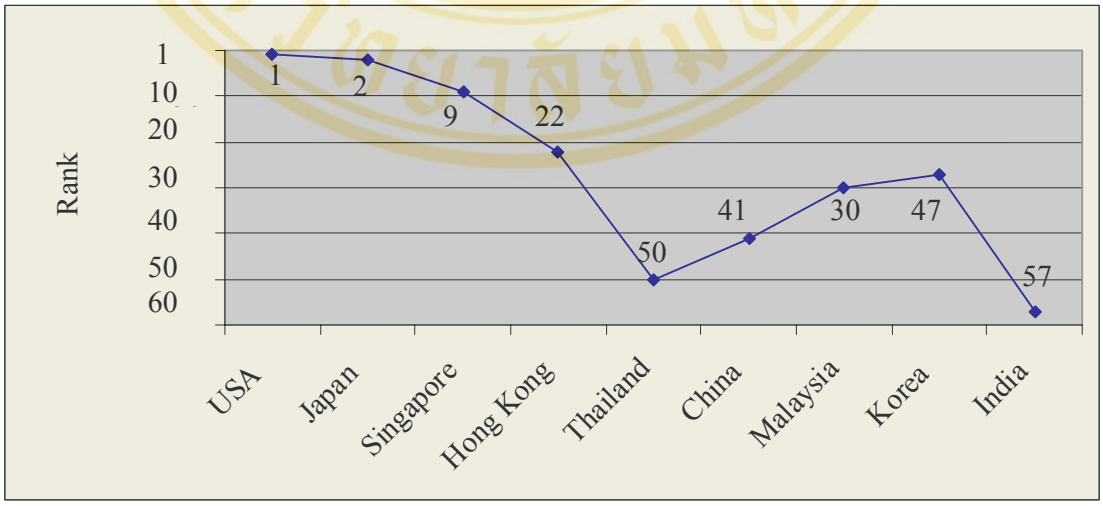

Figure 2.13 Infra Structure Efficiency 2004 [50]

2.8.5 Stages of Economic Development [51]

In assessing the right approach forward, it is helpful to assess Thailand and Singapore's state in the economic development process. The figure 2.14 shows the framework which is used by Michael E Porter.

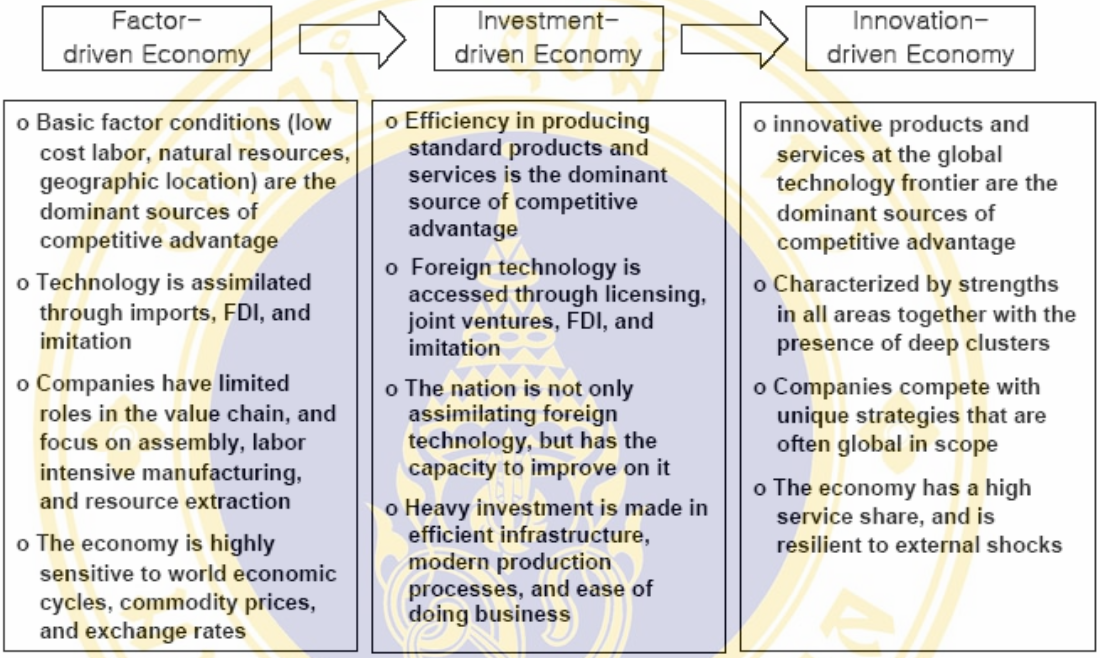

Figure 2.14 Stages of Economic Development [51]

Thailand is going to the investment-driven economy stage that relies heavily on the importation of global technology for local production processes. Funding of the capital imports increases dependency on foreign capital. At this development stage, the economy becomes increasingly integrated into the global economy. The development of local financial markets for raising of debt and equity is important, as is the reduction of bureaucratic hurdles to development and the increase in labour market flexibility.

Singapore is going to the innovation-driven stage, the economy's focus is on continued technology generation rather than predominant reliance on foreign technology. High rates of innovation and commercialization of new technologies characterize this stage. Human resources and flexible organizations that can rapidly respond to a continually changing global environment are the key to continued

innovation and maintenance of a position on the technology frontier. The innovation-driven stage requires flexible organizational structures, strong research institutions and a high degree of venture capital availability.

2.8.6 Free Trade Area/ Agreement (FTA) [52]

FTA is the trade between nations without protective customs tariffs. In modern usage, trade or commerce carried on without such restrictions as import duties, export bounties, domestic production subsidies, trade quotas, or import licenses. The basic argument for free trade is based on the economic theory of comparative advantage: each region should concentrate on what it can produce most cheaply and efficiently and should exchange its products for those it is less able to produce economically.

Virtually all developing countries in Asia have committed themselves to increased trade openness unilaterally, though the timing, pace and modalities at which they actually integrate with the global trading system have varied. Nonetheless, recognizing that they have limited influence in the multilateral arena where recent progress (Seattle and Doha rounds) on trade and investment liberalization is perceived to have been disappointingly slow and negotiations protracted and cumbersome, many Asian economies have underscored the need to consciously and aggressively explore alternative liberalization paths or “fallback positions”. This is where the “new regionalism” comes into relevance. Free Trade Agreements (FTAs) appear to be increasingly regarded by Asian policymakers as effective and expeditious instruments for achieving trade liberalization among “like minded” trading partners2. The Asian Development Bank (ADB) recently noted:

“The operational question now facing policymakers is how to achieve fuller benefits of increased openness to trade. FTAs.. are, at the moment, a popular means of liberalization in the face of domestic and international constraints. There has been a substantial increase in the formation of regional FTAs in the past decade [53].

The new wave of FTAs has three important features. One, they go well beyond just merchandise trade liberalization and also encompass liberalization of services trade and other trade facilitation measures which lead to “deep integration” among partners. These measures include investment protection and liberalization, harmonization and mutual recognition of standards and certification, protection of

intellectual property rights (IPRs), opening of government procurement markets, streamlining and harmonization of customs procedures, and development of dispute settlement procedures. Two, FTAs are not restricted to just the immediate regions (e.g. Singapore-US, Thailand-Bahrain); thus the term "regionalism" is somewhat of a misnomer. Three, because of the depth of issue coverage, the new FTAs tend to be far smaller in initial membership (i.e. largely though not solely bilateral) compared to the older/existing FTAs which had a preference for shallowness or narrowness in issue coverage but broadness in terms of membership.

Given that there is a limit to which lower-income, developing countries are willing or able to go beyond the negotiation of frontier issues and seek deeper integration, this has inevitably meant that the new FTAs in Asia have been dominated by middle and upper income countries (Singapore, Thailand, Korea, etc), though other countries are also jumping on the bandwagon (Table 2.8). This is not altogether a surprising outcome. While neither theory nor empirics is able to offer definitive insight into whether there are any net benefits from a country being a member of FTAs, it is almost certain that a country that is not a participant in any of the new FTAs will be adversely impacted due to trade and investment diversion and reduction in their terms of trade. In other words, there is a strong case for joining FTAs for "defensive reasons" as "(F)TAs are like street gangs: you may not like them, but if they are in your neighborhood, it is safer to be in one" [54]

Table 2.8 Recently Established or Proposed FTAs in the Asia-Pacific, 1999-2004 [52]

Country/ Grouping	Partners	Status of Agreement, 2004	Country/ Grouping	Partners	Status of Agreement, 2004
ASEAN	China India Japan Korea USA (TIFA) CER ASEAN+3 EU	Framework Agreement signed Framework Agreement signed Framework Agreement signed Under Study Under Negotiation Under Study Under Study Proposed	Malaysia	China Japan USA	Under Negotiation Under Negotiation Proposed
China	ASEAN Australia India Hong Kong Macau Malaysia New Zealand Philippines Singapore	Agreement signed Proposed Under study Agreement signed Proposed Under Negotiation Proposed Under Negotiation Proposed	Philippines	China Japan USA	Under Negotiation Under Negotiation Proposed
India	ASEAN China Korea Singapore Sri Lanka Thailand BIMSTEC SACU COMESA MERCOSUR Mauritius	Framework Agreement signed Proposed Proposed Under negotiation Agreement in force Framework Agreement signed Framework Agreement signed Proposed Proposed Framework Agreement signed Under negotiation	Singapore	Australie Canada China Egypt EFTA EU India Japan Jordan Korea Mexico New Zealand Sri Lanka Pakistan Taiwan USA	Agreement in force Under Negotiation Proposed Proposed Agreement in force Proposed (rejected by EU) Under negotiations Agreement in force Agreement in force Under negotiations Under negotiations Agreement in force Under negotiations Proposed Proposed Agreement in force
Hong Kong	China Macau New Zealand	Agreement signed Agreement signed Under negotiation	Taiwan	Costa Rica Japan New Zealand Panama Singapore USA	Proposed Proposed NZ withdrew from negotiations Under negotiation Proposed Proposed
Japan	ASEAN Canada Chile Korea Malaysia Mexico Philippines Singapore Thailand Australia	Framework Agreement signed Proposed Under study Under study Under negotiation Under negotiation Under negotiation Agreement in force Under negotiation Proposed	Thailand	Australia Bahrain China India Japan Korea New Zealand Peru South Africa USA BIMSTEC	Agreement signed Agreement signed Agreement signed Agreement signed Under negotiation Under Study Under Study Agreement signed Under study Under negotiation Agreement signed
Korea	Australia China Chile Japan Mexico New Zealand Peru Singapore Thailand USA	Under study Under study Agreement signed Under study Under negotiation Under study Proposed Under negotiation Under study Under negotiation	Vietnam	Sri Lanka	

Another reason why countries like Singapore and Thailand have been rushing to form FTAs with a large number of different countries early on is to capitalize on being a hub of overlapping arrangements. Producers in the hub have cost advantages vis-à-vis those in the "spokes", being able to obtain more of their intermediate goods at lower prices. Further, since exports originating from the hub are granted preferential access to a number of other markets, this may encourage the transshipment of goods via hubs, hence fortifying its already dominant role as an entrepot point. Of course, it is for this very reason that FTAs have special provisions or rules of origin (ROOs) which are meant to prevent goods being re-exported from the lower tariff country to the higher tariff country one (i.e. trade deflection). However, this in turn may lead to a shift of export platforms from other regional developing economies to the hub in order to benefit from duty-free market access; though care must be taken to ensure that ROOs are not manipulated in such a way that partners gain de facto protection for their goods in the hub market.

Advantage of FTA [55]

1. Increase regional integration
2. Provide free direct market access to members
3. Establish common standards and practices
4. Enlarge market size
5. Promote growth and development
6. More efficient resource utilization

In order to prepare for FTA, in December 2003 Thailand's government moved forward on a 5-year, US$38.5 billion budget for new infrastructure projects, including new roads and a satellite city located in Nakorn Nayok to be serviced by a Japanese-style bullet train. The huge infrastructure spending package will go hand-in- hand to support other on-going infrastructure projects, such as the Suvarnabhumi International Airport expected to open in December 2005, expansion and upgrading of domestic highways, improved mass transit, and integration measures to connect with the Asian Highway and Trans-Asian Railway. (Figure 2.15)

5-Year Infrastructure Budget [56]

- Railway system - 900 billion baht (US$22.5 billion)
- Bullet train - 140 billion baht (US$3.5 billion)
- New roads & highways - 400 billion baht (US$10 billion)
- Infrastructure for Bangkok's new satellite city 100 billion baht (US$2.5 billion)

Figure 2.15 Thailand and Neighboring Countries International Road Linkages [56]

2.8.7 Trade Facilitation Index [57]

In order to facilitate for FTA we have to consider in the trade facilitation index which is the index to measure in port efficiency, customs environment, regulatory environment, and e-business.

For port efficiency, it can be provided in 3 factors as port efficiency index, port facilities and inland water way, and air transport. In 2003, it found that Thai ports still have low efficiency, performance lower than average that behind Malaysia, Chinese Taipei, Singapore, and Hong Kong but ahead Vietnam, Indonesia, Philippines, and China while Singapore has highest efficiency comparing with other APEC economies. (Figure 2.16)

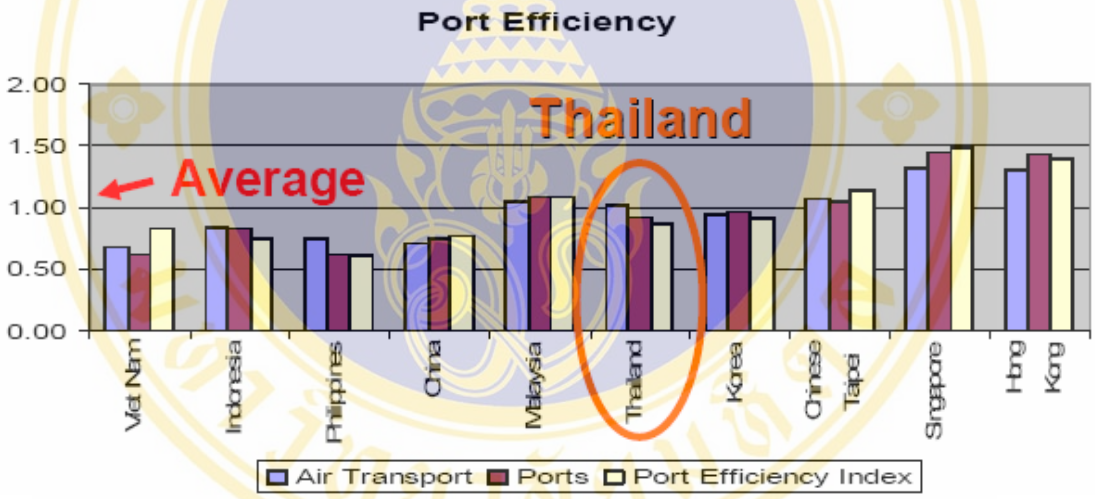

Figure 2.16 Port Efficiency [57]

Customs environment can separates into 4 factors as irregular payments, improper practices, hidden import barriers, and bribery & corruption which is corruption index. In 2003, it found that the custom environment in Thailand is not friendly for doing business enough, the performance is lower than average that behind Malaysia, Chinese Taipei, Singapore, and Hong Kong but ahead Vietnam, Indonesia, and Philippines while Singapore has highest efficiency comparing with other APEC economies. (Figure 2.17)

Regulatory environment is divided into 4 factors as transparency and stability, stringency of standards, and compliance with international agreements, and

enforcement. In 2003, it found that the regulatory environment in Thailand is under the average standard, the performance is behind China, Malaysia, Korea, Chinese Taipei, Singapore, and Hong Kong while Singapore has the best performance comparing with other APEC economies. (Figure 2.18)

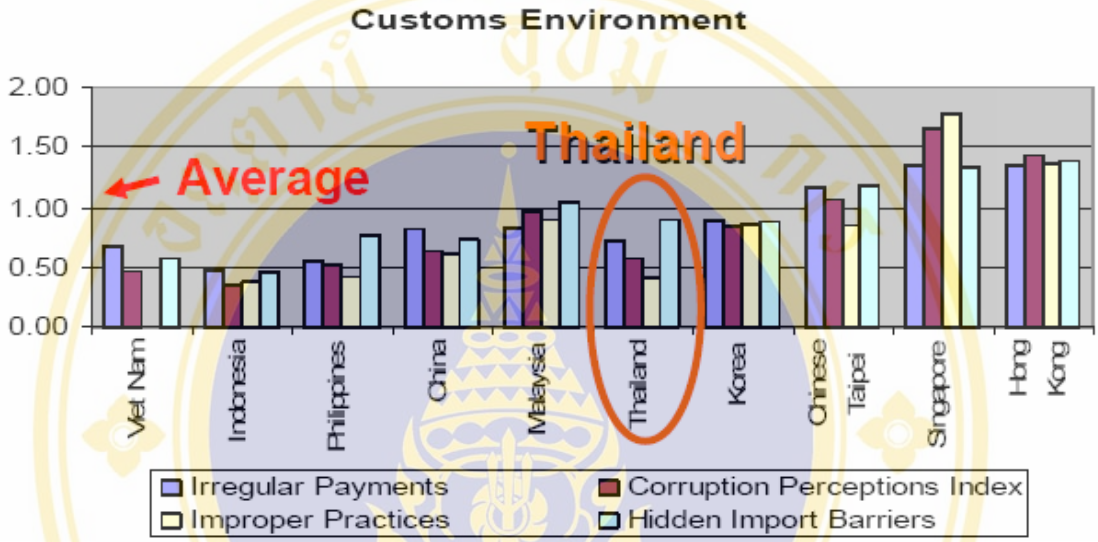

Figure 2.17 Customs Environment [57]

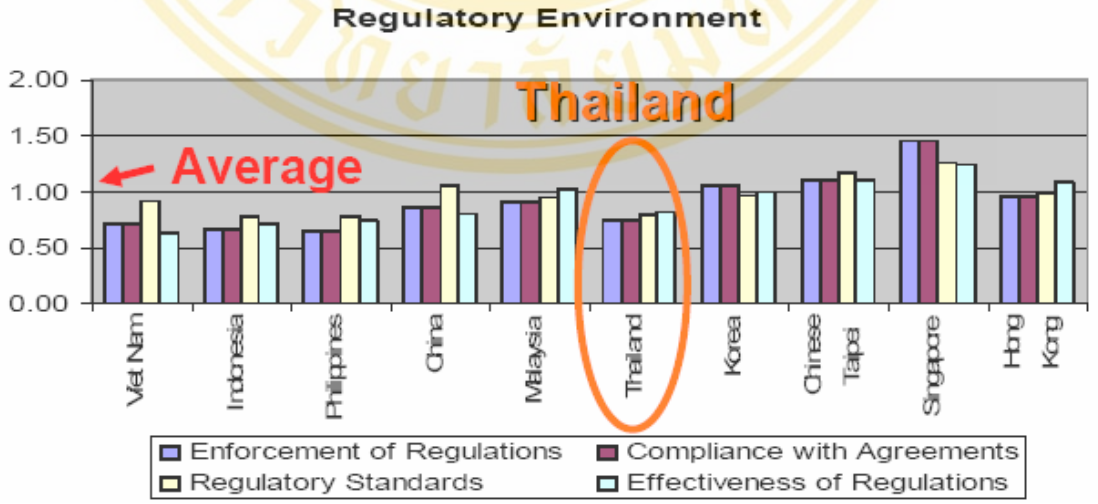

Figure 2.18 Regulatory Environment [57]

E-business is the percentage of companies that use the internet for e-commerce. In 2003, it found that Thailand has the lowest degree of e-business usage while Singapore has the highest degree of e-business usage. (Figure 2.19)

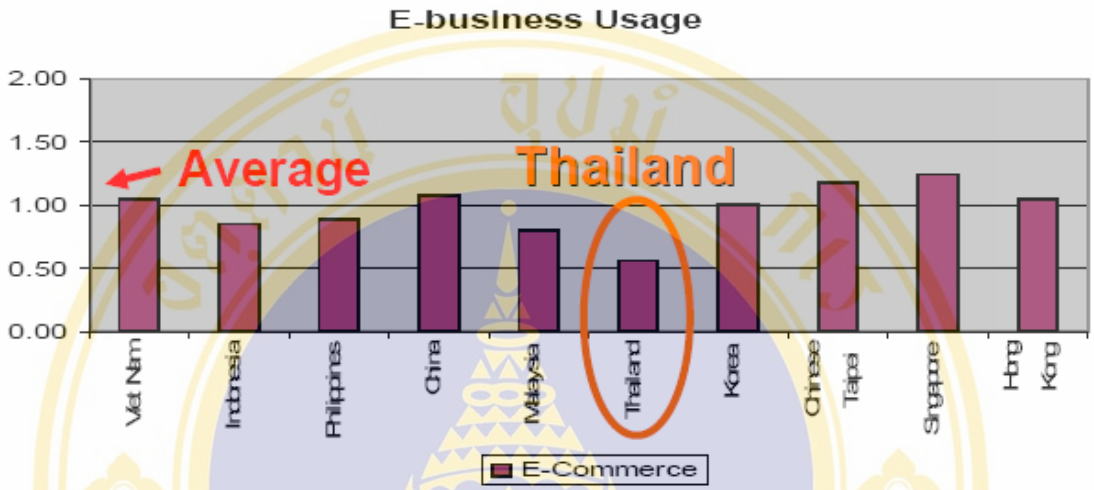

Figure 2.19 E-business Usage [57]

2.8.8 Logistics Cost

Research institute of Thammasat university [58] studied the estimated proportion of logistics cost to GDP in Thailand by Delaney model which is an international standard method, this model uses 3 core logistics activities such inventory carrying cost, transportation cost, and administration cost to calculate macro logistics cost, they report that Thailand has a high logistics cost (Figure 2.20) behind Japan, United Kingdom, USA, and Singapore but ahead China and India while Singapore has the cheapest cost. This study shows that Thailand still has not efficient logistics management to control logistics cost comparing with developed country.

2.8.9 Custom Clearance [59]

Custom clearance is the process of clearing import/ export cargo through Custom (by examination of the documentation and/ or the goods themselves). The International Exhibition Logistics Associates [60] studied about the custom clearance time of countries in the world, it found that Thailand has a long custom clearance time both of less than container load (LCL) case and full container load case (FCL) ahead

Vietnam but behind Singapore, Indonesia, Hong Kong, and Malaysia while Singapore has the least time in custom clearance process.

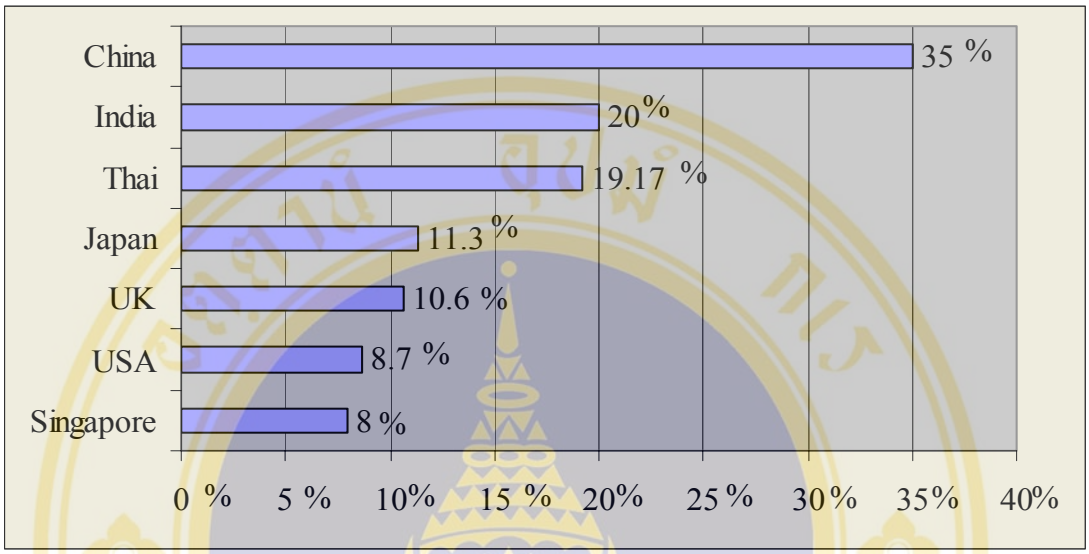

Figure 2.20 Estimated Proportion of Logistics Cost to GDP in 2002 [58]

There are improving of custom clearance process that make it to be shorten, Thailand improve process from 5 day into 1 day (1 day clearance), Malaysia transit process from 4 days into 2 hours, and Singapore transit process from 3-4 days into 10 - 15 minutes. However, Thailand still have custom clearance time more than Singapore and Malaysia.

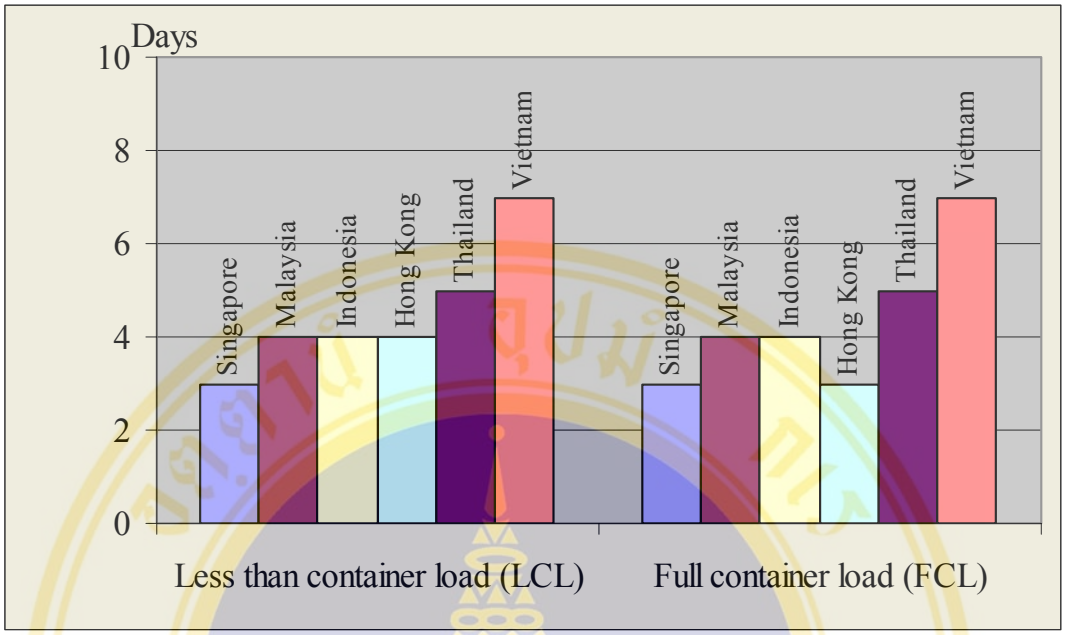

Figure 2.21 Customs Clearance Times [60]

2.8.10 Information Technology

World Development Indicators (WDI) [61] report that Thailand has 39.8 personal computers per 1,000 people ahead China, India, Indonesia, and Philippine but behind Hong Kong, Japan, Korea Rep, Malaysia, and USA while Singapore has 622 personal computers per 1,000 people ahead China, Hong Kong, India, Indonesia, Japan, Korea Rep, Malaysia, Philippine, and Thailand but behind USA. (Figure 2.22)

For internet user, it found that Thailand has 111 internet users per 1,000 people ahead China, India, Indonesia, and Philippine but behind Hong Kong, Japan, Korea Rep, Malaysia, and USA while Singapore has 509 internet user per 1,000 people ahead China, Hong Kong, India, Indonesia, Japan, Malaysia, Philippine, and Thailand but behind Korea Rep and USA. (Figure 2.22)

The total monthly Internet price is shown as the sum of monthly ISP charges and telephone usage charges and as a percentage of monthly GNI per capital. Data are generally derived from the prices listed by the largest ISP and incumbent telephone company. It found that Thailand has monthly internet price as 4.2% of Gross National Income (the total value of goods and services produced within a country (i.e. its Gross Domestic Product), together with its income received from other countries) per capital in 2004 ahead China, India, Indonesia, and Philippine but behind Hong Kong, Japan,

Korea Rep, Malaysia, and USA while Singapore has 0.6% of GNI per capital ahead China, India, Indonesia, Japan, Korea Rep, Malaysia, Philippine, and Thailand but behind Hong Kong and USA. (Figure 2.23)

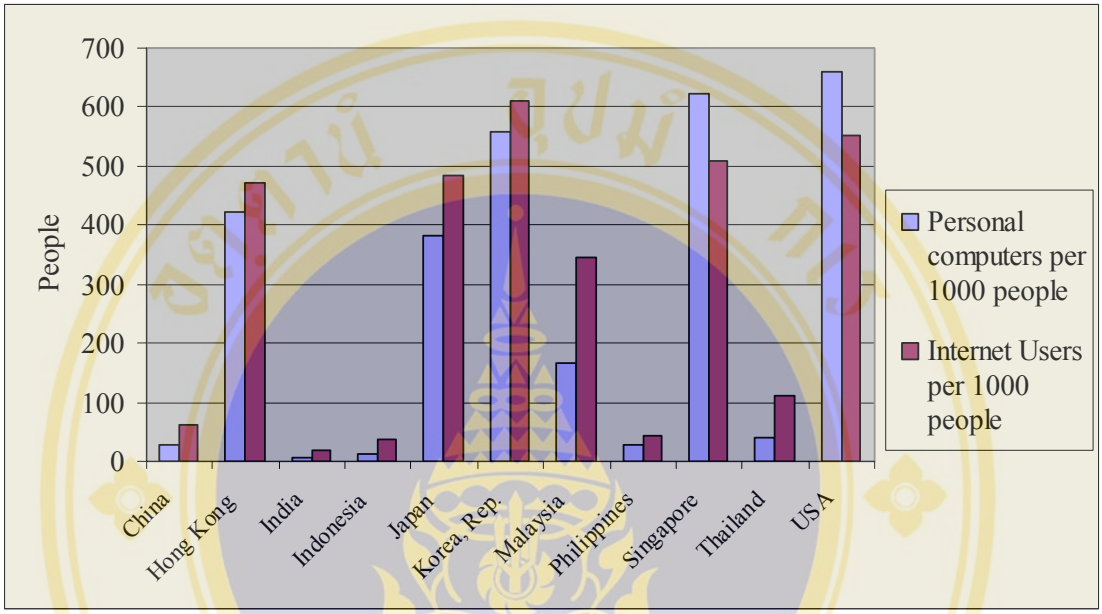

Figure 2.22 Personal computer and Internet user per 1,000 people 2003 [61]

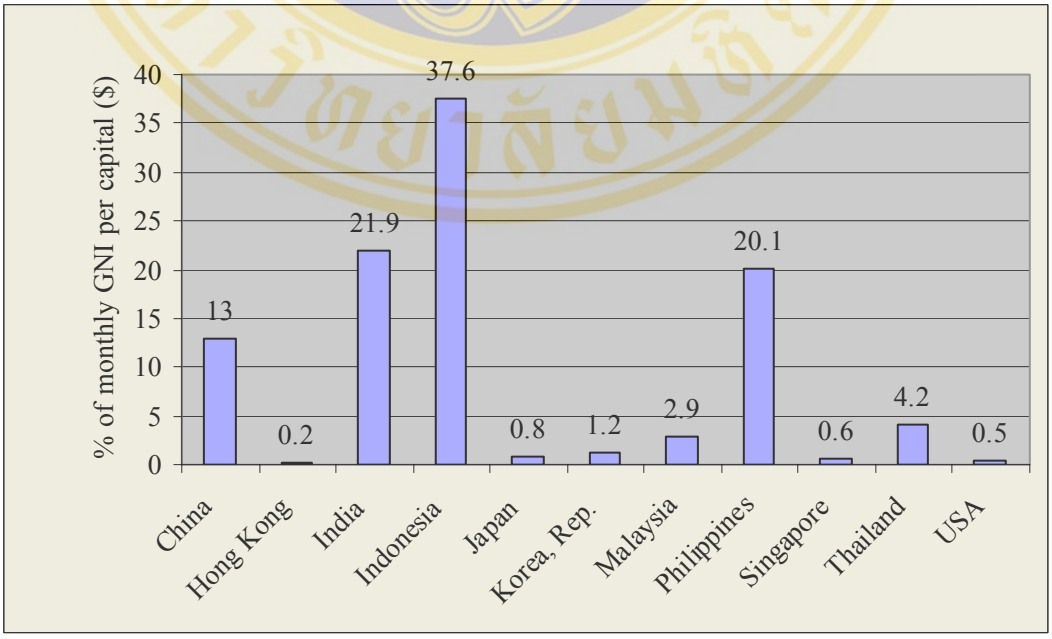

Figure 2.23 Internet price % of monthly GNI per capital ($) 2004 [61]

The number of secure servers, from the Netcraft Secure Server Survey, gives an indication of how many companies are conducting encrypted transactions over the Internet. In 2004, the report shows that Thailand has 258 secure servers ahead Indonesia and Philippine but behind China, Hong Kong, India, Japan, Korea, Malaysia, Singapore, and USA while Singapore has 981 secure servers ahead China, Hong Kong, Indonesia, India, Korea Rep, Malaysia, Philippine, and Thailand but behind Japan and USA.

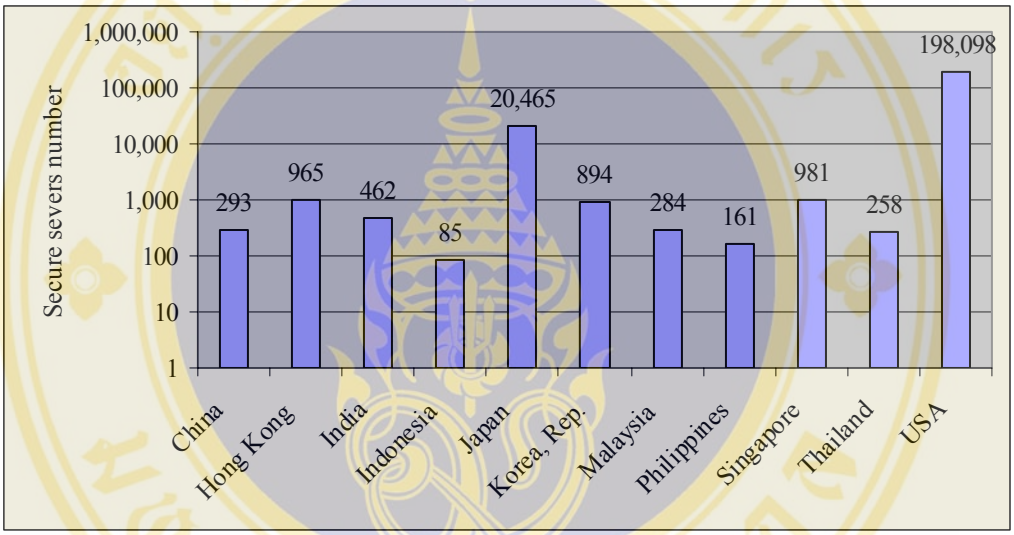

Figure 2.24 Number of secure server 2004 [61]

The data on information and communications technology expenditures cover the world's 70 largest buyers of such technology among countries and regions. In 2003, it found that Thailand has information and technology expenditures 3.5% of GDP ahead Indonesia but behind China, Hong Kong, India, Japan, Korea Rep, Malaysia, Philippine, Singapore, and USA while Singapore has the best performance in this area.

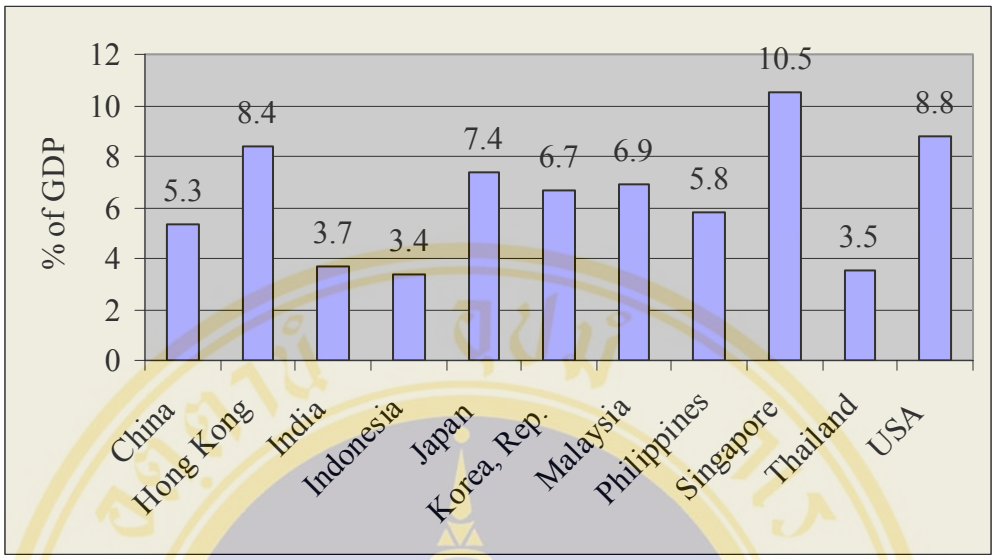

Figure 2.25 Information and communications technology expenditures 2003 [61]

2.9 Related Research

USA

In 1997, US Trip report on Council of Logistics Management Conference [62] found that two trends are highlighted in the conference with regards to logistics providers. The first trend is to provide one-stop service to their clients by expanding their scope of services. These services include carrier selection, rate negotiation, warehouse management, inventory management, logistics information services, order processing, reverse logistics, shipment consolidation, and custom clearance.

The second trend is to provide similar service in foreign markets demanded by large clients as these clients establish their global network. Logistics providers generally limit its investment initially and prefer to rely heavily upon alliance with local companies to broaden their service offering and market coverage. A survey on logistics providers by Ernst and Young Consulting highlighted the following

- Few manufacturers are entrusting in a significant amount of their supply chain activity to logistics providers

- The most commonly outsourced activities are those that have the least strategic impact on the organization.

- Only one respondent in the entire sample used a logistics provider for 10 or more logistics activities.

Some manufacturers view outsourcing as a means to learn more about how to manage a process more efficiently and then bring the activity back in house once the skill has been internalized. This could be a troubling trend for logistics providers

Interestingly, respondents indicated that software packages available commercially had the greatest impact on in the organization as compared to in-house counterparts and were more strategic in nature than operational. However, majority of respondent do not viewed IT as the silver bullet to gain a sustainable market advantage. The advantage is lost as soon as a competitor implements the same type of solution in their supply chain

A survey conducted in 1995 by University of Oklahoma and CGR management consultants has confirmed that package software is displacing in-house system but increased spending for such system can not guarantee user satisfaction.

Lieb and Hickey studied "The use of third party logistics (3PL) services by large American Manufacturers, The 2002 Survey" Sixty-five percent of the Fortune 500 manufacturers responding to 2002 survey indicated they used 3PL services. While that percentage is down slightly from the results reported in the last two annual surveys, it still indicates the extensive penetration of 3PL providers into this market. Sixty-three percent of the users identified in the 2002 survey have used 3PL services for more than five years. Their long-term experience provides a wealth of information for others considering the use of 3PL services. The average user identified in this study paid approximately one-quarter of the company's logistics operating budget to 3PL providers last year, and that is almost identical to the figure reported in 2001. The average projection of paying 32% to 3PL providers three years from now nearly matched the new high established in 2001.

The typical buyer of 3PL services uses a variety of such services, and while more than 40% of users buy those services from multiple providers, very few rely upon the services of 4PLs or logistics providers to manage those relationships. Increasingly, the most frequently used 3PL services, such as customs brokerage and freight forwarding are related to the 13 international operations of the approximately 80% of users who

buy such services outside the United States. Many 3PL users rely upon their providers for IT support, and specific IT capabilities of individual providers play an important role in the provider selection process. The most important of those capabilities are the ability to integrate the company's software and systems with that of other companies involved in the company's supply chain, the ability to operate the client's software and systems, and the ability to implement new software and systems. While nearly all 3PL users identified in this survey report involvement in E-commerce, either from a procurement or sales standpoint, very few rely upon the services of 3PL providers to support those activities.

Langley, et al [64] studied "Third Party Logistics Study : Results and Finding of the 2004 Ninth Annual Study". The year 2004 was significant for this year's study as the regions surveyed expanded from North America, Western Europe, and Asia Pacific to include Latin America. The study's findings confirm that the use of 3PL service is prevalent throughout these major regions. Although 3PL use is similar around the world, the study highlights a number of key differences. Continuing studies will be able to provide increasingly useful comparison of the 3PL industry in the major regions of the world, as well as the monitor key metrics over time.

The market trends similarities and difference exist in user's perceptions about the 3PL market place. For each of the regions, clearly the markets for 3PL service continue to change, and the expectations both buyers and sellers of 3PL services have for each other continue to rise. 3PL customers throughout the world seek competency in area such as operating efficiency and effectiveness, cost management, service delivery, information technology, and globalization. Also today market place is seeing more productive and meaningful 3PL customer relationship evolving. And yet, customers stills are able to identify area for 3PL provider to improve. Consequently, 3PL provider should focus on a number of key objective including implement capable IT, instituting effective management and relationship processes, integrating service and technology globally, and delivering comprehensive solution that create value for 3PL users and their supply chains. Considering that customer demand for performance and sophistication are accelerating, improving in areas such as these is imperative for 3PL providers.

Singapore

In 2000, Menachof [65] studied "Third Party Logistics Providers in Singapore : Trends, Opportunities and Challenge". The study is conducted through in-depth personal interviews with senior executives of leading 3PL companies in Singapore. The aims are to identify global trends in the 3PL industry, and with that to find out where the opportunities and challenges lie, what the critical success factors are, and how companies can position themselves. They found that the most 3PL companies in Singapore attempt to provide as wide a range of 3PL services to their clients as possible, with warehouse management and operation as the most commonly offered 3PL service. These companies also have extensive regional and international network, and serve a number of industries including the main ones like electronics, chemical, high-tech and computers, and consumer goods. The 3PL industry in Singapore is viewed as growing and is ahead of many of its counterparts in Asia. The key strengths of the industry include numerous factors such as good connectivity and language skill, while its main weaknesses are a shortage of qualified staff and high operating cost. There are a number of concerns and issues raised, such as lack of qualified staff, oversupply of warehousing space in Singapore, competition from the influx of foreign 3PL firms to Singapore, and regulations on free trade zone, seaport and airport, all of which may have policy implications.

With regards to global trends, the move towards greater outsourcing is the most frequently singled out broad trend. Others cited include growing pressure from customers, the rise of mega 3PL companies, and the relentless drive towards greater use of IT and e-commerce in the industry. Most of these trends identified are noted to hold in Asia countries including Singapore. The exception is M&A activity that is unlikely to occur in Singapore, due to a lack of interest among the local firms on merger.

Responding to the trend towards greater globalization, all 3PL companies are noted to expand their overseas network. They however differ in their network expansion plan, with the foreign 3PL firms more likely to focus on global expansion and the local 3PL companies more likely to consider strengthening their Asia network.

Many companies are also taking the challenge arising from e-commerce seriously, and most have at least a few e-commerce services such as pre-alert service and track and trace on offer. While acknowledging there is potential in B-to-C service, many companies do not appear keen to pursue opportunity in B-to-C actively.

To capitalize on the opportunities available and to meet the challenges, most companies are keen to position themselves as supply chain solutions providers and would like to leverage on e-commerce, information technology and information system. For the foreign companies, they would also like to position themselves as leading global players. The local companies on the other hand see themselves more as dominant Asia players or player with strong regional network and local knowledge.

The critical success factors invariably relate to resources, with having the right people being singled out as the most critical success factor of all. Others include information technology and process.

However it is also observed that there is a certain level of concern and perhaps frustration voiced out by the 3PL companies against their clients. Invariably, this is detected from the various comments made by the 3PL firms during the personal interview, such as comments like customers do not understand the complexity of and difficulty in providing logistics support in Asia, customers lack the understanding of their logistics process, and customers withhold critical information. Taken together, these comments could imply expectation between the parties is not managed properly, or that there is a gap of understanding and communication between them.

The report of “Developing Singapore into A Global Integrated Logistics Hub” [66] in Singapore report that governments all over the world have or are recognizing the strategic and economic benefits that can accrue from a thriving transport and logistics cluster. The aggressive development of infrastructure such as ports, road, and rail infrastructure, and the engagement of professional consultants to map out the development of their transport and logistics cluster are examples of the various efforts that different governments have made to promote and develop their transport and logistics cluster.

Singapore has enjoyed competitive advantage by virtue of its excellent physical infrastructure. However, these are no longer sufficient to ensure that Singapore stay

ahead of its competitors. While it is important to address the business impediments which hinder Singapore's advancement as a physical hub, it is vital that Singapore now also focus on developing high value added services. The ERC Working Group on Logistics has conclude that pursuing this holistic approach encapsulated in "Global /integrated Logistics Hub" concept could increase the economic contribution of this cluster from the existing S$12 billion to S$30-42 billion in 10 years' time.

The pursuit of a global integrated logistics hub will require an immense amount of co-ordination, effort and work from the various sub-sectors of the Cluster and governmental agencies. A champion agency to coordinate and push through difficult decisions is hence necessary to ensure that implementation is not clouded and overwhelmed by the sheer amount of work, politics and sectors to be covered.

Piplani, et al [67] studied " Perspectives on the Use of Information Technology at Third Party Logistics Service Providers in Singapore ", a specific case of interrelation between the uses of IT at the third party logistics service providers (3PLs) in Singapore is highlighted. Information collected through a randomly selected sample of 3PLs indicates that more and more service providers are either planning to incorporate IT in their operations or are benefiting from their use. Towards this end, the providers are acquiring new knowledge, skills and technologies. They found that respondents are also concerned about their investments in IT as they feel that with rapidly changing technology, their equipment, skill and processes could become obsolete before any tangible benefits could be derived from them. The providers indicate that financial justification is another key barrier to full-scale IT implementation. These constraints hinder the implementation of strategic IT projects, which require significant investments. Therefore, a package program for skill development and equipment incentive could be initiated for 3PLs in Singapore.

Thailand

Logistics Bureau (Asia) Limited studied "2002 Current Status and Future Prospects of the Third Party Logistics Industry in Thailand from Provider Perspectives" [68]. They found that the current status of the 3PL market in Thailand is somewhat fragmented. This is due mainly to the lack of market penetration by the larger 'broad service' international 3PLs and the slow up take of 3PL services by local

companies, probably due to a low perception of the 3PLs value proposition. This perception in turn, being driven by the highly competitive market, with relatively low costs and a traditional focus on cost reduction rather than service delivery.

Where there is the opportunity to add significant value, the 3PLs have made good ground. Not surprisingly, this has tended to be with the larger companies, international companies who have already had experience of utilizing 3PLs and those companies with relatively high logistics costs who do not see logistics as a core competency. They see the 3PL market in Thailand growing, although perhaps slowly. In the short term at least, it will remain a constant challenge for 3PLs to demonstrate the value add for their services, for unlike more developed 3PL markets, not only must the focus be on cost effective service, but also on highlighting some of the 'hidden value' such as reduced product damage, reduced returns, improved serve and hence sales and so on. For that section of the market that is already utilizing 3PL services, the future will hold continued pressure on pricing, but perhaps more encouragingly, 3PL customers will be seeking a broader range of 'integrated' services. This follows the trend of more mature 3PL markets.

A number of questions relating to electronic commerce were asked. A majority of the providers agreed that the rapid expansion of E-commerce provides opportunities for the 3PL industry. Most providers indicated that these opportunities exist in the area of supply chain visibility/real time information service. However, one of the providers has yet to realize the explicit opportunity from the expansion of electronic commerce, due to the lack of the necessary infrastructure and the educational requisites, caused by the immature economic development stage.

In addition, the providers were asked whether they currently provide E-Commerce support to the customers. Half of the participants do not currently provide E-commerce support, while the other half provides this support only to their major existing accounts. The service ranged from supply chain event management, inventory track and trace, reconciliation between systems, to EDI.

Hong Kong

Lai and Cheng did research "A Study of the Freight Forwarding Industry in Hong Kong" [69]. A survey questionnaire was administered to over 1,100 companies

in the industry, examining their demographic profiles, capability in providing different types of logistics services, service performance and the perceived prospects of the industry. Based on 221valid survey responses, the study results show that the industry consists mainly of small and medium-sized companies (i.e. number of employee ≤ 50). Furthermore, freight forwarding services contribute more than 60% of revenue in over 70% of the respondent companies. While many freight forwarding and many traditional logistics services, they seem to lack the ability to provide other value added services. Nevertheless, their self- assessments indicate that they perform well in different logistics services and that they are inclined to transform themselves into third party logistics providers.

Gunasekaran and Ngai studied "3PL: experiences from China resources logistics (Hong Kong)"[70]. In the research, In this paper, an attempt has been made to explain the importance of 3PL and its implications on organizational performance and competitiveness in the global market of the twenty-first century. Considering the importance of flexibility and responsiveness in logistics services, the importance of e-commerce technologies is discussed within the context of improving the performance of logistics services. In order to demonstrate the complexity of logistics operations and the application of ICT in developing an integrated logistics service system. This case study illustrates the experience of a company in Hong Kong, with reference to the strategies and technologies adopted (such as strategic alliances, partnership formation based on core competencies and internet technologies), and the integration of logistics activities with the help of ICT. Some of the critical success factors in logistics operations include:

- Strategic alliances with large clients and local 3PL providers across the world
- Web-based information systems
- Networking and relationship management
- Key performance indicators for logistics management control
- Customer relationship management (CRM)
- Joint ventures
- Innovation and benchmarking.

For commercial reasons, the case company was unable to provide detailed information on the costs and benefits of different strategies, methods and technologies,

including details on the architecture of the information systems Electronic Distribution Requirements Planning (EDRP) and MK Logistics Systems (a new logistics system adopted in company that has feature in Item ownership, out-tracing numbers, bar-codes cross-referencing, storage charges, operations charges, service charge tables and service billings, supply chain event management module, order processing module, warehouse management systems module, service and warranty module, and finance module). However, the main objective of this case study is to explain the experience of a real-life logistics company, examining their success in the management of logistics for enhanced competitive advantages.

China

In 2002, Kadar and Huang studied "The Third Party Logistics Market in China: Opportunities and Challenges" [71] to survey Market overview, Customer requirements, 3PL provider tactics, and Future trends of third party logistics in China. They interviewed about 20 major 3PL providers, shipper interviews focused on eight sectors with high potential for outsourcing. All the provider interviews were face-to-face, the shipper interviews were both face-to-face and by telephone.

The research found that the 3PL market in China is large, fast growing, in its early stage of development, and concentrated in geography. The China market for outsourced logistics was estimated to be just under US$4.8 billion in 2001. A large majority of the logistics providers surveyed reported annual growth rates in excess of 30% over the last three years. 85% of providers' revenue comes from basic services such as transportation management and warehousing; nearly 70% of providers believe clients are not ready for outsourcing, while almost half of the shippers surveyed cite obstacles for outsourcing, especially 3PL service quality. The market is very fragmented: No 3PL provider interviewed has a market share over 2%. About 80% of providers' revenues come from the Yangtse River and Pearl River Delta regions. The demands of multinational versus Chinese shippers are very different, suggesting two distinct market development paths. Many providers are seeking partners to compliment their capabilities and meet the growing challenges. Finally government initiatives are also stimulating the 3PL market in China

Dai, et al studied "2002 China Logistics Provider survey" [72]. In the survey, they targeted important questions in the areas of management, service offerings, operations, information technology, customer relations, partnerships, WTO challenges and policy issues. These questions were directly answer by high level executives in 33 leading logistics companies in China (25 domestic and 8 foreign). The result of the survey provide comprehensive first hand information about China's logistics industry. It should be pointed out that before conducting this survey they also interviewed executive of many leading logistics companies in China. The results have confirmed many existing notions, logistics companies have also unveiled a few surprises that one case in point is that, contrary to the common perception of Chinese domestics logistics companies having an advantage in domestics transportation network coverage, the foreign joint ventures in fact have a slide edged within China!

Overall, the survey results show that both domestics and foreign joint venture regard China as a market with huge growth potential. Virtually all surveyed companies offer total logistics solution in addition to many traditional logistics services, such as warehousing and transportation. Most of the country have already built extensive domestics networks, especially in Eastern China, and all of them have plans for future expansion. Road transportation is the preferred mode in China, but surprisingly and contrary to the establish notion, most surveyed companies do employ inter-modal transportation. The majority of the surveyed companies out-sources transportation but retain tight management control over operation. Overall warehousing is still at an early stage of development, with rudimentary facilities and limited use of modern information technology. The electronics products and household appliances sectors have accounted for the highest portion of revenues by logistics companies. The electronic products market is also regarded as having the highest potential growth. When it comes to future challenges, there exists a marked difference between domestics and foreign companies. Domestics companies are most concerned with the limited resources available for future expansion, while foreign companies list policy restriction and regulations as their biggest challenges. Although a surprisingly large percentage of employee in the survey companies have college equivalent or higher education, both domestics and foreign companies agree that a shortage of logistics professionals and executives is one of major concerns.

In 2003, Dai, et al study “2003 China Logistics User Survey”, [73] survey forms were distributed and collected between March and July of 2003. A diverse group of 103 firms (57 3PL service users and 46 non-users) responded to the survey. The 34 questions in the survey targeted important questions concerning users’ overall experience in outsourcing logistics operations. In particular, the questions asks users how satisfied they are on a variety of issues ranging from effectiveness, value, IT and software capabilities, and geographical coverage to quantifiable measures such as cost, asset, inventory, and lead-time reductions. The survey results added comprehensive and complementary first-hand information, including several surprises, to what was gathered in the providers’ survey.

The researchers find there is a general consensus among firms on the strategic importance of logistics. Users generally agree that their 3PL experience is somewhat a success, but with some guided reservations, as few of the users rate their experience as very successful. Firms in China appear to use 3PL providers predominantly for transportation services and management, much more so than their counterparts in North America and Europe, as all other services such as warehousing, inventory management, and custom clearance received less than half of the responses. Most users rely on internal sources for their IT solutions and are not very satisfied with the IT capabilities of the 3PLs. Most users have good but not strong feelings about the value of their 3PL services, which contrasts sharply with the impressive results 3PL providers can deliver for their clients. In most cases logistics costs, fixed logistics assets, and inventories are greatly reduced and various customer service levels are drastically improved. Contrary to the conventional wisdom, few firms avoid outsourcing solely because they are not able to shed their logistics assets and personnel. Non-users have reported a number of other equally or more important reasons, the most widely cited being their own expertise in logistics and the belief that logistics is too important to outsource. On average, domestic state-owned enterprises (SOEs) and foreign firms plan to increase their logistics expenditures, while interestingly some domestic non-SOEs plan to reduce it. One of the biggest surprises is that users of domestic 3PL providers have reported a higher rate of satisfaction than users of foreign and joint venture (JV) 3PL providers. Even more surprisingly, the higher satisfactions are recorded in virtually all areas of services, even in areas such as

technology delivery to clients, consultative and knowledge-based skills, and on-time delivery, areas we have least expected. Similarly, foreign and JV users, employing a larger percentage of foreign and JV providers, are least satisfied with their 3PL experience, particularly in terms of value for money.

Others

Viswanadham and Gaonkar studied "Understanding E-Supply chains Design and Future Trends" [74], they found that the rise of the internet has enable information driven E-supply chains that posses unique properties, which are critical in the global economies of tomorrow. The establishment of an e-supply chain requires universal supply chain visibility, which in turn can only be achieved through integration of the information systems of all supply chain partners. Greater value can be derived by harnessing this visibility in the development of supply chain automation and planning tools that will increase productivity, flexibility, and responsiveness of the e-supply chain. Some of the solution that will increasingly form part of these e-supply chains include electronic marketplaces, collaborate exchanges and B2B process controllers. E-supply chain will also be increasingly customer centric and will promote out-sourcing of non-core activity in the chain.

Eyefortransport global research studied "The European 3PL Market : A synoptic overview of emerging trends & opportunities" [75], they reported that the European 3PL market is currently going through a fundamental redefinition. An increase in the globalization process, the role of IT and a series of acquisitions and mergers, are fast transforming the 3PL industry. The business models that supported "arms length" relations with customers are no longer attractive or desired. The new focus is on integrated logistics as "one-stop" solutions. There is also a significant migration from asset-based logistics to value-added and integrated contract logistics solutions.

Transportation, warehousing and distribution services are traditionally managed like commodity service businesses. Margins in such asset-based basic services are declining and there is definitely more value to be realized in the value-added segments. Price is, and has been the key to sustaining bottom-line. Presently, revenues from basic services such as overland transportation constitute 50-80 per cent of the

sales revenues of 3PL companies. Most 3PL providers, including some of the larger operators, are limited in their ability to offer economies of scale to improve their cost structures on a trans- European level. Incremental growth in business volume does not necessarily have desirable impacts on reducing operating costs. The 3PL solutions now demand additional investments to bring about network expansion and organizational growth to be able to offer value-added solutions. For example, a firm that is going to provide an international 3PL service would look at business trends for the industry to be served, information technology needs, outsourcing, international sourcing, political stability of key countries and other factors that affect the growth of the 3PL market. This enables the potential 3PL to understand the market and define the service segments against which the firm will have to compete.

A prospective 3PL needs to break down the market by the industries in which they intend to compete and evaluate the market opportunities. Profiles of customers and competitors within the market segments should be developed that recognize and quantify the size, market share, cost and product data, short-range changes in the market and long-range trends and expectations.

Jaana Auramo, et al of Helsinki University of Technology in Finland studied "Benefit of IT in supply chain management : an explorative study of progressive companies" [76]. The objective is to provide empirical evidence of benefit from IT in supply chain management. Data in this qualitative study were collected through multiple enquiries. Supply chain management consultant interviews gave an understanding of the current state of practice. A survey of 48 progressive companies was conducted to identify what IT solutions they have implemented in supply chain management. This was followed by 18 in-depth case studies to identify the mechanisms for achieving benefit of IT in supply chain management.

Based on the empirical studies five proposition are presented on the use and benefits of IT. First successful companies have develop focused e-business solution for improving customer service elements that are most important in their business. Second, improved efficiency allows company personnel to focus more on critical business activities. Third, the use of e-business solutions improves information quality. Fourth, e-business solution support planning collaboration and improved

agility of the supply network. Finally, to gain strategic benefits, the use of IT has to be couple with process redesign.

CHAPTER III
METHODOLOGY

3.1 Population and Example Group

A stratified random sampling was adopted for the survey. The database of logistics provider is available in The database of 3PL come from Ministry of Commerce for 2004 [77] and a guide book “A Guide to Export-Import Transportation” published by Inter-trade publication. [78]

In order to do this research, the three core logistics businesses are defined as the following;

- **Transportation** companies that provide transport service to customers;
- **Warehousing** companies that offer public, shared use, and/ or dedicated storage services;
- **Freight Forwarding** companies that coordinate freight movement and documentation for containerized cargo.

A total of 500 logistics companies based in Thailand were randomly selected to the survey.

In addition the 6 companies from the survey respondents which have amount turn over more than 100 million baths that 3 companies are local firms and 3 firms are foreign firms will be interviewed.

3.2 Data Gathering

There are 2 steps in gathering data from example group ;

1. Questionnaire : To gather data in the first step is using questionnaire which develop from *The National University of Singapore (NUS*) ’s questionnaire. The survey is divided into 4 parts (Appendix) ;

- **Part I : Current Profiles of 3PL Companies in Thailand.**

This section will help to understand the company profile such as core business area, prizes or standards of organization, customer base in and outside Thailand, ownership and revenue, the number of employees, and mode of transportation.

- **Part II : Companies Strategies and Direction for Logistics Service.**

The second part will provide strategies to develop logistics service in company, average response time for customer order inquiry, and logistics performance metrics of 3PL firms in Thailand.

- **Part III : IT Applications and Infrastructure Deployment.**

The third part will determine the implementation status of IT applications in 3PL companies such as transaction system, planning system, logistics management system, and new applications including e-commerce, standard of information exchange between organizations, and status of adopting technology into organization.

- **Part IV : Company Achievements and Future Directions.**

In the final part, the questions are designed to find the company achievements through implementing IT, prime motivators for adopting IT and barriers to usage IT of 3PL companies, important IT skills for personnel in 3PL companies to support logistics.

2. Interview : According to second step for gathering data, there is structure interview to senior executives of 6 major leading 3PL providers in Thailand which are 3 local companies and 3 foreign companies to collect information in the policy level that divided into 4 parts (Appendix) as shown in the below ;

- **Part I : General Trends of 3PL Companies in Thailand.**

This section will describe about general trends of 3PL firms such as core policy and general strategic of companies.

- **Part II : Globalization, Supply Chain and E-Commerce Trends of Companies.**

The questions for second part are design to find reacting of 3PLs to globalization world, trends of developing supply chain management in organization, and trends of using e-commerce in their businesses.

- **Part III : Positioning & Critical Success Factors of Companies.**

The third part will identify the positioning of organizations and the critical factors that make companies successful in 3PL market.

- **Part IV : Opinion about General Concept of 3PL in Thailand.**

The final part will determine the general concept of 3PLs in Thailand in their perspectives such as current status of 3PLs market in Thailand, the strengths and weakness of local and multinational 3PLs.

3.3 Pilot Testing

After design the questionnaire, there is pre – testing to five 3PL companies to check understanding about the question in questionnaire.

In order to interview, the direction and question to interview must be approved by 2 professors of logistics and 1 professor of information technology.

3.4 Data Analysis

In order to analyze data, the combination of questionnaire evidence and interview evidence will use in the separation of the analyses of quantitative and qualitative data that when a pattern from questionnaire is collaborated by the evidence from structure interview, the finding is stronger and better ground. [79] The difference found significant are noted in the paper but those found non-significant are not identified.

1. Quantitative Analysis : The analysis will use the questionnaire evidence and transform into descriptive statistical to show the result of survey in graph and table forms that can keep us from being carried away by vivid, but false impressions in qualitative data, and it can bolster findings when it collaborates the findings from qualitative evidence. [80]

2. Qualitative Analysis : The analysis will use the structure interview evidence to compare the pair of local 3PLs and foreign 3PLs, then list the similarities and differences between pair and concluding in table form that the juxtaposition of seemingly similar cases by a researcher looking for differences can break simplistic

frames. In the same way, the search for similarity in a seemingly difference pair also can lead to more sophisticated understanding. The result of these forced comparisons can be new categories and concepts which the investigators did not participate. [80]

The evidence of analysis are from questionnaire and structure interview. After quantitative and qualitative analysis we will get the conceptual of 3PLs in Thailand then the other researches involve 3PLs of other countries that especially focus on Singapore which is a leader of logistics and supply chain management will be compare to find status of Thailand's 3PLs in Asia and find the direction to develop 3PLs in Thailand.

3.5 Research Schedule

Activities	Month																							
	1				2				3				4				5				6			
1. Review literature	*	*	*																					
2. Identify potential issues for logistics study			*	*	*																			
3. Pilot test					*	*	*																	
4. Select 3PLs for investigating						*	*	*																
5. Gathering data by question-aire									*	*	*	*	*											
6. Select 3PL companies for interview													*	*										
7. Gathering data by interview															*	*	*	*	*					
8. Data analysis												*	*	*					*	*	*	*		
9.Docum-entation																						*	*	*

Table 3.1 : Research Schedule

CHAPTER IV
RESULTS

This chapter consists of two parts. The first part is the report of the survey by questionnaire. The second part is the report of the interview.

The propose of first part is to investigate 3PLs in Thailand and Singapore. Investigating 3PLs in Thailand provides current profiles of 3PL companies in Thailand**,** companies strategies for logistics service, IT applications and infrastructure deployment, and company achievements and future directions. For Singapore, there are 4 part as profile of logistics industry in Singapore, logistics service of 3PLs in Singapore, status of IT implementation within the industry, and motivation and barriers in using IT for logistics operations.

The second part use structure interview with senior executives of major leading 3PL providers in Thailand to collect information in the policy level that aim to identify general trends of companies, to identify globalization, supply chain and e-commerce trends of companies, to identify positioning & critical success factors of companies, and to know opinion about general concept of 3PL in Thailand in executive view.

The results of the research will be shown in two parts for this manner.

4.1 Report of the Survey

Thailand

A 500 questionnaires were randomly sent to 3PL companies whose core business fall within the 3 key areas namely ; Transportation, Warehousing or Freight Forwarding by mail with a pre-paid envelope attached.

At the close of the survey, there are 72 valid from respondents, The response rate is 14.40%. Some of the respondents have indicated that they are operating in more than 1 core logistics business, and therefore the total number of responses exceeds the

number of respondents. A breakdown of the 72 companies by different core business is shown in Table 4.1.

Table 4.1 Percentage of core businesses operated by 72 respondents

Core business	No. of responses	Percentage
Transportation	32	37.65
Warehousing/ Distribution	17	20
Freight Forwarding	36	42.35
Total	**85**	**100**

Part I : Current Profiles of 3PL Companies in Thailand

The majority of respondents (90.3%) are local companies. In term of foreign-owned companies, there are 6.47% Asia companies, 2.16% Europe companies and 1.07% USA. (Figure 4.1)

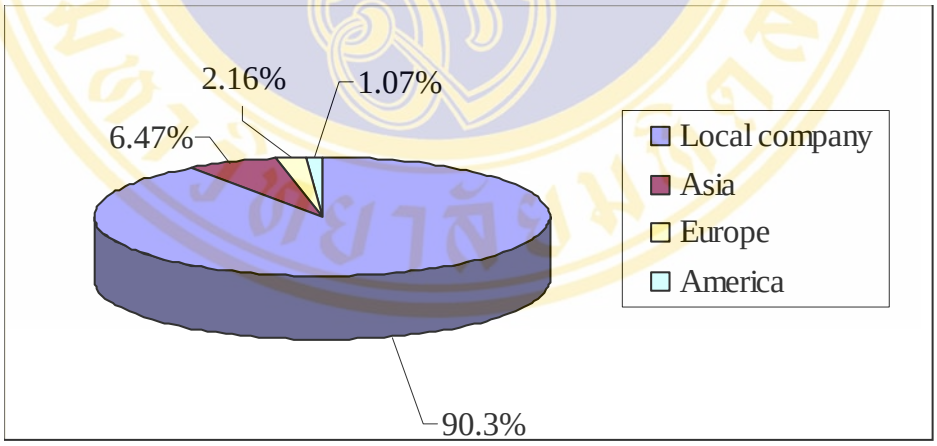

Figure 4.1 Profile of respondents by country of origin : Thailand

Most of the respondents (50.7%) have business operation breadth between 0–3 years. 33.1% of the respondents have operated companies for 4-10 years, 10.1% are the companies who have operated between 11-20 years and the smallest percentage (4.2%) have operated companies more than 20 years. (Figure 4.2)

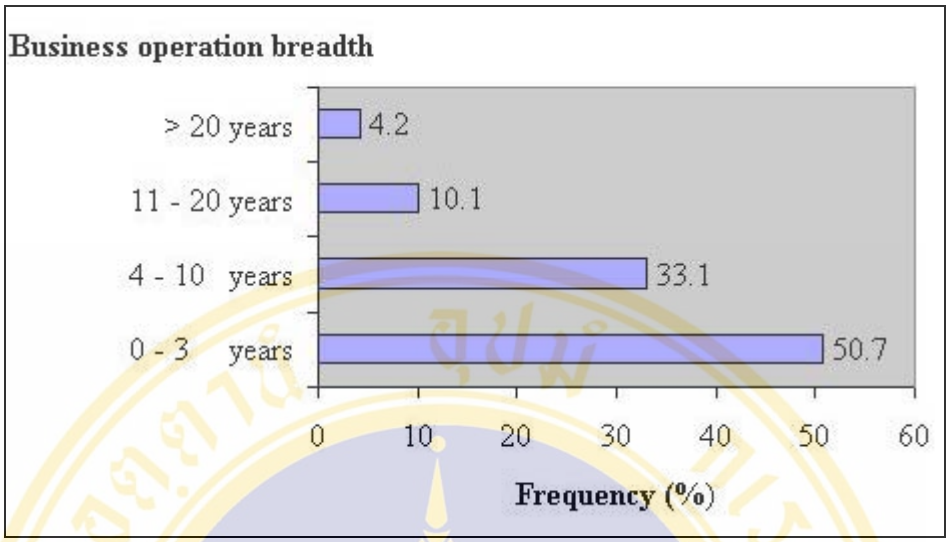

Figure 4.2 Business operation breath of respondents

The majority of respondents (70.4%) have only 1 branch to operate. There are 14.1% have 2-5 branchs. Number of branch between 6-10 branchs and more than 20 branchs are 5.6%. In addition, there are 4.2% have 11-20 branchs. (Figure 4.3)

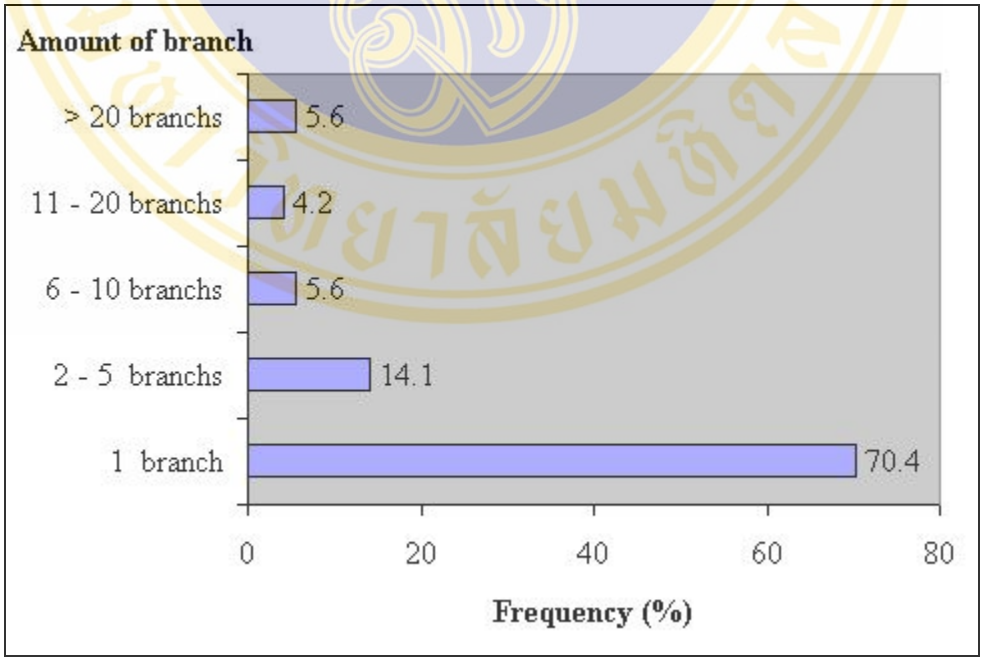

Figure 4.3 Number of company branch of respondents

Most of respondents (87.5%) do not have national standard or prize in operation, they have own standard to manage and finish their work. Without this, there are 7% have ISO 9001, 2.8% have ISO 9002, 2.8% have Licensed custom broker, 1.4% have Responsible care and 1.4% have ISO 9000. (Table 4.2)

Table 4.2 Standard/ Prize of respondents company

Standard/ Prize of companies	Percentage
None	87.5
ISO 9000	1.4
ISO 9001	7
ISO 9002	2.8
Responsible care	1.4
Licensed custom broker	2.8

P.S. : A company can have more than one standard/ prize**.**

The highest percent (71%) of operating revenue for 2004 have turnover less than 25 million bath. There are 7.2% have revenue operating 26-50 million bath, 51-100 million bath and 101-250 million bath. The operating revenue companies between 251-500 million bath are 5.8% and more than 500 million bath are the smallest (1.4%). (Figure 4.4)

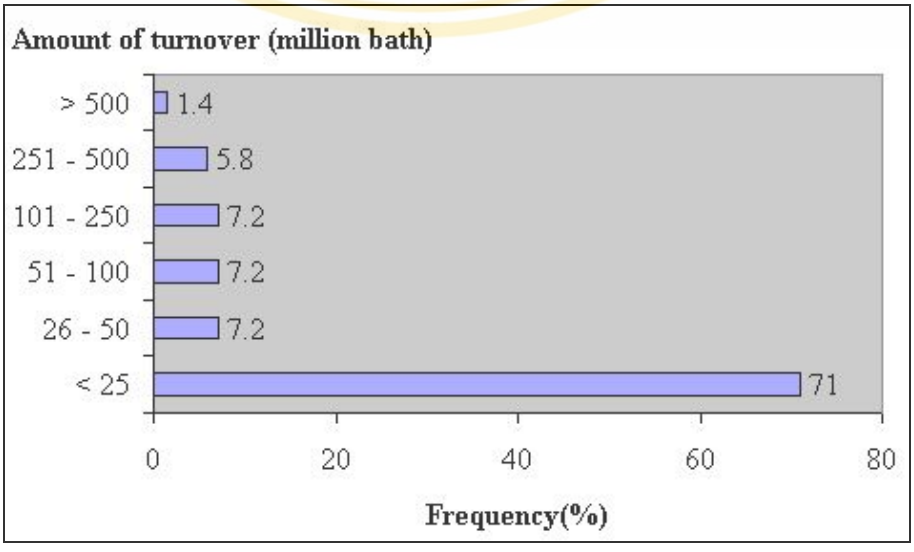

Figure 4.4 Profile of respondents' operating revenue for 2003 : Thailand

Most of 3PL have 1 – 3 IT employees (40.5%) and none IT employees for 37.7% in 3PL companies. There are 4 – 10 IT employees for 20.1% and least of percentage in IT employees is 11 -20 employees (1.4%). (Table 4.3)

For the number of total employee, the highest percent (69.6%) of 3PL have 1 – 25 employees in companies, 26 -100 employees is the minor percentage (24.6%) of company's employees. There are 4.4% which have101 -200 employees in companies and more than 200 employees is 1.4% (Table 4.3)

Table 4.3 Employee profile in IT function

Employment	Percentage
Number of employees in IT function	
None	37.7
1 – 3 employees	40.5
4 – 10 employees	20.1
11 – 20 employees	1.4
More than 20 employees	0
Number of total employees	
1 – 25 employees	69.6
26 – 100 employees	24.6
101 – 200 employees	4.4
More than 200 employees	1.4

Top 6 goods that 3PL always service to do logistics activity to customers are mechanical (52.9%) and textile (52.9%), chemical (51.5%), electronics (51.5%), consumer products (51.5%) and food/ drink (51.5%). (Figure 4.5)

For the number of customer, it was found that most of 3PL companies (50.7%) have 20 – 99 customers, 29.6% have 5 – 19 customers, 11.3% have less than 5 customers and the least (8.5%) of 3PL companies have more than 100 customers. (Figure 4.6)

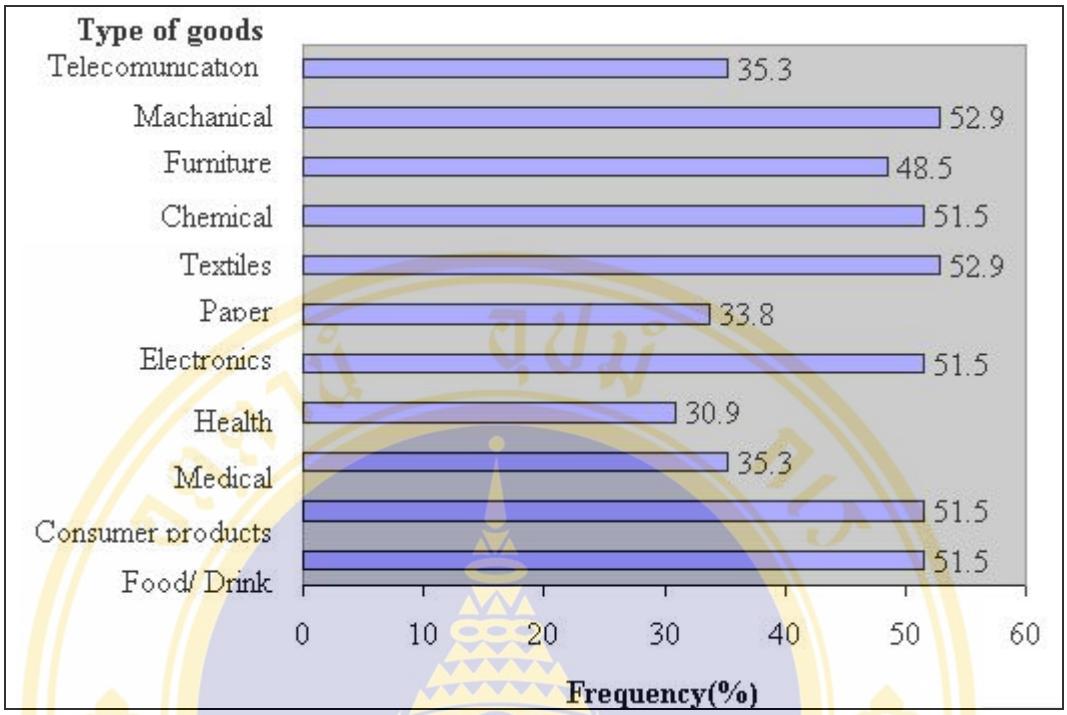

Figure 4.5 Type of goods which company service to customers

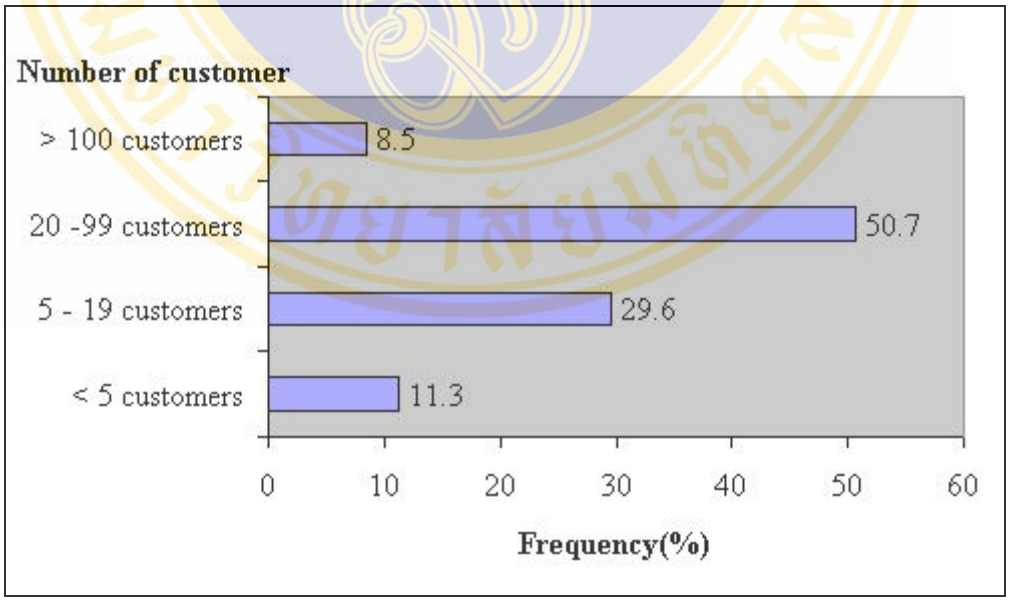

Figure 4.6 Number of customers

Most of 3PL's customers (94.4%) is the private company, 30.6% is the oversea company, 26.4% is people, 9.7% is the government-linked company and the least percentage (8.3%) is the government. (Figure 4.7)

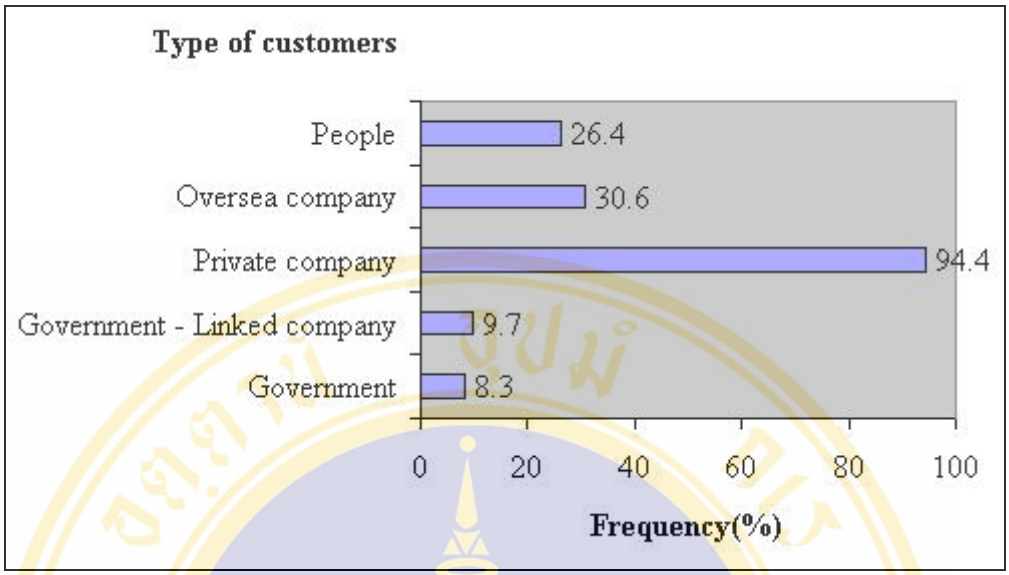

Figure 4.7 Type of customers

Top 5 services that 3PL companies always serve to customers are customer service (81.9%), traffic and transportation (77.8%), packaging (40.3%), logistics communication (36.1%) and warehousing and storage (29.2%) (Figure 4.8)

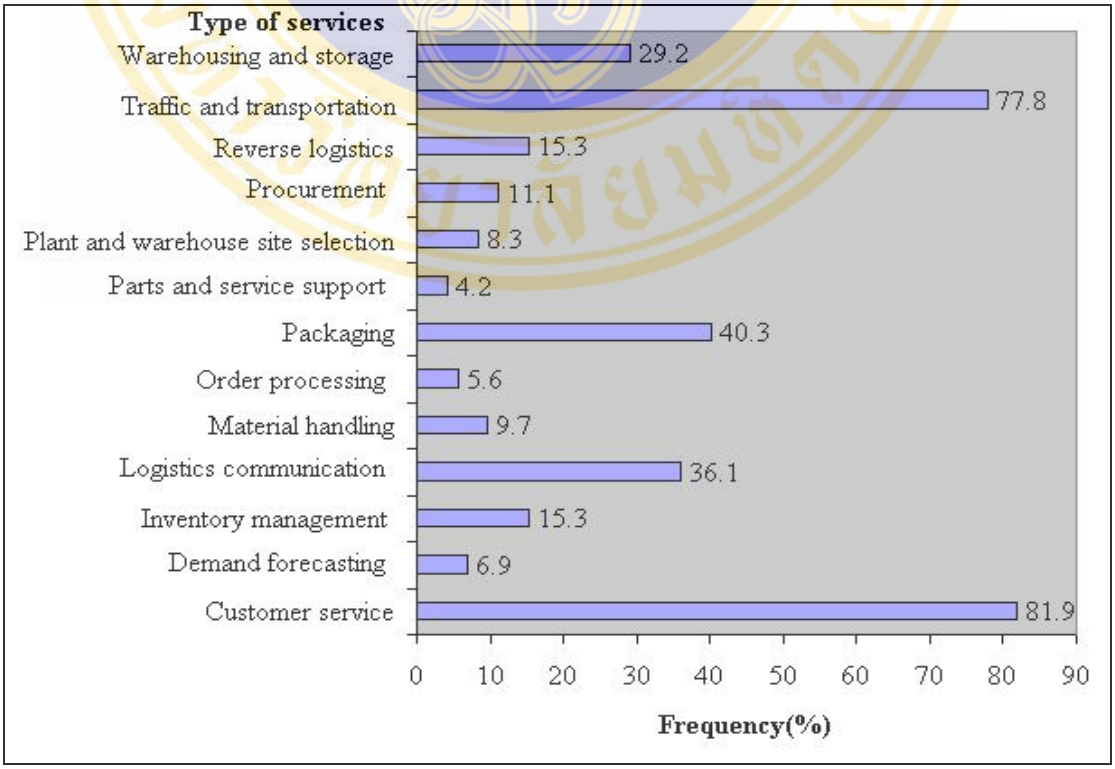

Figure 4.8 Type of services to service customers

The least 5 services that 3PL companies lack to service customers are parts and service support (4.2%), order processing (5.6%), demand forecasting (6.9%), plant and warehouse site selection (8.3%) and material handling (9.7%). (Figure 4.8)

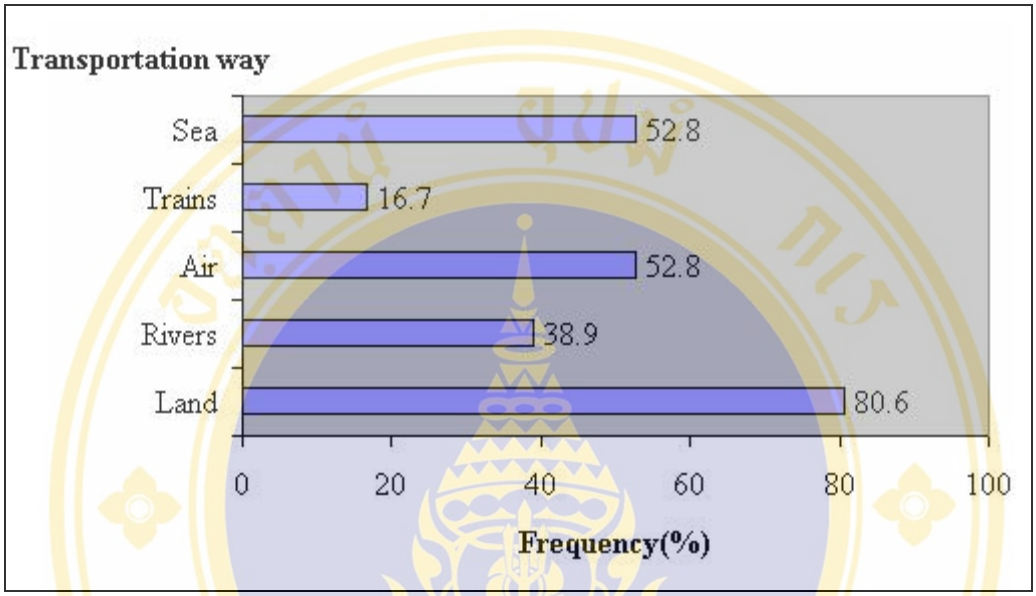

Figure 4.9 Transportation modes

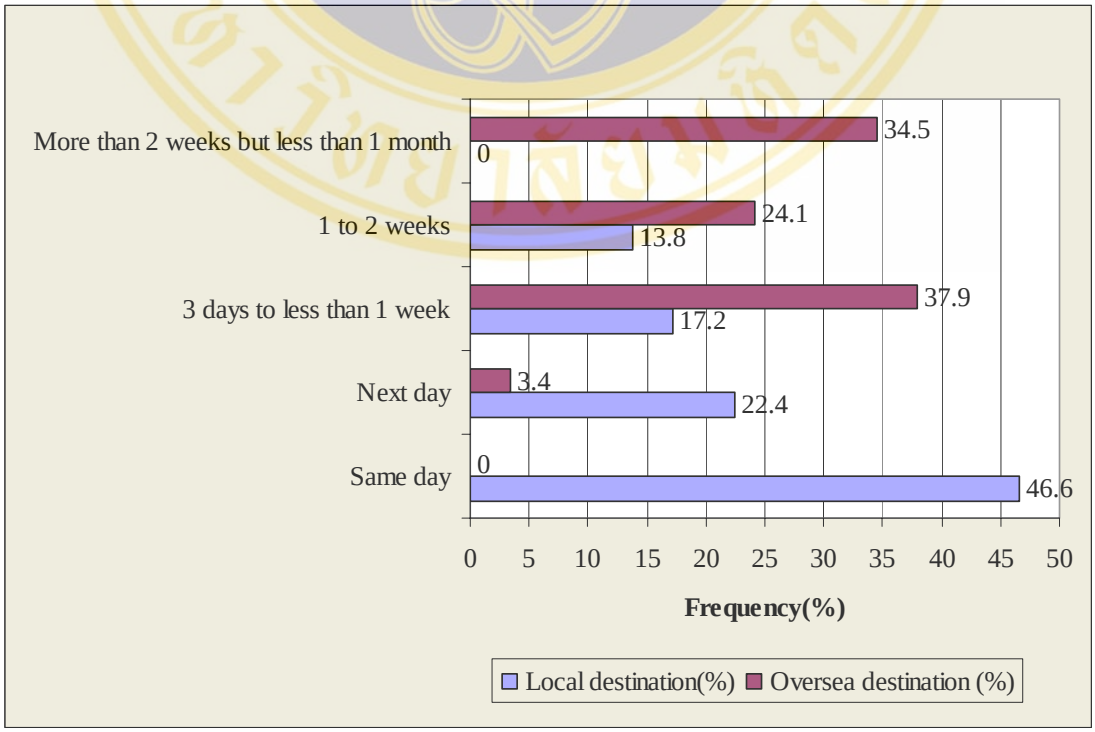

Figure 4.10 Average turn around time for good delivery

The highest percent (80.6%) of 3PL companies transports goods to destination by land transportation, 52.8% by sea transportation and air transportation, 38.9% by river transportation and the lowest percent (16.7%) transports goods to destination by train transportation. (Figure 4.9)

The major percentage (46.6%) of average turn around time for good delivery in local is the same day, the minor percentage (22.4%) is the next day, 17.2% is 3 days to less than 1 week and 13.8% is 1 to 2 weeks but none has average turn around time for good delivery in local more than 2 weeks. (Figure 4.10)

Most of average turn around time for good delivery in oversea (37.9%) is 3 days to less than 1 week, 34.5% is more than 2 weeks but less than 1 month, 24.1% is 1 to 2 weeks and 3.4% is next day but none has average turn around time for good delivery in oversea in the same day. (Figure 4.10)

Part II : Companies Strategies and Direction for Logistics Service

Top 5 of strategies adopted by organizations are time based logistics (agree : 79.7%), logistics performance (agree : 79.1%), strategic alignment of IT (agree : 72.3%), business partnerships (agree : 70.6%) and standardization (agree : 64.6%) respectively. (Figure 4.11)

According to the figure 4.12, average response time for customer enquiry of majority (40.6%) is immediately, minority (36.2%) is 1/2 hour, 17.4% is 1/2 – 1 hour, 4.3% is more than 1 hour but less than 4 hours and the least (1.4%) is more than 4 hours.

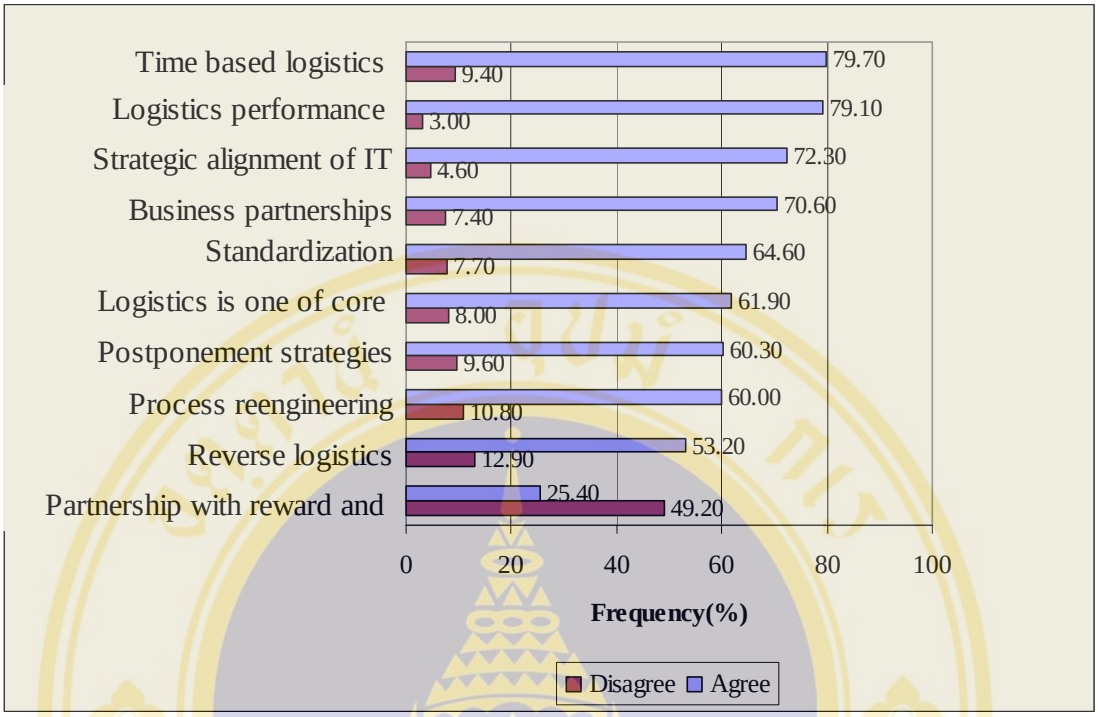

Figure 4.11 Strategies adopted by organizations

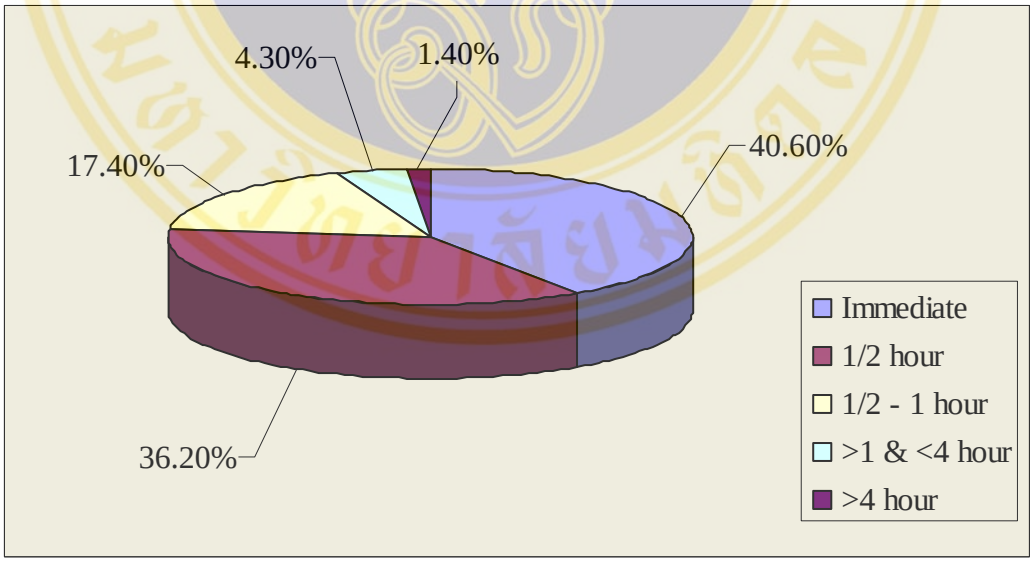

Figure 4.12 Average response time for customer enquiry

There is 52.1% of 3PL companies have measurements for logistics performance. Top 3 logistics performance have measured by on-time delivery (74.2%), accurate, complete & damage-free delivery (59.7%) and data accuracy (39.8%) respectively. (Figure 4.13)

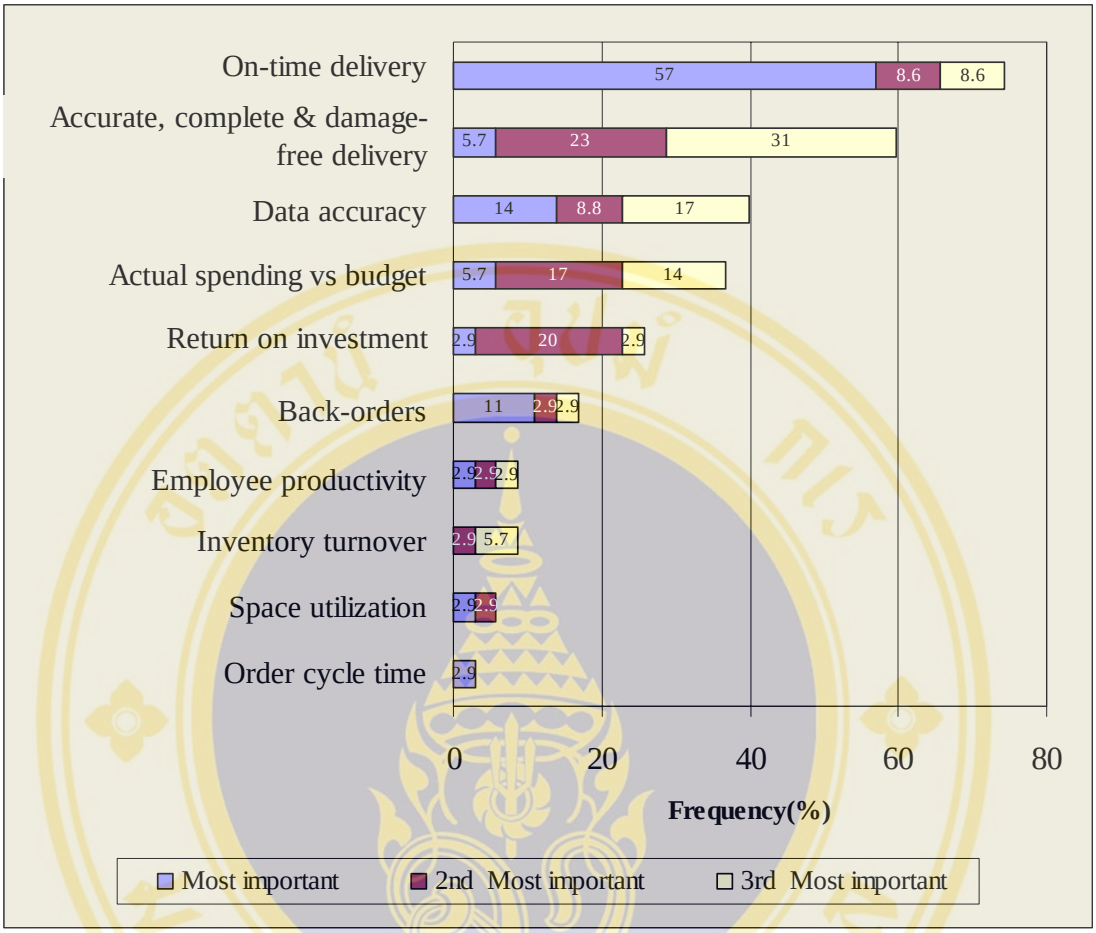

Figure 4.13 Logistics performance metrics

Part III : IT Applications and Infrastructure Deployment

According to implementation status of IT applications in 3PL companies (transaction system), most of them (71.2%) is implemented/ implementing financial management system, minority (44.7%) is implemented/ implementing inventory management system, 40% is implemented/ implementing purchasing management system, 29.3% is implemented/ implementing sales order processing system and the least (28.2%) is implemented/ implementing production control system. (Figure 4.14)

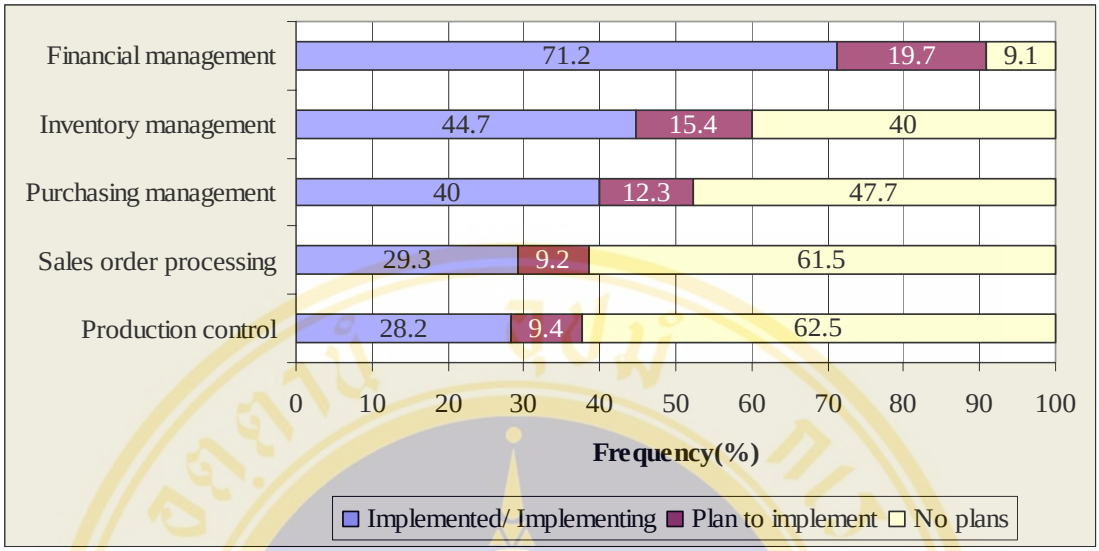

Figure 4.14 Implementation Status of IT Applications in 3PL companies (Transaction Systems)

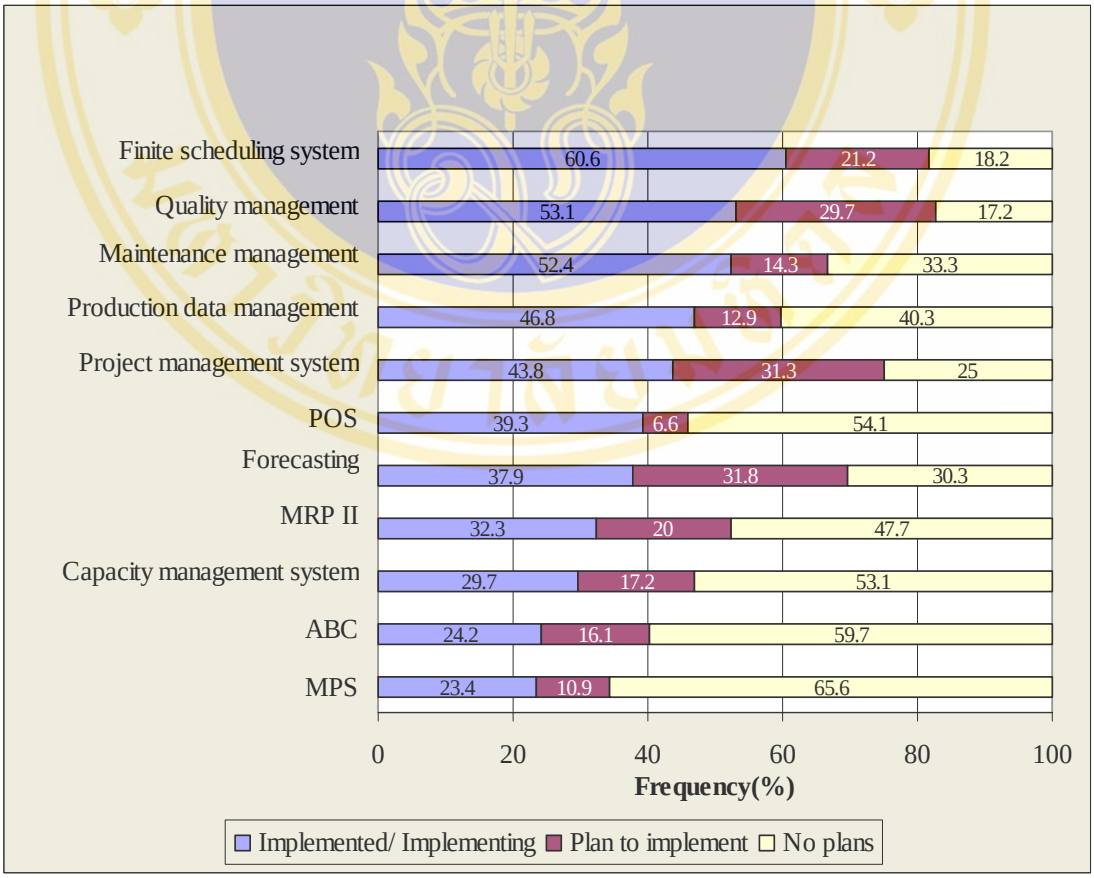

Figure 4.15 Implementation Status of IT Applications in 3PL companies (Planning Systems)

Top 5 of implementation status of planning system in 3PL companies are finite scheduling system (60.6%), quality management system (53.1%), maintenance management system (52.4%), production data management system (46.8%) and project management system (43.8%) respectively. (Figure 4.15)

For logistics management implementation status, majority (72.1%) of implemented/ implementing is transportation management system, minority (43%) is distribution resource planning system, 41.5% is warehousing management system and the least (40.3%) is customer service and returns system. (Figure 4.16)

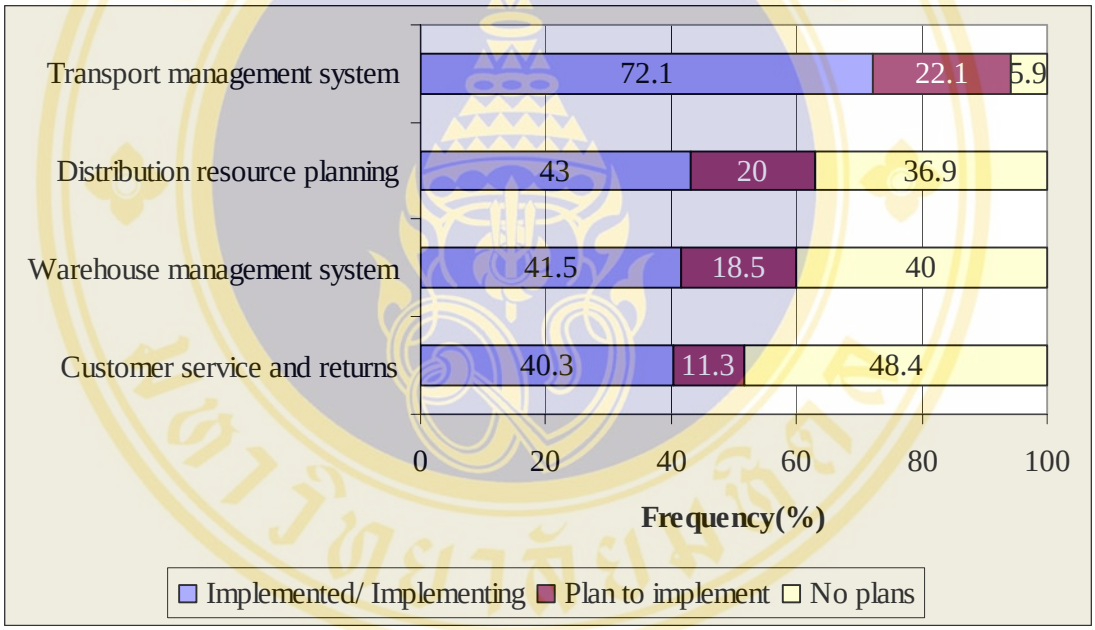

Figure 4.16 Implementation Status of IT Applications in 3PL companies (Logistics management system)

According to new applications implementation status, Most of 3PL companies (70.7%) is implemented/ implementing time management system, 62.5% is implemented/ implementing customer relationship management system (CRM), 31.8% is implemented/ implementing logistics network modeling system, 29.7% is implemented/ implementing supply chain planning system (SCP) and the least (16.2%) is implemented/ implementing laboratory information management system (Lab IS). (Figure 4.17)

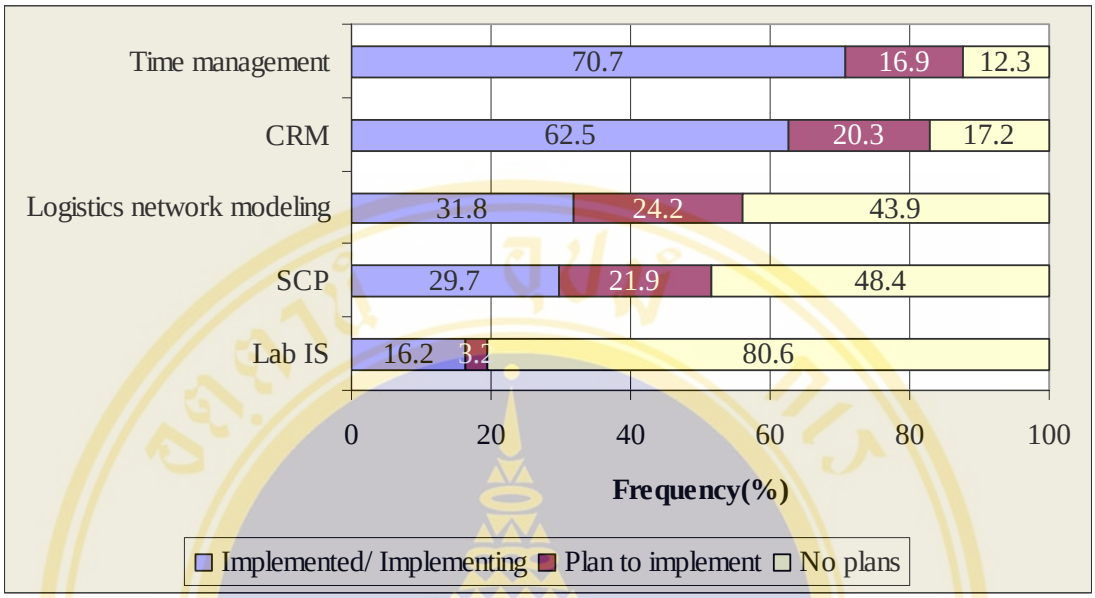

Figure 4.17 Implementation Status of IT Applications in 3PL companies (New applications)

E-commerce service using in 3PL companies, it was found that only 23.6% use e-commerce to service customers. The major (80%) of 3PL companies use delivery monitoring service, 40% use track and trace service and 30% use Checking stock status online service and pre-alert service. (Figure 4.18)

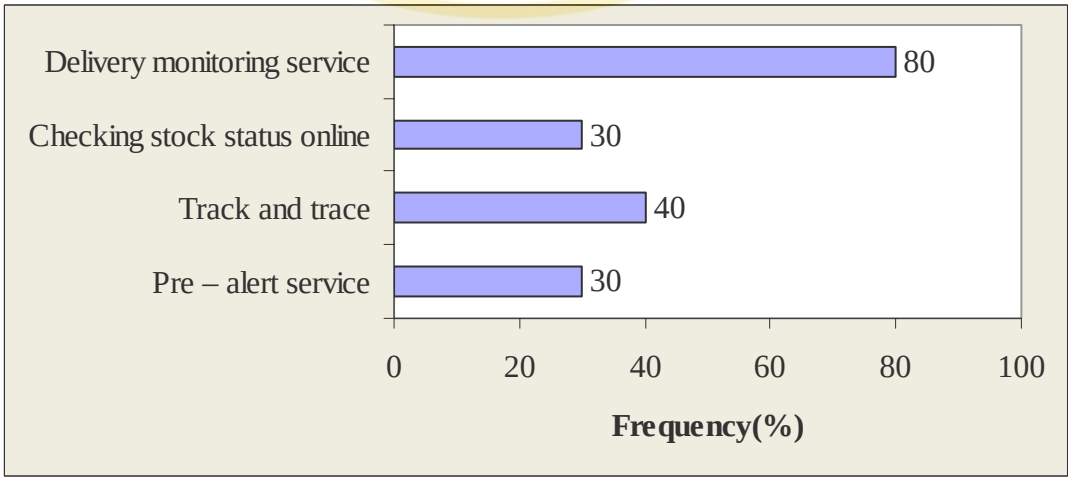

Figure 4.18 E-commerce services using

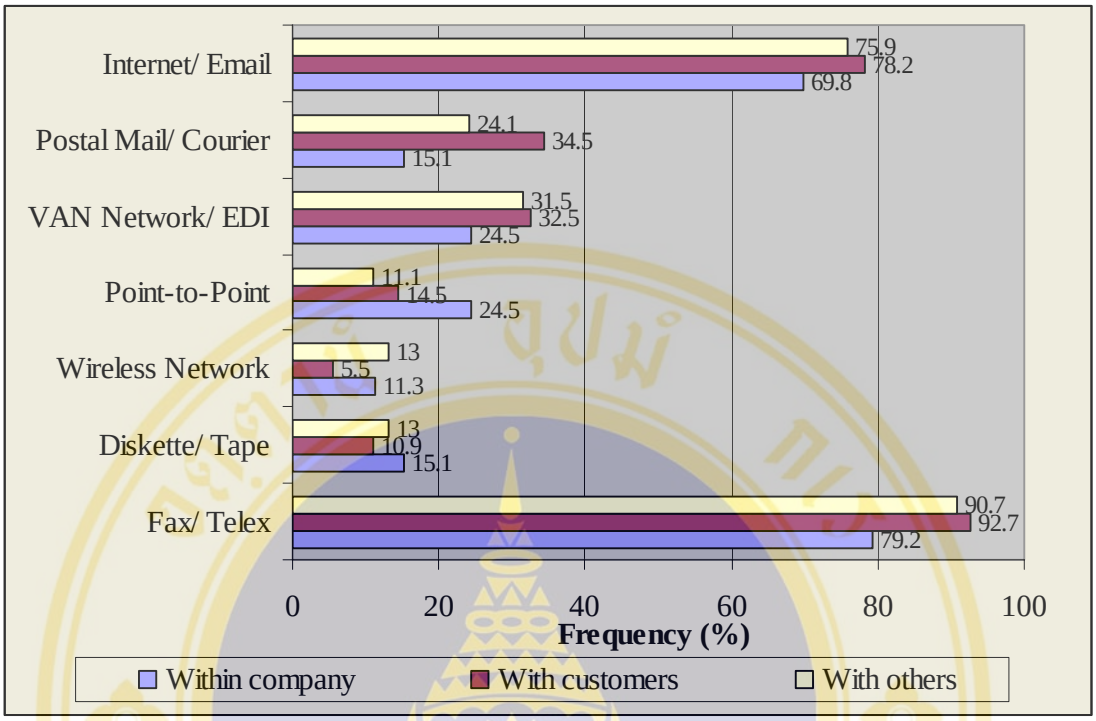

Figure 4.19 Standard for information exchange between organizations

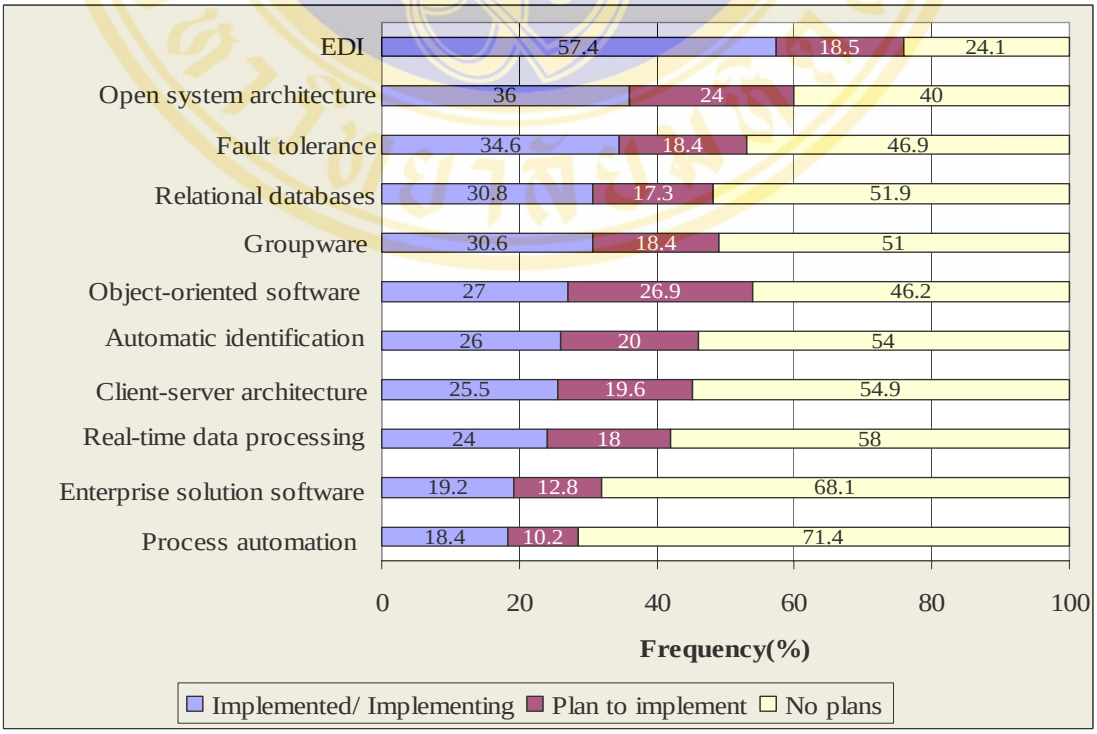

Figure 4.20 Status of adopting technology into organization

For standard of information exchange between organizations, it was founded that Top 3 of Standard Information exchange between organizations are Fax/ Telex (within company 79.2%, with customers 92.7% and with others 90.7%), Internet/ Email (within company 69.8%, with customers 78.2% and with others 75.9%) and VAN Network/ EDI (within company 24.5%, with customers 32.5% and with others 31.5%) respectively. (Figure 4.19)

According to status of adopting IT into organization, Top 5 of 3PL technologies implemented/ implementing in companies are EDI (57.4%), open system architecture (36%), fault tolerance (34.6%), relational databases (30.8%) and groupware (30.6%) respectively. (Figure 4.20)

Part IV : Company Achievements and Future Directions

For company achievements through implementing IT , the result shows that top 3 achievements of companies are improve data quality (agree : 80%), cost reduced (agree : 75.9%) and more reliable delivery (agree : 75%). (Figure 4.21)

Top 3 prime motivators for adopting IT of 3PL companies are reducing data entry errors (critical : 28.8%), decreasing labour cost (critical : 28.8%) and reducing order cycle time (critical : 28.4%) respectively. (Figure 4.22)

Top 5 barriers to usage IT of 3PL companies are lack of education (agree : 71.6%), integration with legacy system (agree : 65.2%), unaware of new technology (agree : 58.2%), organization (agree : 56.1%) and financial justification (agree : 55.4%) respectively. While most of the respondents (68.2%) do not agree that IT is not a necessity, and 47.7% do not agree that there is high failure rates of implementation. (Figure 4.23)

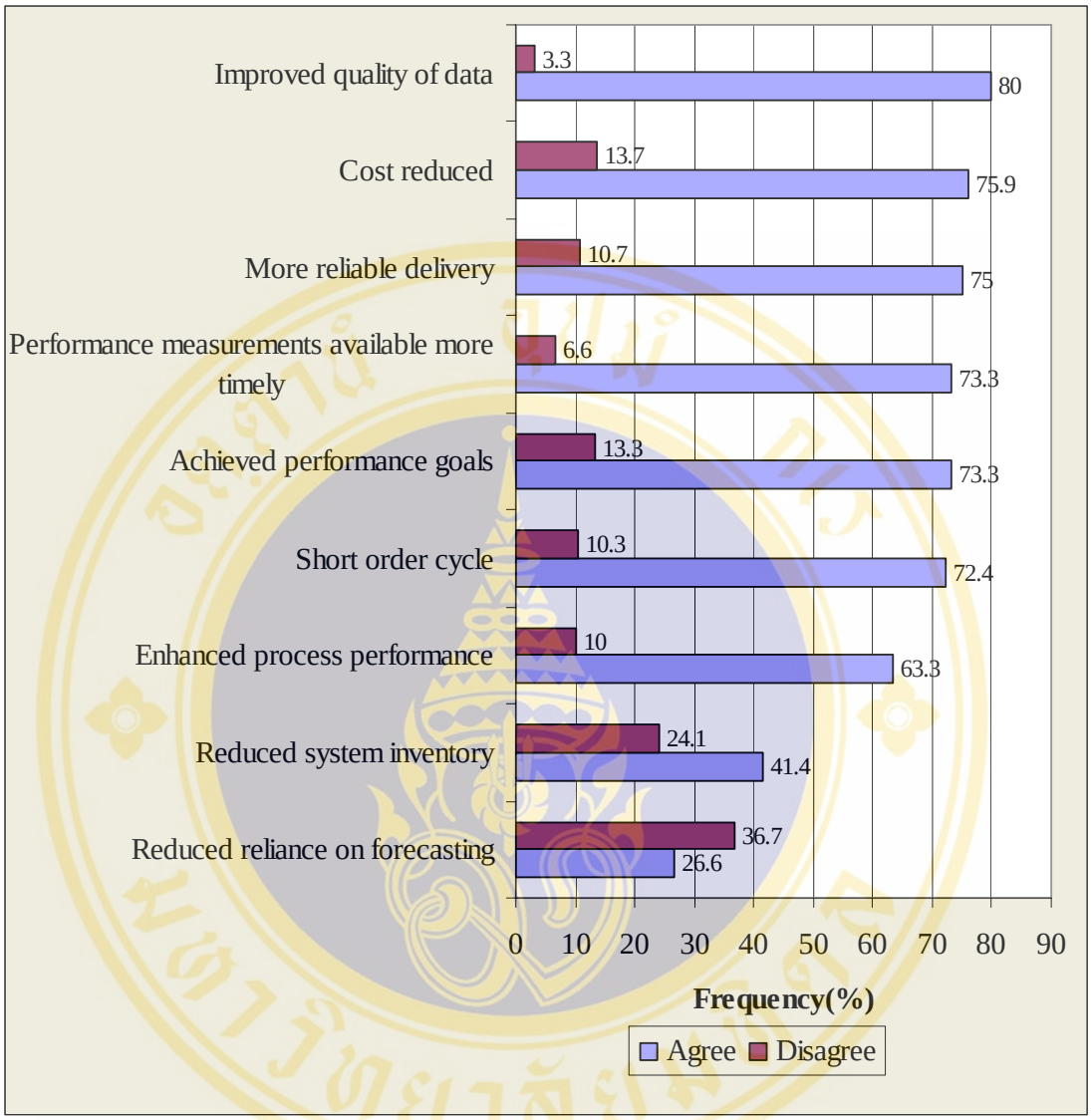

Figure 4.21 Company achievements through implementing IT

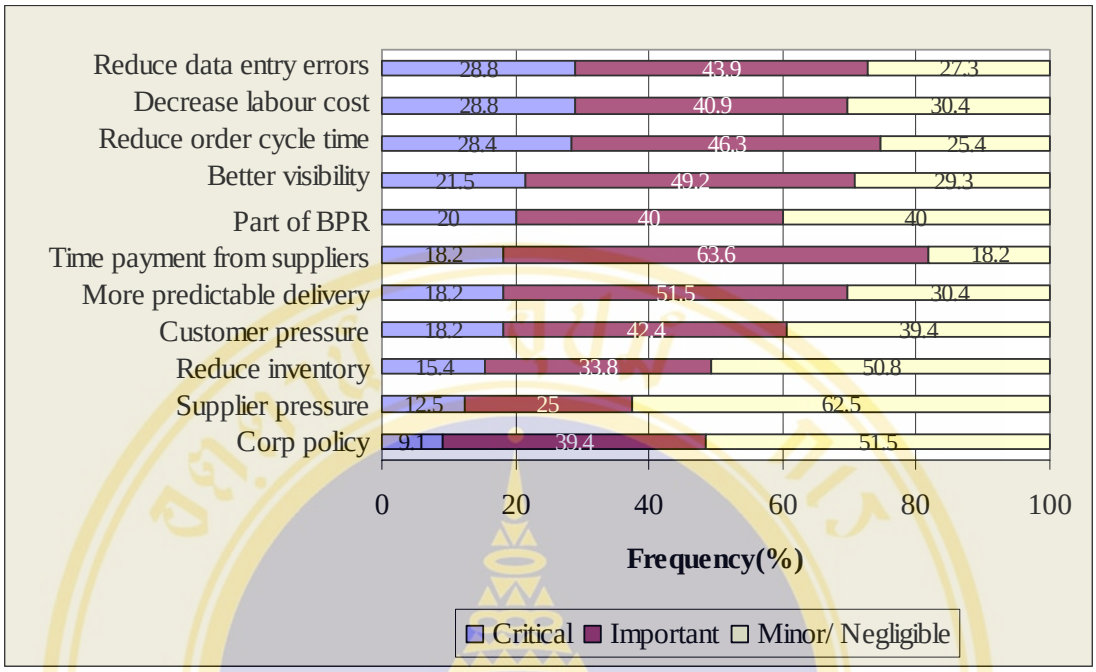

Figure 4.22 Prime motivators for adopting IT

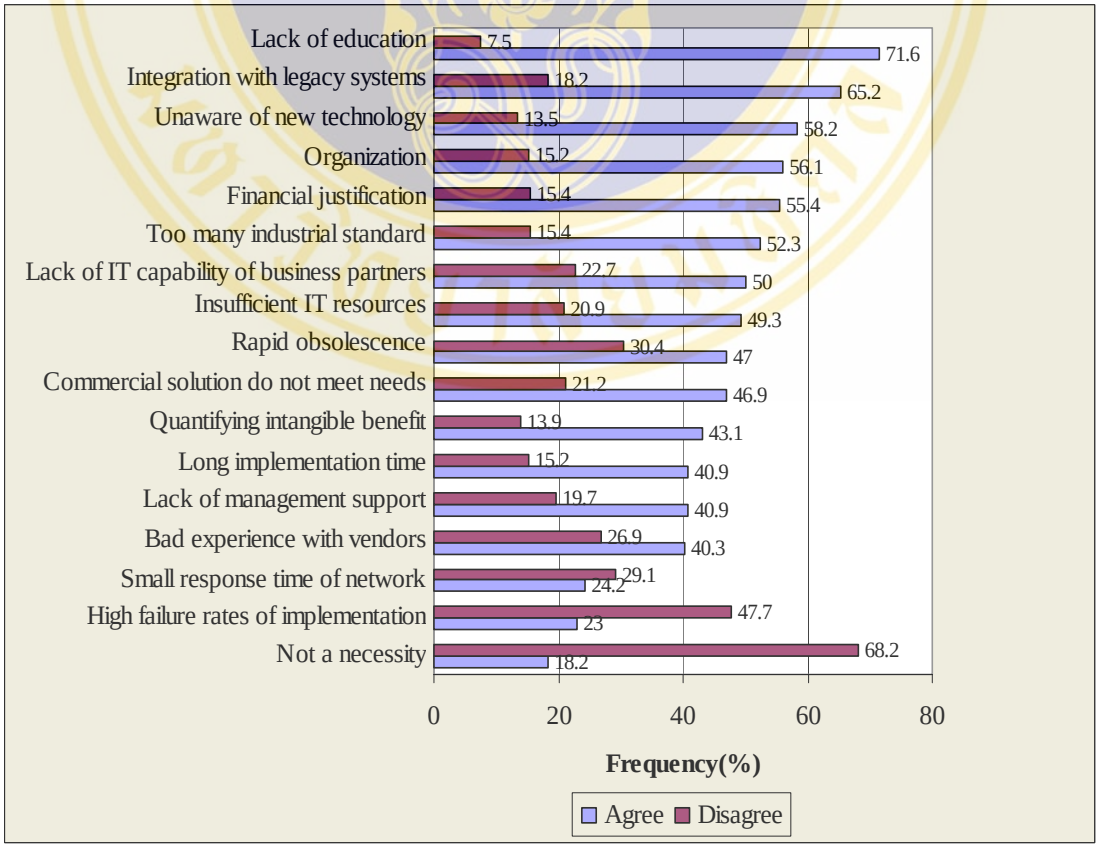

Figure 4.23 Barriers to usage IT

Figure 4.24 shows that top 3 important IT skills for personnel in 3PL companies to support logistics are word processing (agree : 78.6%), spreadsheet (agree : 78.5%) and operating system (OS) (agree : 78%)

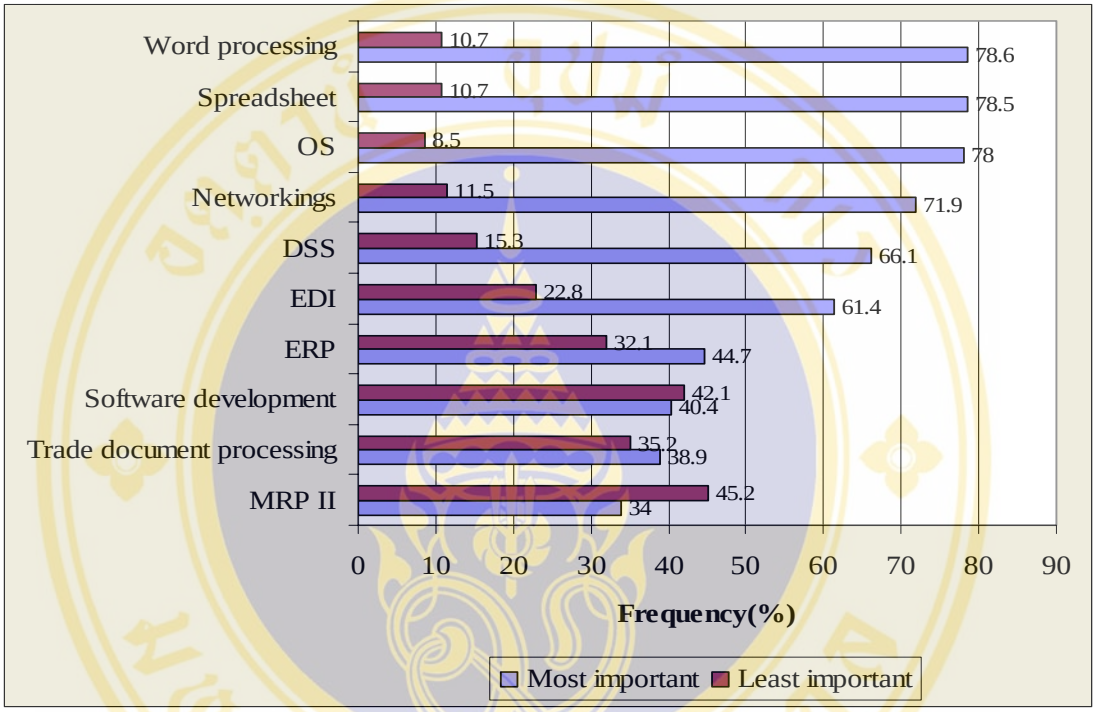

Figure 4.24 Important IT skill to support logistics

Singapore [67]

Part I : Profile of logistics industry in Singapore

Of the total respondents, 39 (34 %) 3PLs had core business in freight forwarding, 36 (31%) in warehousing operations, 28 (24%) in land transport operations, and 13 (11%) in depot operations. Most of the respondents indicated that they were operating in more than one core logistics business; therefore the total number of responses in each key area was more than the received number of responses.

In figure 4.25, almost 70% of the respondents were local private companies and 8% government-linked companies (GLCs), making it a total of 78% for Singapore-origin 3PLs. In terms of foreign-owned companies, 13% of the respondents were from

Europe, 6% from Asia and the rest from the USA (figure 4.26). Revenue of 3PLs is shown in figure 4.27 ; two thirds of the respondents' revenue was less than S$10 million a year.

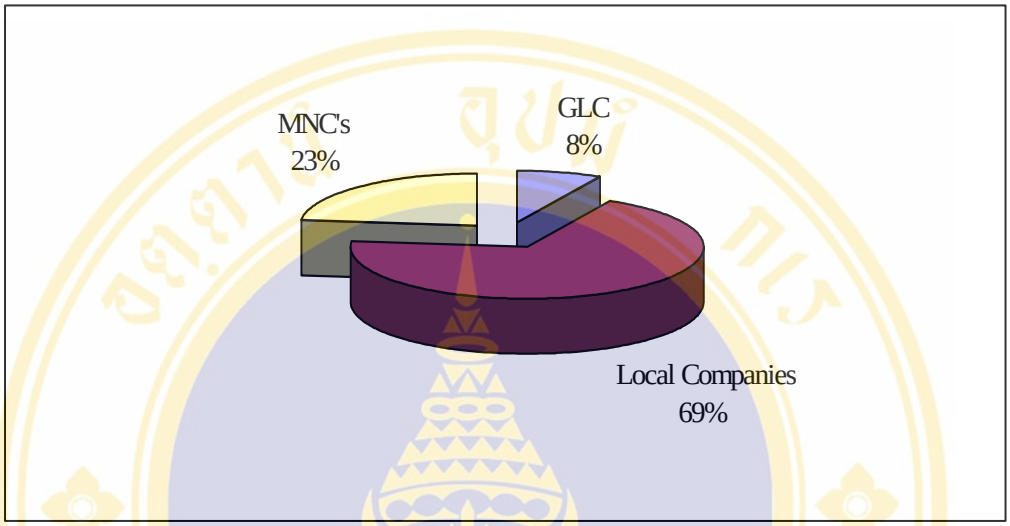

Figure 4.25 Profile of respondents by type of company : Singapore

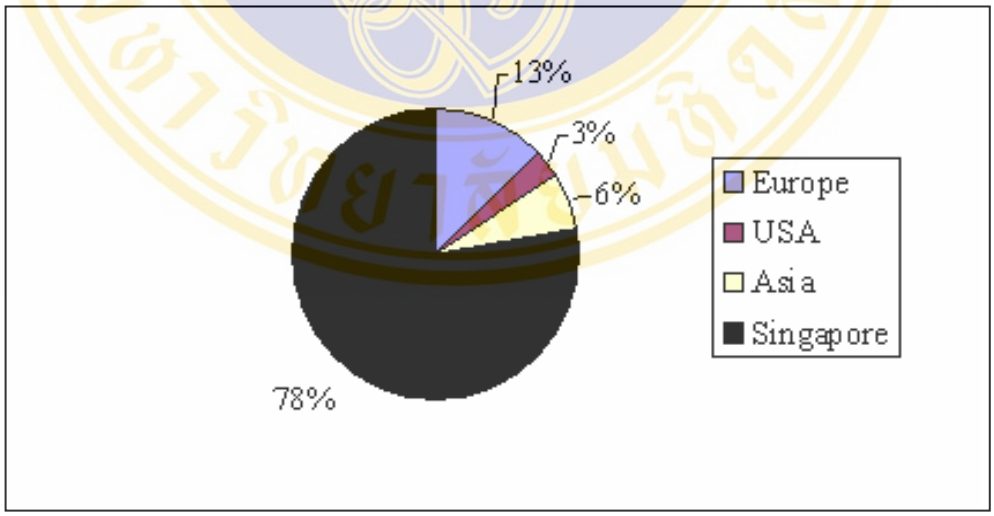

Figure 4.26 Profile of respondents by country of origin : Singapore

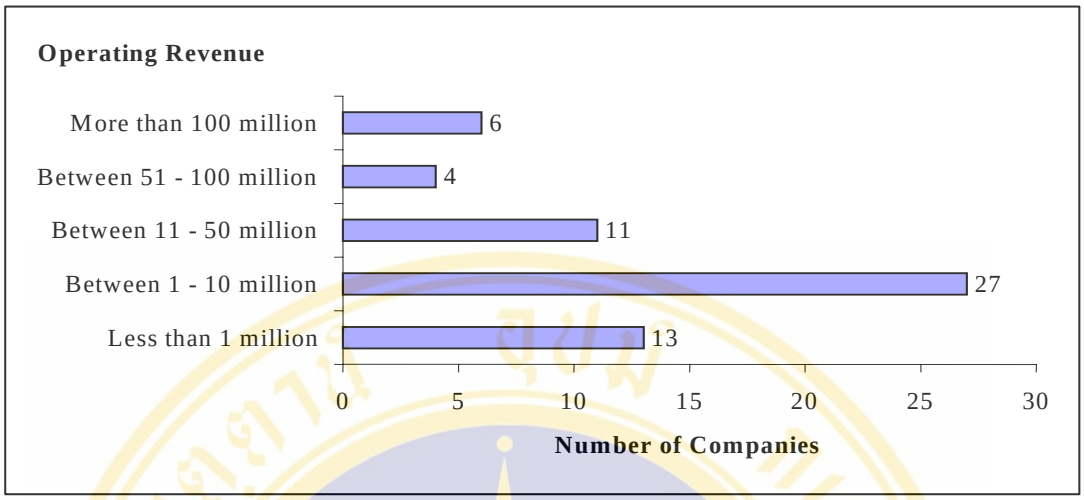

Figure 4.27 Profile of respondents' operating revenue for 1999 : Singapore

There are some distinct differences in employee profile between companies earning S$10 million or less and those earning more than S$10 million (Table 4.4). Companies with revenue of S$10 million or less had fewer employees (about 40) and the percentage of employees with university education was also low (2%). On the other hand, companies with more than S$10 million in revenue have more employees (about 200 on average) and the percentage of employees with university education was also higher (11%), apparently because of the complexity involved in running their business.

Table 4.4 Employee profile in IT function : Singapore

	Companies with revenue <S$10 million, (n=40)	*Companies with revenue >S$10 million,* (n=25)
Average total number of employees	40	200
Average number of employees in logistics function	22	110
Average number of employees in IT function	2	3
Average percentage of employees in logistics function with university education	2%	11%

Part II : Logistics service of 3PLs in Singapore

The 3PLs in Singapore seldom offer a single core service to their customers because of the need to distinguish themselves in the competitive market. More than 46% of the 3PLs offer freight forwarding (especially sea-freight) as their main business. However, they consider warehousing as a major part of their logistics operations too. Similarly, container depot operators are more likely to offer transportation services (as a supplementary service) to move containers into and out of Singapore ports.

3PLs in Singapore provide thirteen different value added services (figure 4.28), such as order processing, product assembly, inventory control and reverse logistics. However, almost 42% of them provide only five services and almost half of them provide 6 to 10 logistics services. There are less than 8% of 3PLs that provide more than 10 services. This clearly indicates that the majority of the suppliers provide less than 10 services and that 3PLs providing more services need to use better technology to keep themselves competitive in all areas of service.

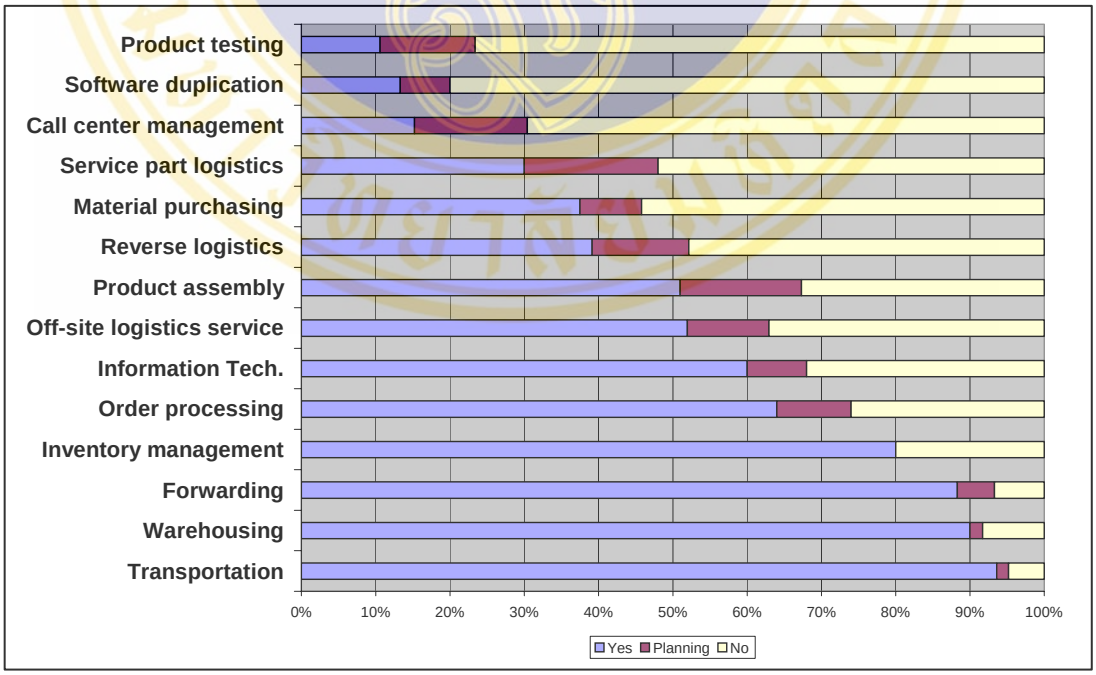

Figure 4.28 Current and future services offered

Transportation, warehousing and freight forwarding are the most common logistics services offered by 3PLs (Figure 4.29), while order processing and

management of IT operations for the clients are two areas where respondents are planning to expand their services over the next two years. As more manufacturing companies outsource their logistics functions, 3PLs will need to offer more value-added services in order to secure the business. This demands faster data (or order) processing in 3PLs and IT obviously plays a greater role in it.

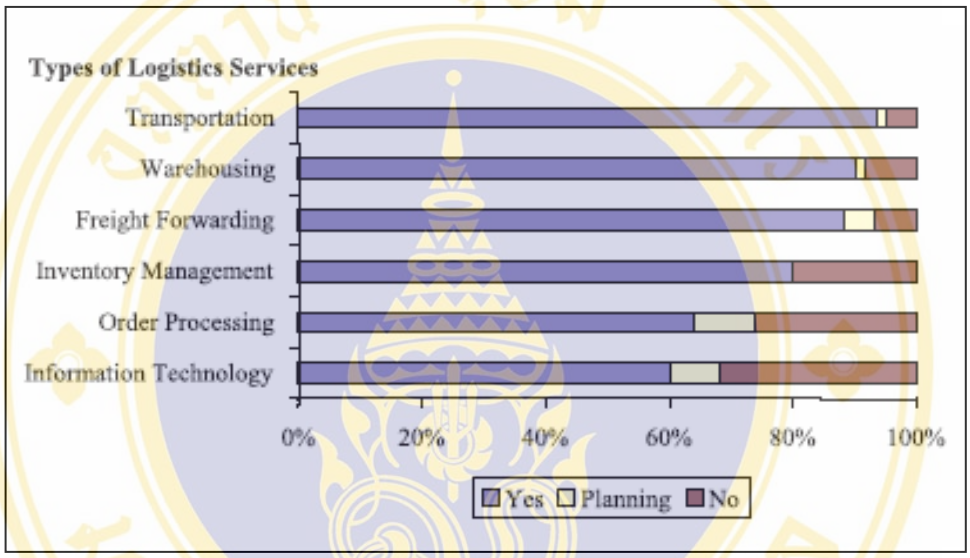

Figure 4.29 Key value-added services provided by the logistics companies

The inevitability of IT expansion in 3PLs can also be seen from the fact that almost 20% of 3PLs are currently serving the electronics, telecommunication, and food and beverage industries (Figure 4.30) and are planning to expand their operations to chemical, automotive and healthcare industries. The general trend is that the out-sourced logistic volume by these industries is increasing every year mainly due to competitive pricing offered by 3PLs and increased competition in their own core business. Therefore, 3PLs need to be ready to grab a bigger share of this growing market through the use of IT in their operations.

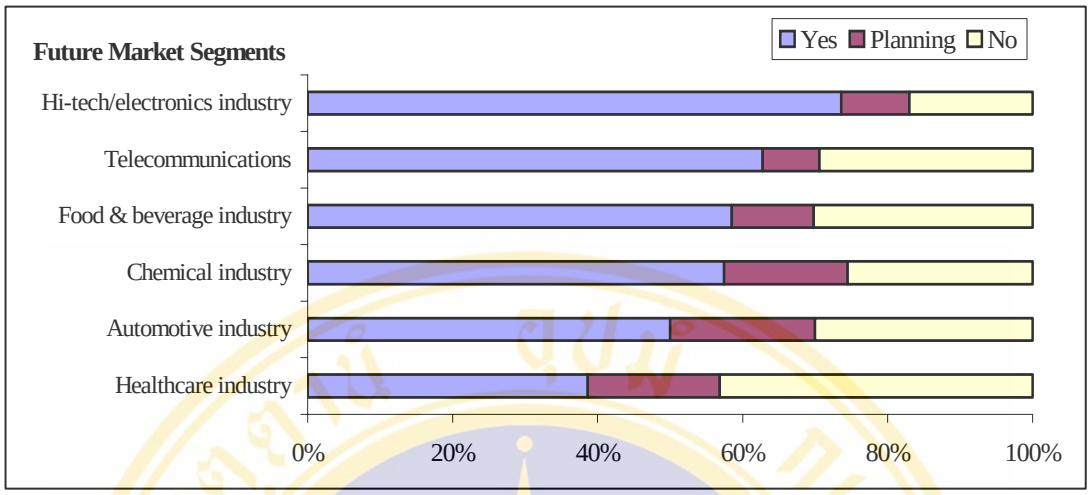

Figure 4.30 Current and Future market segments

Part III : Status of IT implementation within the industry

The status of IT implementation at 3PLs is shown in Table 4.5. The data differentiate 3PLs in terms of their current and planned IT system usage. Most of the 3PLs are aware of the benefits of IT when used for faster data processing.

Table 4.5 Status of IT by sectors

Status of IT	Forwarding	Warehouse	Transpotation	Container depot
IT currently in use	EDI Workflow Order processing	Order processing Workflow Bar-coding	Order processing Accounting	EDI Workflow Wireless communication
IT use planned over next 3 years	E-commerce	E-commerce Wireless Communication Optimisation Software	Transport Management Network Modelling Workflow	PDT E-commerce Digital imaging

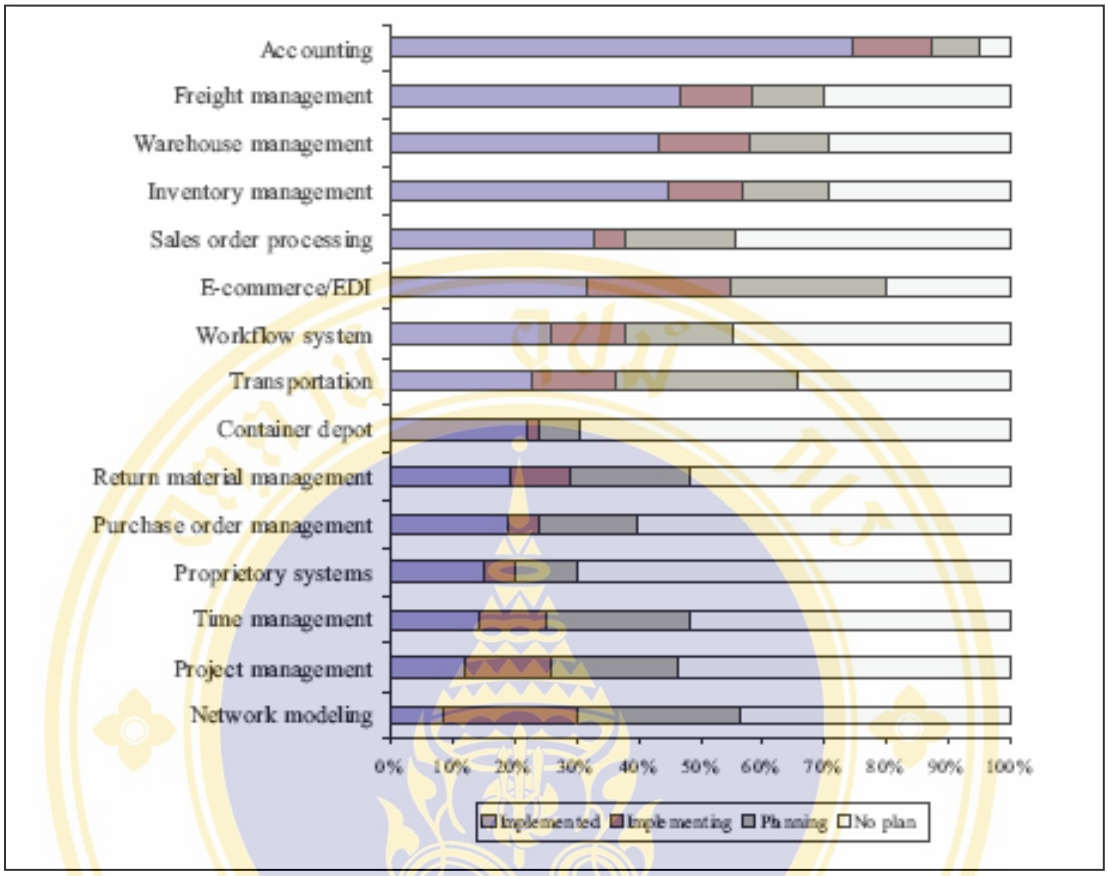

Figure 4.31 Status of IT adoption : Singapore

From figure 4.31, top 5 of IT implementing in organizations are accounting, freight management, warehouse management, inventory management, and sale order processing respectively.

Part IV : Motivation and barriers in using IT for logistics operations

The top five motivating factors for adoption of IT in 3PLs are shown in figure 4.32, which are reducing data entry error, improving customer service level, reducing order cycle time, furthering integration of supply chain activities, and reducing customer inventory costs respectively.

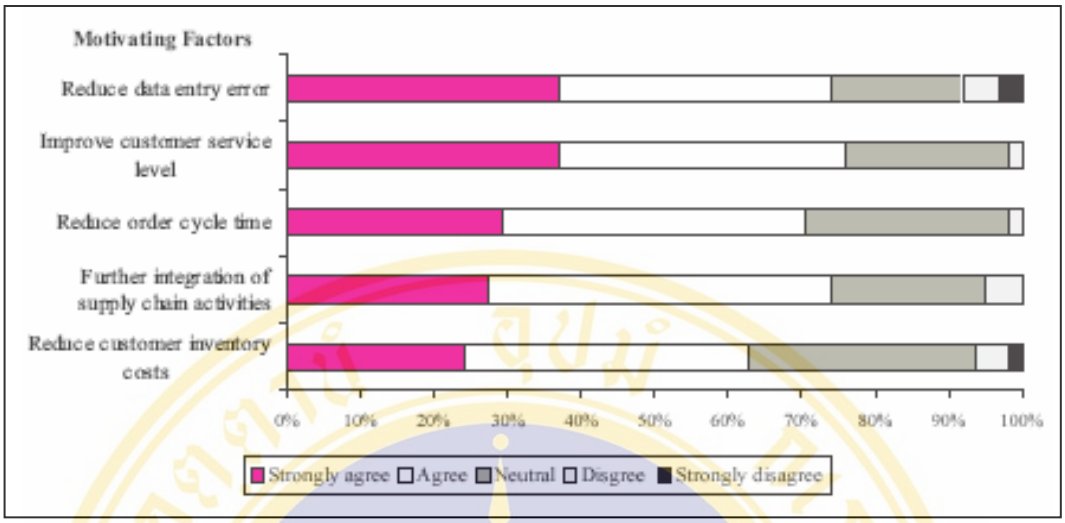

Figure 4.32 Top 5 motivating factors for IT adoption : Singapore

The main barriers to the adoption of IT in 3PLs are displayed in figure 4.33, which are rapid obsolescence of technologies, financial justification, long implementing period, difficulty to measure intangible benefits, and finding qualified people respectively.

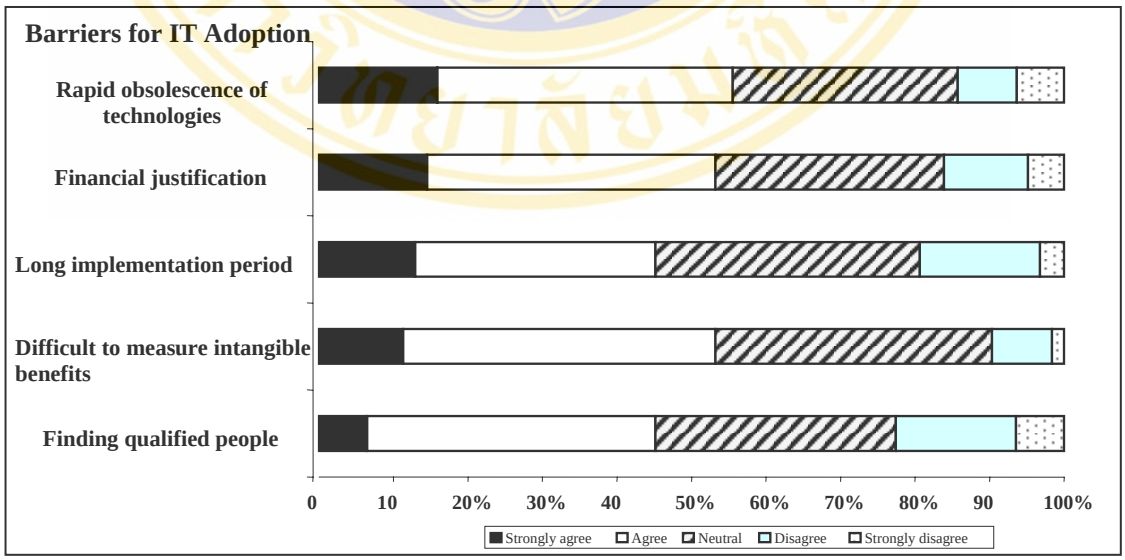

Figure 4.33 Top 5 barriers for IT adoption : Singapore

4.2 Report of the Interview

For this study, a total of 6 companies are interviewed, comprising three from the home grown Thailand 3PL firms, and three foreign 3PL firms that are based in Thailand. The companies are drawn from the database maintained by Department of Internal Trade, Ministry of E-Commerce. For the local 3PL firms, they are selected from the list of the four largest local 3PL firms in Thailand that reply questionnaires in chapter 4, ranked by their 2003 turnover. Similarly, for the foreign 3PL firms, they are chosen from the list of the 7 largest 3PL firms in Thailand that reply questionnaires in chapter 4, ranked by their 2003 turnover. The names of 6 companies are listed in Table 4.6 below.

Table 4.6 List of 6 Participating companies

Local 3PL	Attributes	Foreign 3PL	Attributes
Blue & White logistics	Private-owned	Exel	EU originated
Cementhai Logistics	Private-owned	DHL	US originated
JWD InfoLogistics	Private-owned	Tokyo World Transport	Asia originated

The question of interview is divided into 4 parts that are General trends, Globalization, Supply Chain Management and E-commerce trends, Positioning and Success factors, and General concept of 3PL in Thailand. (The details of each company interviewed are shown in Appendix) The results of interview can conclude the important aspects in each factor in this manner.

Part I : General Trends

Most of respondents want to be the leaders of 3PL market in Thailand and focus on long term relationship with customers. All of local 3PL firms think that they have moderate costs in high quality while most of foreign firms view that they have high cost in excellence quality. All of respondents want to expansion their network across the country which all of foreign 3PLs want to expand their network across the world too while local 3PLs focus on expansion in Thailand and Indo-China region by truck mode operation. Only one of respondents which is a foreign 3PL has planed to do merge and acquisition activities within 1-2 years. Most of local firms agree with

collaborative with other 3PLs to increase power of trade bargaining while foreign firms do not need to do. (Table 4.7)

Table 4.7 General trends of 3PLs in Thailand

General trends	L1	L2	L3	Local	F1	F2	F3	Foreign
To be the leader of local 3PLs.	/	/	/	3	/	/	/	3
To be the leader of 3PLs in Thailand.		/	/	2	/	/	/	3
Have long term relationship with customers.	/	/		2	/	/	/	3
Costs • High cost • Moderate cost • Low cost	/	/	/	3	/	/	/	2 1
Company expansion across the country.	/	/	/	3	/	/	/	3
Company expansion in abroad.	/		/	1	/	/	/	3
Merger and acquisition (M&A) activities within 1-2 years.				0	/			1
Agree with collaborative with other 3PLs.	/		/	2		/		1

Part II : Globalization, Supply Chain Management and E-Commerce Trends

For globalization trends, all of respondent recommended that globalization world push them to use IT to be competitive and survive in modern world. Due to Free Trade Area (FTA) project of Asian that Thai is one of stakeholders, all of local firms do not think that FTA can be advantage for them because the companies from aboard usually use logistics services from foreign 3PLs while the foreign 3PLs see FTA is the opportunity to establish more channels and customers for them. In global expansion, we found that all of local firms do not have policy to expand their network across the world because of limited resource but all of foreign 3PLs do. (Table 4.8)

Table 4.8 Globalization trends of 3PLs in Thailand

Globalization	L1	L2	L3	Local	F1	F2	F3	Foreign
Globalization push company to use IT.	/	/	/	3	/	/	/	3
FTA can be advantage for company.				0	/	/	/	3
Company expansion across the global.				0	/	/	/	3

Table 4.9 Supply Chain Management trends of 3PLs in Thailand

Supply Chain Management	L1	L2	L3	Local	F1	F2	F3	Foreign
Realizing the advantage of IT.	/	/	/	3	/	/	/	3
Developing IT in organization.								
• Buy from famous software company in abroad.		/		1	/	/	/	3
• Buy from Thai software company.		/	/	2				
• Develop by themselves.	/		/	2			/	1
Barriers to use IT								
• Operational skill of staff.	/			1	/	/	/	3
• High investment.	/		/	2	/	/		1
• Not standardization of software solution.			/	1				
• Not ready of customer to collaborate with company.	/	/		2	/			1
Motivators to use IT								
• Lower cost.					/	/	/	3
• Higher service quality.					/			1
• Decrease complicated of work.	/	/		2				
• Increase accuracy of data.	/	/		2				
• Pressure from business environment.	/			1			/	1
• Modernization.	/		/	2				
• Reduce risks.						/		1
• Differentiation.						/		1
• Customer satisfaction.							/	1

For supply chain management trends, it was found that all of respondents realize that how IT important and can be advantage for them. In order to adopt IT into organizations, all of foreign 3PLs buy software package from famous logistics software companies in aboard while most of local 3PLs buy software package from Thai software companies and developed by their personnel. (Table 4.9)

For barriers to use IT, most of respondents determined that are staff operation skill, high investment, customers readiness, and software unstandardization, respectively. (Table 4.9)

The motivation to adopt IT in most local firms are decrease complicated of work, increase accuracy of data, pressure from business environment, and modernization while foreign companies focus on lower cost, higher service quality, reduce risk, differentiation, and customer satisfaction. (Table 4.9)

For e-commerce trends, it was found that all of respondents use e-commerce to service their customers which is tracking service. Most of respondents think e-commerce is important to companies in the moderate level. One of local firms has a low opportunity and low advantage to use e-commerce, another one has a high opportunity and high advantage to use, and another one has a moderate opportunity and moderate advantage to use. Most of foreign firm have moderate opportunity and moderate advantage to use e-commerce. Only a foreign firm has a low opportunity and low advantage to use e-commerce. Without that there is a local firm use IT as strategy to improve the business. (Table 4.10)

Table 4.10 E-Commerce trends of 3PLs in Thailand

E-commerce	L1	L2	L3	Local	F1	F2	F3	Foreign
Using e-commerce services.	/	/	/	3	/	/	/	3
Important of e-commerce to company.								
• High		/		1				
• Moderate	/		/	2	/	/	/	3
• Low								
Opportunity to use e-commerce.								
• High		/		1				
• Moderate			/	1	/		/	2
• Low	/			1		/		1
Advantage from using e-commerce.								
• High		/		1				
• Moderate			/	1	/		/	2
• Low	/			1		/		1
Using e-commerce as strategy to improve the business.		/		1				0

Part III : Positioning and Success Factors

All of foreign companies place themselves in globalization and supply chain management positions but not for e-commerce. All of local companies place themselves in supply chain management position, there is one firm has a position in e-commerce. Another one place himself in globalization company. (Table 4.11)

Success factors of local 3PLs are technology, human resource, good relationship with customers, good relationship with sub-contract 3PLs, big scale of volume, and strategy while success factors of foreign 3PLs are technology, experience, human resource, high quality services, and meeting customer’s needs. (Table 4.11)

Table 4.11 Positioning and Success factors of 3PLs in Thailand

Positioning & Success factors	L1	L2	L3	Local	F1	F2	F3	Foreign
Position placing in :								
• Globalization			/	1	/	/	/	3
• SCM	/	/	/	3	/	/	/	3
• E-commerce		/		1				
Success factors								
• Technology	/	/		2	/	/		2
• Experience					/			1
• Human resource	/	/	/	3	/			1
• Good relationship with customers		/		1				
• Good relationship with sub contract 3PLs		/		1				
• Big scale of volume	/			1				
• High quality services						/		1
• Meeting customer's needs						/	/	2
• Strategy			/	1				

Part IV : General Concept of 3PL in Thailand

The concept of 3PLs in Thailand in local firms opinions are people are not really understand about logistics, there is a lot of competitor in market, the oversea multinational company focus on using service from oversea 3PLs, this make local 3PLs lose the opportunities to do their businesses, and it is the crisis for local 3PLs while foreign firms think that there is lack of personnel in logistics field, people are not really understand about logistics, most of leader of 3PL market in Thailand are the multi-national logistics service provider, and there is a lot of competitor in market. (Table 4.12)

Table 4.12 Concept of 3PLs in Thailand : Executive view

Concept of 3PLs in Thailand	L1	L2	L3	Local	F1	F2	F3	Foreign
• There is lack of personnel in logistics field.					/			1
• People are not really understand about logistics.			/	1	/	/		2
• Most of leader of 3PL market in Thailand are the multi-national logistics service provider.					/			1
• There is a lot of competitor in market.	/	/		2			/	1
• The oversea multinational company focus on using service from oversea 3PLs, this make local 3PLs lose the opportunities to do their businesses.	/			1				
• It is the crisis of local 3PLs.	/	/		2				

Table 4.13 The strengths of local and foreign 3PLs in Thailand

The strengths of local 3PLs (Response by local 3PLs)	**The strengths of foreign 3PLs** (Response by foreign 3PLs)
• Controlling operational workers. (3) • More flexible than multinational 3PL. (1) • Lower cost in operation management. (1)	• Great technology. (1) • Excellence training. (1) • Long experience in business. (2) • Good systematic in process. (2) • Understanding the factors in the success of the business. (2) • Stability of company. (1) • A lot of network. (1)

The strengths of local firms in their opinion are ability to control their operational workers, more flexible than multinational 3PLs, and lower cost in operation management while the foreign firms think their strengths are great technology, excellence training, long experience in business, good systematic in

process, understanding the factors for the success of business, stability of company, and a lot of network. (Table 4.13)

Table 4.14 The weaknesses of local and foreign 3PLs in Thailand

The weaknesses of local 3PLs (Response by local 3PL)	**The weaknesses of foreign 3PLs** (Response by foreign 3PL)
• Lack of Technology. (1) • Lack of visual to develop business. (1) • Lack of investment budget. (2) • Lack of networking. (1)	• Lack of Thai customers. (1) • Lack of empowerment for critical decision. (1) • Have to send income from operation service back to the headquarter. (1)

The weaknesses of local companies in their opinions are lack of technology, lack of visual to develop business, lack of investment budget, and lack of networking while the foreign 3PLs think their weaknesses are lack of Thai customers, lack of empowerment for critical decision, and have to send income from operation service back to the headquarter. (Table 4.14)

CHAPTER V
DISCUSSION

This chapter aims to discuss the results in order to see enough direction and trend. These will help make sufficient clear the current status and IT role of 3PLs in Thailand, Thailand competitiveness comparing with other countries especially Singapore who is the leader of logistics hub in Asia, and problem and direction to solve the problems of 3PLs in Thailand to be competitive in the present world.

5.1 Thailand

5.1.1 Current Status of 3PLs in Thailand

Sizes

From results of the survey, we can analyze that most of 3PLs in Thailand are local companies, have a small size and have little breath of service. The logistics providers have increased in 3 years for 50.7% of respondents. Due to a little breadth of service determine that they are lack of experience to manage their companies. Without that there is lack of IT personnel compare with totally employee.

Services

The services are fundamental service typically, they still lack of value-added service to provide to customers. Most of 3PLs focus on “Customer service” which is the decision services about inventory, transportation, and warehousing. Traffic and transportation is the most second service that is the core activity of service.

Consider to goods which companies take care them for customers, top six of goods they take care are mechanical, textile, chemical, electronics, consumer products, and food/ drink. In order to be competitive, 3PLs should focus on service or good which are their strength. Some good like medical need the special instrument to keep,

chemical item has to be specially careful. If each company experts in some service or some kind of good, they will survive and growth in the high competitive market even if they are tiny.

In order to transport goods to a destination, the majority of 3PLs choose to transport by land for transport within country, air and sea for transport between countries. For transport mode within country, the tiny percentage choose the train mode eventhough the cost of transportation by trains are cheapest [16], this may because there is a strong infrastructure of road rail in Thailand and transportation by train may effect to goods damage because the railway is old and lack of maintenance. The river is one of transportation channel that cheaper than truck but there is not popular as land mode too due to infrastructure and slowly speed so land transport are popular to transport goods within country. This may the main reason of high logistics cost in Thailand which is 19.17% of GDP. [58]

Strategies

For the direction of strategies in order to service logistics activity for customers, 3PLs focus on time based logistics solutions**,** logistics performance measurements and strategic alignment of IT that mean they are focus on transportation speed, standard of service and IT for data improving like the result of logistics measurement that give important to on-time delivery, accurate & complete & damage-free delivery and data accuracy. Quick response to customer enquiry show that firms pay attention to their customers a lot to establish relationship that will be good effect to business for long term.

Regard to logistics performance measurements which one of strategies major 3PLs focus on, now most of 3PLs have their standard to improve their operation but each standard is not international standard, they are lack of international standard like ISO 9001, 9002 to show their process performance. The government should has standard measurement to measure 3PLs’s logistics performance. Then SMEs providers will have the standard to follow to improve their performance that bring they to be competitive in market.

5.1.2 IT role of 3PL firms in Thailand

IT applications and infrastructure deployment

According to IT applications and infrastructure deployment, most of firms have financial system, transportation management system, finite scheduling system and time management system. These may because the majority has core business in transportation and they want to improve their traffic and transportation service. Without that customer relationship management system is one of factor index that logistics providers in Thailand do have attention to customers which is appropriated with their strategies. The standard of information exchange, fax/ telex and internet/ email is the most popular to use, EDI is going to be interested, this may because Thai government is enhanced firm to use EDI connected to bureau especially the Customs department that logistics provider have to always connect to. However, IT systems in firms are only fundamental system. There is lack of using e-commerce although e-commerce can support their business as well.

EDI is the technology that most of companies have and have plan to adopt it into organization this point is matched with trend of using EDI for standard information exchange. Without EDI, open system architecture, fault tolerance, relational databases and groupware are the technologies that most of firms use. Object oriented software, open system architecture, automatic identification, and client server are the technology that firm will need.

Motivations and barriers to adopting IT in organization

For the prime motivators for adopting IT, we can see that they usually use IT for reducing data entry errors, decreasing labour cost, and reducing order cycle time. A high percentage of disagree in “IT is not a necessary” show the important and advantage of IT that they have realized. Due to barriers of adopting IT, we found that the main problem is lacking of IT personnel, integration with legacy system, unaware new technology, and most of organizations are not support their firms to use IT that may because of financial justification.

Company achievements through implementing IT & Important IT skill needs

For company achievements through implementing IT, the high percentage of agreement are improve data quality, cost reduced, be more reliable delivery, performance measurement available more timely, achieve performance goals, short order cycle, and enhance process performance but if we consider the percentage of disagree in these items we can see cost reduced item and achieve performance goals item has highest disagree percent. It means some 3PLs do not agree that IT can help them to reduce cost and achieve performance goals that may because there is high cost of beginning IT investment so it depends on time and number of customers to reinvestment. The SME providers may have hard considerate to invest IT due to their income and customers like the result of barriers to adopt IT in organization in part IV (financial justification). For the disagree of achieve performance goals item may because lack of knowledge to use IT and inappropriate IT adoption regard to the barriers of adopting IT in organization that they are lack of IT personnel and unaware of new technology so there is lack of effective to use IT that they invested.

Personnel skills of IT in companies, we found that skills of word processing, spreadsheet, and operating system is needed, also skills of using networking, DSS, EDI, and ERP will be needed

5.1.3 Direction and policy trends of 3PLs leaders in Thailand

For general trends, we can found that both of local and foreign 3PLs want to be the leaders of 3PL market in Thailand and focus on long term relationship with customers which are the heart of logistics and supply chain management [2]. Local 3PLs have moderate cost but foreign 3PLs have high cost. In local 3PLs views, they see themselves can be competitiveness with others include foreign 3PLs both of price and quality sides but their customers usually be Thai companies, there are tiny foreign companies want to be their customers because of national royalty while foreign 3PLs usually have foreign customers, they explain that because of Thai companies still lack in logistics understanding so Thai firms think foreign 3PLs has high price. The high price of foreign 3PLs may because of technology and international quality so there is increasing of cost in high technology and quality personnel. In fact, big local 3PLs always have standard of quality process like ISO 9001, 9002 and IT adoption to

service logistics activities for their customers, but what the reason make the difference of them in the point of customer's nationality? For precisely the networking should be focus, local 3PLs try to expand their network across the country and oversea in Indo-China region, some want to focus in only Thailand so their customers would be in Thailand and Indo-China while foreign 3PLs try to expand their network across the world so their customers would be in anywhere in the world. So it is not surprisingly that local 3PLs look forward to collaborate with other 3PLs, at least it can make local 3PLs have a strong customers within country while most of foreign 3PLs do not want to collaborative with others this may because they already have an economy scale of multi-national companies as shown in the high score of FDI [48] so they still can have the large segment in market, they prefer to do merge activity with a big foreign 3PLs. Some foreign 3PL agree to collaborate with others, it determines that he wants to dig more channel in Thai companies segment, this point would be considered that without foreign 3PLs can get advantage from Thai customers increased but local 3PLs can earn profit from multi national companies increased too.

In globalization trends, FTA is the emerging trend now in Thailand. All of foreign 3PLs see the opportunity to build more profit from FTA due to the value increasing of import and export activities in Thailand but local 3PLs do not think they can get advantage from FTA because their core activities and customers are Thai companies so they are not the stakeholder of FTA. In fact, local 3PLs can get a lot of advantage from FTA eventhough they have core activities within Thailand. Because when there are increasing of import and export it must have logistics activities within Thailand so if local 3PLs establish their relationship with neighbor countries such as China, Loa, Malaysia, Indonesia, Singapore, etc. These would be advantage for local 3PLs. Addition in local 3PLs, most of providers are Thai-Chinese, they can establish special relationship by Chinese language so the agreement between Thailand, China, and Singapore would be great. For Loa, Malaysia, and Indonesia probably not be problems because they are Thailand neighbor, the relationship must be tightly.

For supply chain management, all of respondents realize the advantage of adopting IT into organizations, local 3PLs look IT be advantage for them in order to decrease complicated of work, increase accurate of data, adapt themselves into modernization cause of business pressure while foreign 3PLs use IT for lower cost,

increase service quality, differentiation and customer's satisfaction. Foreign 3PLs usually buy package software from famous logistics software companies in aboard while local 3PLs usually buy software from Thai software company or develop software buy themselves due to the cost and compatible of software with their companies. Link to the barriers to adopt IT in firms, local 3PLs have barrier of high investment so they try to save cost by buy software from Thai software company and develop by themselves that may the cause of software un-standardization which occur in local 3PLs. Another barriers for local 3PLs are staff operational skill like foreign 3PLs and not ready of customers to use IT solution but there is no problem for foreign 3PLs with regard to their customers, most of foreign 3PLs's customers are multi-national companies so there are knowledge and technology transfer from headquarter then they are ready to accept IT solution from 3PLs while local 3PLs's customers are Thai companies which are lack of IT adoption in firms and lack of budget to invest in IT so most of them are not ready to use IT solution from 3PLs. For e-commerce, all of respondent have e-commerce service like track and trace for customers. Most of them think e-commerce important to companies in the moderate level and see the opportunity to use e-commerce in the moderate level too and do not use e-commerce as their strategy because the business characteristics is intangible, the agreement must talk through the customers that may have bargaining with customers to follow their needs so e-commerce is something that can be convenient for customers to track their goods and monitoring the services but can not assist all the process of tracing to customers. But some 3PL use e-commerce as his strategic to develop business because of convenient, data accuracy, and decreasing the complicated of work so he see the e-commerce is very important to company and there is high opportunity to use e-commerce due to the customers which are their other line product in the same brand so he has the permanent customers, the deal have been long term and company know his duty with customers well so there is not necessary to talk through customers for usually.

All of respondents place their position in supply chain management, all of foreign 3PLs place their position in globalization, and only one local 3PL put his position on e-commerce due to their policy in order to develop their IT as their strengths, expand network across the world for foreign 3PLs, and the one of local

3PLs use e-commerce as their strategy to develop business respectively. The success factors of local 3PLs are technology, human resource, good relationship with customers, good relationship with sub-contract 3PLs, big scale of volume, and strategy while success factor of foreign 3PLs are technology, experience, human resource, high quality service, and meeting customer's needs. Link to their strengths in each group, their strengths match with their success factors that local 3PLs think their strengths are controlling operational workers as their success factor in human resource because they can mange their worker well, and establish good relationship to their sub-contract, more flexible than foreign 3PLs as their success factor in good relationship with customers that they can do agreement flexible depend on situation and customer's need, and lower operation cost than foreign 3PLs because they are Thai, they can manage people by themselves with Thai price. The strengths of foreign 3PLs are technology, training, experience, systematic process, understanding the factors in the success of the business, company stability, and a lot of network that bring foreign 3PLs to have good human resource, high quality service that can meet customer's need. The weaknesses of general local 3PLs in local 3PLs respondent perspective they think local 3PLs still lack of technology, lack of visual to develop business, lack of investment budget, and lack of networking. If local 3PLs can have knowledge transfer from foreign 3PLs's experience and have a lot of network to develop their business, the local 3PLs situation in Thailand must be better quality and lower cost of logistics.

5.2 Singapore

5.2.1 Current Status of 3PLs in Singapore

Sizes

From results of the survey [67], we can analyze that most of 3PLs in Singapore are local companies, have a small to medium size. There is lack of IT personnel compare with totally employee.

Services

The services are different value-added service such as order processing, product assembly, inventory control and reverse logistics. The 3PLs in Singapore seldom offer a single core service to their customers because of the need to distinguish themselves in the competitive market. More than 46% of the 3PLs offer freight forwarding (especially sea-freight) as their main business. However, they consider warehousing as a major part of their logistics operations too. Similarly, container depot operators are more likely to offer transportation services (as a supplementary service) to move containers into and out of Singapore ports.

In Singapore's manufacturing sector, electronics and engineering contribute more than 80% of the value added services and chemical industries contribute another 15% [81]. As a result, the demand for logistics services in these sectors is also higher, and is comparable to that reported in Lieb and Luigi [82] for the USA. In Singapore, business for the chemical industry is growing at about 25% per annum due to increasing demand of such products in the USA and Europe [81]. Therefore the logistics market to support these industries is also growing fast. Also, with the completion of a physical link to Jurong port Island (in the western part of Singapore) from the main island, containers would have to be transported between the clearing ports and the Jurong Island. This has again created additional business for 3PLs.

The highest percentage of revenue (using mean score) comes from freight forwarding business but its deviation is also the largest. This means that while most freight forwarders are offering forwarding as their main service (those with high mean score), other service providers are also offering it as a secondary service (those with low mean score) in order to provide a total logistics solution to their clients.

3PLs with higher annual revenue are more eager to expand their market and to adopt IT for competitive advantage. As 3PLs are providing more than one service and their business processes are expanding, IT could be a potential feature to improve on the information flow between the supplier and the customer.

The majority of the 3PLs have indicated that having expert knowledge or specialized skills was one of the key differentiating factors that gave them the competitive edge. Expert knowledge or skill could be in operational efficiency, IT capability or effective management where employees play a critical role. Global

coverage is another important attribute; it implies that the company is ready to serve the MNC clients when they expand the businesses in the region. The degree of importance given by 3PLs to each attribute, however, depends upon their revenue levels mainly because higher levels of value added services can lead to new investments for facility expansion including new IT investments. Global coverage is more important to those with less than S$10 m in annual revenue; however, expansion of their services is more important to those with higher revenues. In either case, the volume of information and transaction would be greater and would justify the need for adopting appropriate IT systems.

Breadth of services is considered crucial as more companies are transforming themselves into third-party logistics providers. Third-party logistics providers are expected to provide a one-stop service for transportation, storage and other value-added services.

5.2.2 IT role of 3PL firms in Singapore

IT applications and infrastructure deployment

The breakdown by activities within 3PLs shows that most of them are already using IT in network modeling and accounting. Depending upon the nature of their services at present and their planned expansion, 3PLs are either adopting or planning to adopt IT for data exchange and data processing in various business processes such as freight management, transportation, material management, project management and return material management. Most of the 3PLs do not see a need to adopt IT for some business processes such as container depot operations, purchase order management and proprietary systems management. This shows that there is a lack of exposure of these companies to the capability of IT in increasing business efficiency and ultimately projecting Singapore as the logistics hub of the region. Therefore, programmes like incentives in equipment purchase and mass training programme by organisations like Trade and Development Board of Singapore and National Science and Technology Board becomes important to these 3PLs.

Wireless communication technology seems to be another important area for warehousing operators. The use of radio frequency technology for warehouse management is becoming popular due to better data accuracy and lesser human intervention. For container depot operators, on the other hand, the use of digital imaging and portable data terminal technologies seems to be gaining ground, as these IT systems can lead to productivity improvement.

Network modeling system, including spatial location system, is getting popular in 3PLs providing transportation services. These IT systems help to optimize vehicle routing operation. In case of freight forwarding companies, E-commerce solutions are becoming popular as they provide on-line booking and on-line inquiry on the cargo status to their clients.

Motivations and barriers to adopting IT in organization

As the logistics business is becoming more competitive, acquiring, analyzing and reporting of correct data has also become more important. Therefore, more companies have to implement a sound and automated information system in the future. The top five motivating factors for adoption of IT in 3PLs are increasing data accuracy seems to be the prime motivation for IT adoption. 3PLs are beginning to realize that with increased adoption of EDI and E-commerce, information received by one party can be directly fed into its in-house application systems for planning and execution. That way, 3PLs would be able to enhance the level of customer service and reduce operating costs on both sides.

Another motivating factor for the use of IT is the benefit of easier integration of supply chain activities among the various business partners. IT can be used to update customer companies on the status of cargo so that they can plan their production more efficiently.

Also, since many companies are implementing vendor-managed inventory (VMI) arrangements with their suppliers, IT can be used extensively to monitor the level of inventory at the clients' premises. This type of monitoring helps the customers reduce the quantity of safety-stock needed and eventually leads to a reduction in inventory cost. With the use of IT, such a cost reduction would become effective for many years.

The main barriers to the adoption of IT in 3PLs shows that one of the main concerns for adoption of IT is the speed of IT development itself. More than half of 3PLs feel that by the time they plan and execute IT programmes, the technology could become obsolete. At the same time, because of the obsolescence, it is difficult to justify the use of IT in financial terms as well. However, almost 20% of 3PLs do not feel that obsolescence needs to be of any concern because of compatibility of technology from one generation to another and the price competitiveness of the technology. Financial justification, however, can be tricky as many of the benefits obtained through IT could be intangible, such as improved customer service, or increased accuracy in data transfer and management.

5.3 Thailand VS Singapore

There is the same high growth rate of 3PLs both in Thailand and Singapore that most of 3PLs in Thailand are small and in Singapore are small to medium size. But 3PLs in Singapore have higher MNC 3PLs more than Thailand. These may one of reason that Singapore has higher development in IT and logistics more than Thailand due to knowledge and IT transfer from MNC who have high technology and long experience in logistics management.

The services of 3PLs in Thailand are fundamental services compare with Singapore which provide different value added service to their customers. The 3PLs in Singapore seldom offer a single core service to their customers because of the need to distinguish themselves in the competitive market. This is an interesting strategy that 3PLs in Thailand should be follow to be competitiveness in Thailand market.

The majority of the 3PLs in Singapore focus on having expert knowledge or specialized skills which was one of the key differentiating factors that gave them the competitive edge. Expert knowledge or skill could be in operational efficiency, IT capability or effective management where employees play a critical role. In Thailand, we do focus on human resource too but there is the limited of expert knowledge and budget. Many of 3PLs in Thailand have misunderstood about IT adoption in firms, they just know that IT is very important to them now to survive in globalization trend. They think IT is cool and modern so customers will use their service, do they right? IT is the instrument that helps firms to increase effective for management then the cost

of management will decrease. In addition, they cannot finish their operation without standardize instrument to exchange data. These results indicate that 3PLs in Thailand are walking in the wrong direction. The understanding of advantage in IT should be concern. Without that, there is lack of experts both in IT and logistics in Thailand. Most of these experts are usually focus on their research to establish logistics database in Thailand follow the logistics master plan but logistics and IT knowledge in 3PLs should be done together due to a long period to build human resource.

For IT implementing, it is clearly that 3PLs in Singapore are better than 3PLs in Thailand. Most of Singapore 3PLs already have fundamental systems and going to develop higher level systems while 3PLs in Thailand still lack of adoption IT even the fundamental systems like POS, WMS etc. However Thailand government force in order to use EDI for data exchange with Custom Ministry is work, many firms interest to implement EDI into their firms.

The motivation to adopting IT into organization of 3PLs in Thailand and Singapore are not difference. Both of them want to increase their capability in services. But the barriers are significantly different, the top 3 barriers of 3PLs in Thailand are lack of education, integration with legacy system, and unaware of new technology while the top 3 barriers of 3PLs in Singapore are rapid obsolescence of technologies, financial justification, and long implementing period. The results show that 3PLs in Thailand really lack of knowledge about IT so they cannot optimize advantage from IT implementation.

5.4 Thailand Competitiveness

Thailand

Most of 3PLs in Thailand are local companies, have a small size and have a little breath of service (3 years). The logistics providers have increased in 3 years for 50.7% of respondents. Due to a little breadth of service determines that they are lack of experience to manage their companies. Without that there is lack of IT personnel compare with totally employee. The operational workers are lack of language skill. The services focus on fundamental service that are lack of value-added service to provide to customers. Transportation within country focus on land transport and

between country focus on sea and air transport. There are using basic IT, lack of using e-commerce. EDI is going to be interested. They are lack of IT personnel and logistics experts. The main barriers for adopting IT into organizations are financial justification.

The government supports on stimulating SMEs in Thailand to use out-sourcing service, launch 0% interest loan for SMEs, developing infrastructure within country such as technology, rails, roads, education and research, developing efficiency in custom and regulatory, establishing channels for import and export such as FTA project, logistics hub project, roads to country neighbor project.

Strengths

- Service mind
- Land transport
- Controlling operational workers
- Lower cost in operation management

Weaknesses

- Lack of experience
- Lack of logistics knowledge
- Lack of value added service to customers
- High logistics cost due to mode of transportation
- Lack of effective inter-modal connection
- Lack of network
- Unaware new technology
- Lack of IT adoption in SMEs
- Lack of budget to invest IT in SMEs
- Lack of IT personnel

Opportunities

- FTA
- Government support
- Realizing the advantage of IT adoption
- Chinese skill due to most of provider are Thai-Chinese

- Increasing trend of GDP
- Fair GCI index
- Great FDI index
- Good economic performance
- Good government efficiency
- Good business efficiency

Threats

- Old and lack of maintenance railway tracks
- Hard to integrate new systems with legacy systems
- Lack of English skills
- Poor infrastructure efficiency
- Poor port efficiency
- Poor custom environment
- Poor regulatory environment
- Very poor e-business usage
- Poor personal of computer

Singapore

Most of 3PL in Singapore are local firms and have a small to middle size. There are widely service customers in value-added logistics and great using IT and e-commerce in 3PLs. There is the Logistics Institute of Asia Pacific in Singapore that is a collaboration between University of Singapore and Georgia Tech to educate logistics knowledge to people and develop logistics research to their country. Workers have strong language skill but high cost. The logistics cost in Singapore is low.

Singapore is the leader logistics hub in Asia so there is economy scale to do logistics activities with a great profit. They have great infrastructure and great geography that are great connectivity. The government have strongly support in logistics and IT, import-export like FTA project too.

Strengths

- Great using IT in 3PL which are SMEs
- Value added in logistics service
- Good connectivity
- Language skill
- Logistics a recognized profession in Singapore
- Presence of decision-makers of multinational companies in Singapore
- Presence of a good number of foreign 3PL players in Singapore
- Low logistics cost

Weaknesses

- High operating cost
- Limited local market potential

Opportunities

- FTA
- Strong government support
- Hub service support
- Strategic location allowing coverage of a large number of regional countries
- Great GCI
- Great economic performance
- The best government efficiency
- Great business efficiency
- Strong of infrastructure efficiency
- The best port efficiency
- The best custom environment
- The best regulatory environment
- The best e-business usage
- Many personal of computer

Threats

- Customers lack the understanding of their logistics process
- Decreasing trend of GDP
- Regional countries catching up
- Influx of too many foreign 3PL players into Singapore

China

Most of 3PL in China are local firms and have a small size. There is high growth rate of 3PL significantly. The market is fragmented that no 3PLs has a market share over 2%. Local 3PLs have an advantage in domestics transportation network coverage but the foreign joint ventures in fact have a slide edged within China. Road transportation is the preferred mode in China. The logistics service is still at an early stage of development, with rudimentary facilities and limited use of modern information technology. There is large percentage of employee in companies have college equivalent or higher education. The topic should be major concern is a shortage of logistics professionals and executives.

The government tries to develop infrastructure, increase import-export activities (FTA), develop research and action plan to develop their country into a logistics hub in Asia.

Strengths

- High education of 3PL's employee
- Chinese logistics experience that can make more satisfy to customers than foreign logistics service
- Low cost of operation

Weaknesses

- The 3PLs market is very fragmented.
- Lack of value added services
- Blur in 3PLs's service quality
- An early stage of warehousing development
- Rudimentary facilities

- Limited use of modern information technology
- Limited resources available for future expansion of local 3PLs
- A shortage of logistics professionals and executives
- High logistics cost

Opportunities

- FTA
- Strong government support
- Huge growth potential 3PL market
- High growth rate of GDP
- Great FDI index
- Great economic performance
- Good government efficiency
- Good infrastructure efficiency
- Good e-business usage

Threats

- Clients are not ready for outsourcing
- Poor geographical
- Poor GCI
- Poor business efficiency
- Low port efficiency
- Low custom environment
- Low regulatory environment
- Poor number of computer personal

Hong Kong

The majority of 3PLs in Hong Kong are small and lack the financial strength to invest in the physical assets (e.g. office space) and capital-intensive information technologies like ERP system. The industry is dynamic, and facing increasing pressure to improve service as competition intensifies. Companies are highly capable of

providing traditional logistics service such as freight forwarding, warehousing, picking and packaging but lack the capability to provide other value added logistics service.

Hong Kong position itself to be a logistics hub with providing the world class logistics service and enjoys many advantage to sustain this position. These include a prime geographic location, world class transportation infrastructure, a wide choice of multi-modal connections with China which is a mainland and other countries. The government support in developing infrastructure and stimulating export-import activities like trading with (FTA).

Strengths

- Quality service in core logistics activities

Weaknesses

- Lack of value added service
- Lack of financial strength
- Lack of modern information technology

Opportunities

- FTA
- Language skill of operational workers
- Good GCI index
- Government support
- Good FDI confidence index
- Good economics performance
- Great government efficiency
- Great business efficiency
- Good infrastructure efficiency
- Great port efficiency
- Great customs environment
- Fair regulatory environment
- Good e-business usage
- Many personal of computer

Threats

- Limited market within country
- Tiny alliance with other countries due to FTA agreement

Comparing Thailand with other countries, 3PLs in Singapore are better than 3PLs in Thailand for all sectors as logistics service, IT adoption, knowledge about logistics and IT, and quality of personnel. Singapore has good connectivity due to their infrastructure as basic infrastructure, technological infrastructure, scientific infrastructure, health and environment, and education that has been develop continually for a long time integrated with great geological, port environment, customs environment, and regulatory environment push Singapore to be a leader of logistics hub in Asia. However 3PLs in Singapore has high operating cost and limited local market potential (decreasing trend of GDP) but FTA project which is the collaborative of many countries with Singapore, helps to increase import-export activities, can be advantage for 3PLs a lot. Singapore has a lot of opportunities to develop their 3PLs both of strategic and IT developing due to a lot of logistics professional and research activity. The best of e-business usage, the strong technology infrastructure, and a lot of computer personal in Singapore make developing modern IT of 3PLs in Singapore easier. Anyway, influx of too many foreign 3PL players into Singapore may pressures 3PLs market that make local 3PLs unstable without that catching up of regional countries for being logistics hub may effects to economy scale of logistics activities in Singapore.

3PLs in China still behind Thailand both of service quality and IT adoption. The logistics service is still at an early stage of development, with rudimentary facilities and limited use of modern information technology that they have limited resources available for future expansion of local 3PLs and a shortage of logistics professionals and executives. Now Thailand is comparative China in technology, public institution, macro-economics environment (GCI ranking), and port efficiency. But the high of FDI index, high of GDP, and low labour cost that make the great impact to volume of production activity within country integrated with FTA agreement with many countries will push a lot of logistics activities in China that make China government has a strongly logistics support for basic infrastructure, technology, logistics research,

regulatory, including logistics education in its country. Next 5-10 years Thailand maybe one of countries that behind the prominent dragon like China.

Most of 3PLs status in Hong Kong are like Thailand that majority of firms are small, there is lack of value added logistics services and modern technology adoption. But Hong Kong has comparative to improve its 3PLs in many sectors. Geographic location, world class transportation infrastructure, a wide choice of multi-modal connections with China which is a mainland and other countries, great port efficiency, great custom environment, and great regulatory environment are the reasons to attract logistics activities in its country so there is enhance 3PLs to develop their service and technology. E-business usage, language skill of operational workers, and many personal of computer make IT expansion in 3PLs organization easier.

So 3PLs of Thailand are in the same position of 3PLs in Hong Kong for service and IT adopting sides but Hong Kong has comparative in channels to improve their service and IT due to their environments and infrastructure. Without that, 3PLs in Thailand are behind Singapore for both of services and IT adoption. Singapore has many logistics factors better than Thailand such as logistics knowledge, infrastructure, environments, IT personal, and logistics cost. In addition, 3PLs of Thailand now are ahead 3PLs of China for service and IT adoption but China has a lot of factors to push its 3PLs to be improved. So China is a country that Thailand can not look over. However Thailand government is also has a lot of project to enhance logistics activities within country for being logistics hub in Asia too like FTA project, logistics research project, basic infrastructure improvement project, IT developing project, and SMEs enhancement project so 3PLs in Thailand should be a country who can be competitive with others.

5.5 Problems of 3PLs in Thailand

The problems of 3PLs in Thailand that should be solved, are divided into service perspective and IT perspective as show in the below ;

Service Perspective (Figure 5.1)

- Lack of value-added service
- Lack of logistics knowledge
- High logistics cost due to mode of transportation
- Lack of effective inter-modal connection
- Lack of network

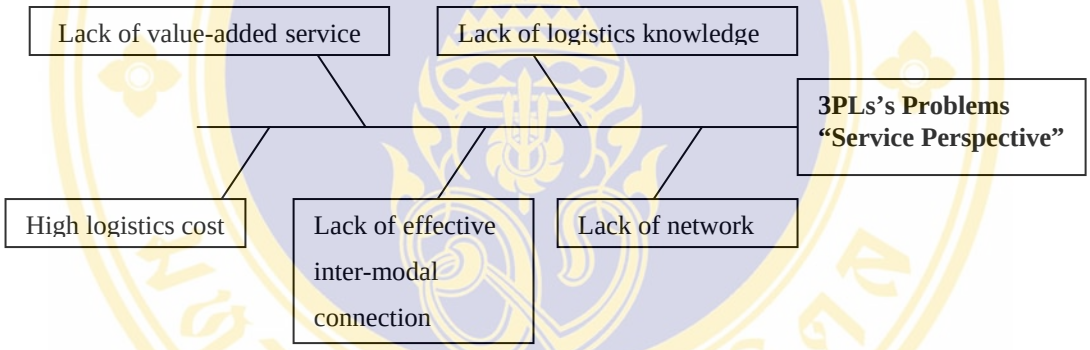

Figure 5.1 3PLs's Problem : Service Perspective

IT Perspective (Figure 5.2)

- Unaware new technology
- Lack of IT adoption in SMEs
- Lack of budget to invest IT in SMEs
- Lack of IT personnel

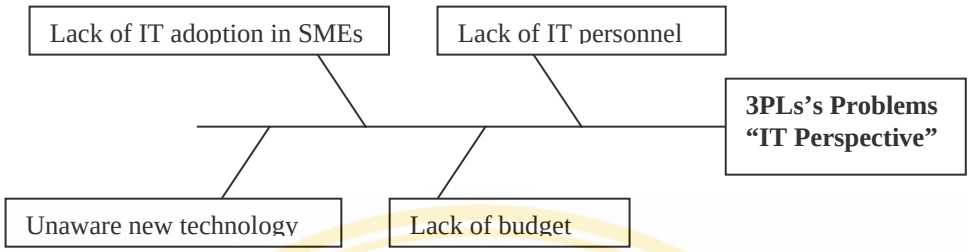

Figure 5.2 3PLs's Problem : IT Perspective

5.6 Direction of Solutions

The problems of 3PLs in Thailand can best be solved by 2 roles which are government role and 3PLs role.

The government should develop infrastructure within country which are basic infra structure as roads, rail tracks, and port, technology infrastructure, scientific infrastructure, health and environment, and education & research about logistics and IT. Without that government should support SMEs providers by law, tax, and loan that help them to be competitive with others by budget increasing, cost decreasing and more convenient. In addition, pushing IT into other industries such as food, chemical, textile etc. should be concern to increase IT usage in country. (Figure 5.3)

3PLs can develop themselves by improve their service performance and improve their IT as show in figure 5.4 .

The service performance can improve by increase value-added service to establish more activity into logistics market (like demand forecasting, logistics communication, material handling, parts and service support, plant and warehouse site selection, procurement, and reverse logistics), specify market sector to establish their expert, measure performance to increase their quality service (such as on-time delivery, accurate, complete, damage-free delivery, data accuracy, actual spending vs. budget, return on investment, back-orders, employee productivity, inventory turnover, space utilization, and order cycle)

IT adoption in organization should be logistics system to increase productivity in services (Transportation Management System, Warehouse Management System, and Distribution Management System), communication technology to decrease complexity

and increase convenient to customers and themselves (EDI and E-commerce), and supply chain monitoring system to monitor chain connected of logistics activities from up-stream to down-stream (Supply chain model, Supply chain simulator, Event tracker, and Performance monitor) as show in figure 5.4 and 5.5 respectively.

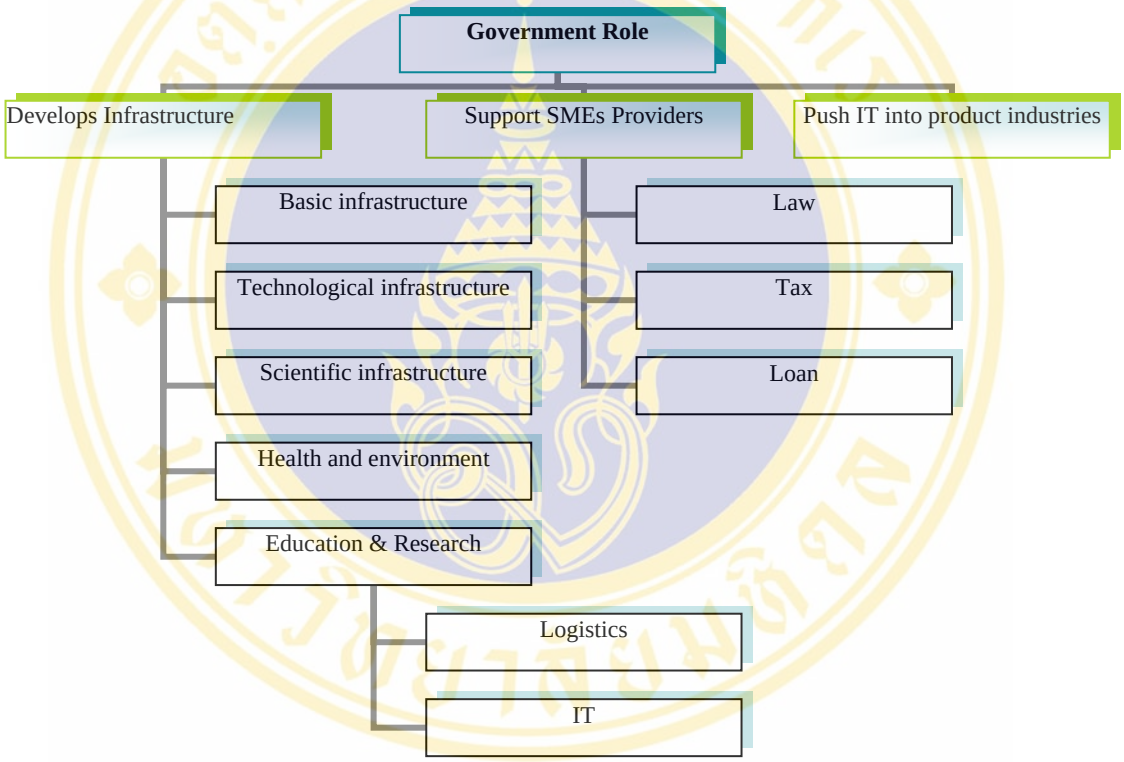

Figure 5.3 3PLs's Solution : Government Role

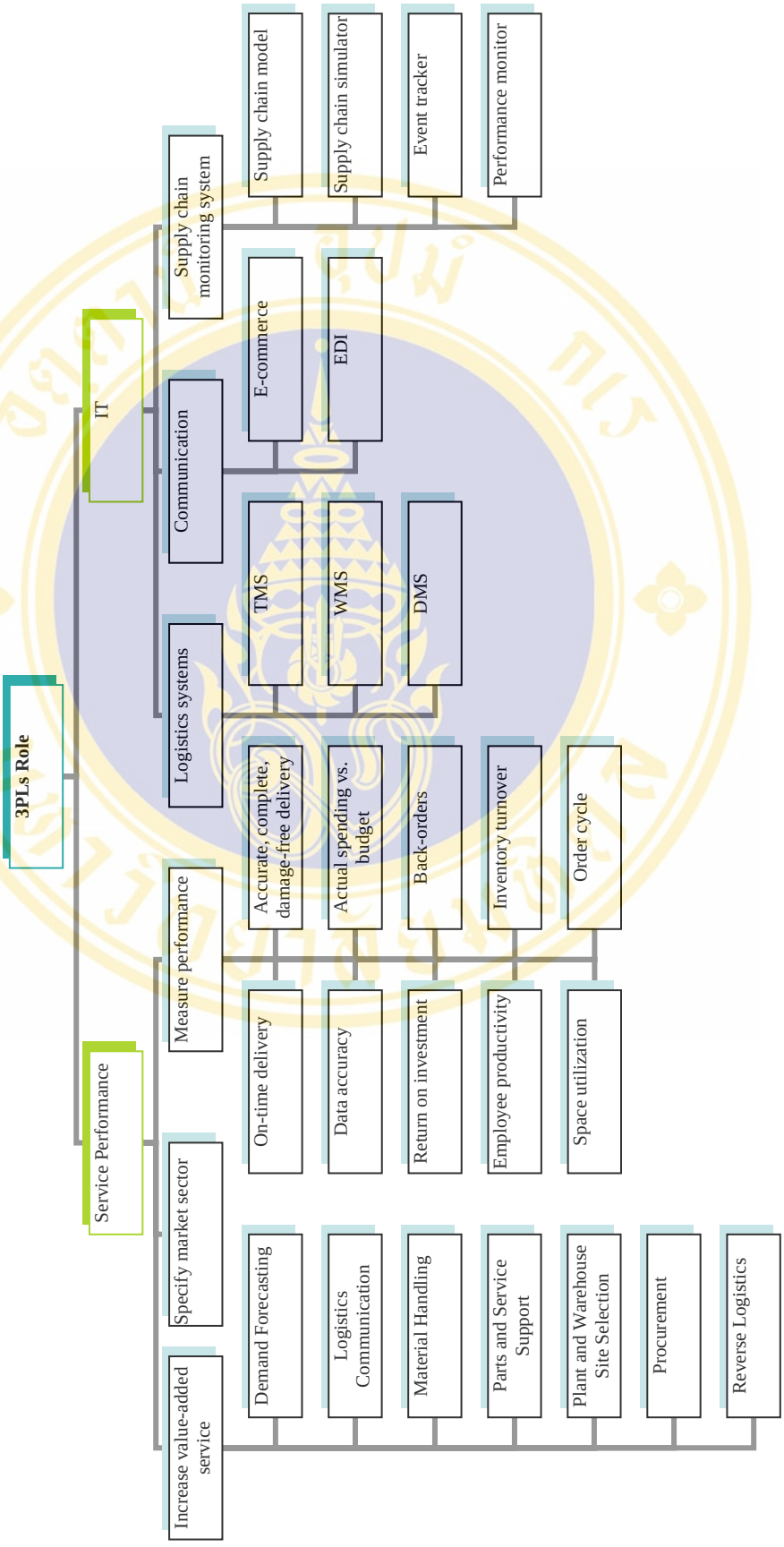

Figure 5.4 3PLs's Solution : 3PLs Role

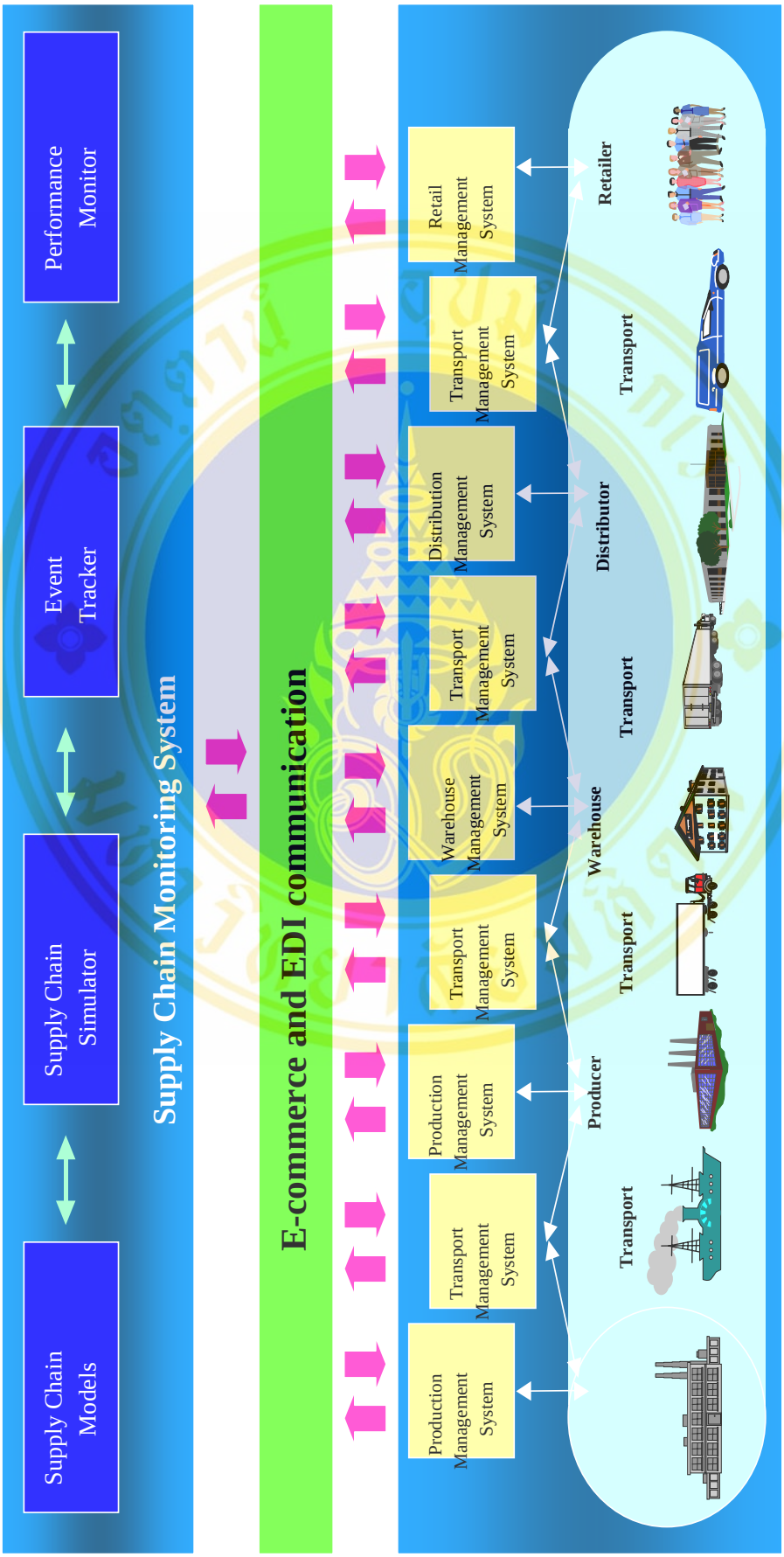

Figure 5.5 IT Solution [67]

For establish IT skill of personnel in 3PLs organization, the IT skill that should concern are word & spreadsheet, operating system & networking, EDI & ERP & E-commerce, TMS & WMS & DMS, and supply chain monitoring system as show in figure 5.6

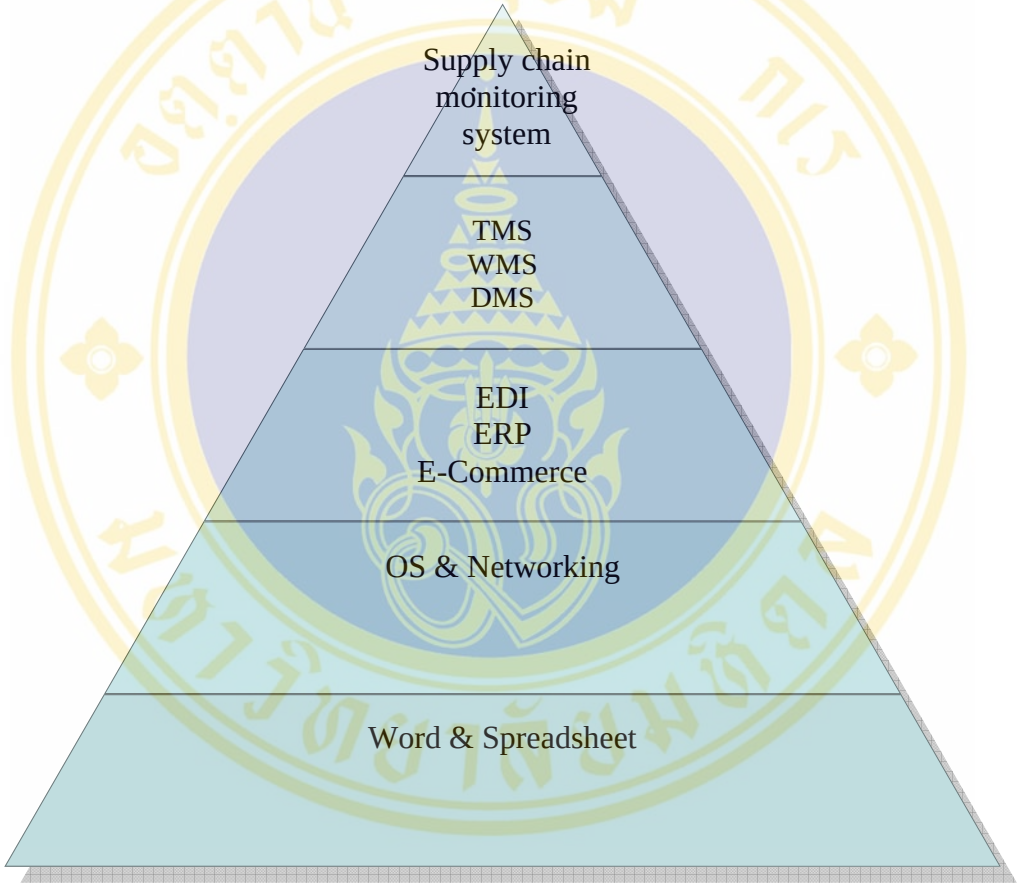

Figure 5.6 IT Training Program

So Thailand will have a good connectivity and strong infrastructure with high quality 3PLs to develop logistics within country to be a logistics hub.

CHAPTER VI
CONCLUSION AND RECOMMENDATIONS

This chapter aims to conclude the final result of this research. This section will answer the of objectives set out in chapter I and make recommendations for future research.

6.1 Conclusion

Currently, most of 3PLs in Thailand are local companies, have a small size and have a little breath of service. The services are typically fundamental services, they still lack of value-added service to provide to customers. Most of 3PLs focus on "Customer service" which is the decision services about inventory, transportation, and warehousing. Traffic and transportation is the second most common service activity. In order to transport goods to destination, the majority of 3PLs choose to transport by land for transport within country, and air and sea for transport between countries. For the direction of strategies in order to improve the service of customers' logistics activities, 3PLs focus on time based logistics solutions**,** logistics performance measurements and strategic alignment of IT. Regarding logistics performance measurements, which is one improvement strategy that major 3PLs focus on, now most 3PLs have their own standard to improve their operations but each standard is not an international standard, such as ISO 9001, 9002 to show their process performance.

According to IT applications and infrastructure deployment, most firms have financial systems, transportation management systems, finite scheduling systems and time management systems. The standard of information exchange, fax/ telex and internet/ email is the most popular to use, EDI is going to be interested, this maybe because Thai government has enhanced firms to use EDI connected to bureau especially the Customs department that logistics provider have to always connect to. However, IT systems in firms are only fundamental systems. There is lack of using e-

commerce although e-commerce can support their business as well. For the prime motivators for adopting IT, we can see that they usually use IT for reducing data entry errors, decreasing labour cost, and reducing order cycle time. The barriers to adopting IT include: a lack of IT personnel, problems of integration with legacy systems, lack of awareness about new technology, and lack of organizational support for using IT as cost could not be justified. For company achievements through implementing IT, the high percentage of agreement are improvement of data quality, cost reduction, more reliable delivery, timely performance measurement, achieve performance goals, shorter order cycles, and enhanced process performance. Personnel skills of IT in companies, we found that skills of word processing, spreadsheet, and operating system is needed, also skills of using networking, DSS, EDI, and ERP will be needed.

For the direction of leader 3PLs in Thailand, we can found that both of local and foreign 3PLs want to be the leaders of 3PL market in Thailand and focus on long term relationship with customers. Local 3PLs focus on expand their network within country and Indo-China region while foreign 3PLs have policy to establish their network across the world. Local 3PLs do not see the advantage from FTA project opposed to foreign 3PLs which see FTA as an engine to increase import-export activities that can be advantage to most of them. Most local firms agree to collaborate with each other to increase trade bargaining power while foreign firms do not need to. On the IT side, all respondents realized how important IT is, and how it can be an advantage for them but they do not focus on e-commerce as e-commerce is perceived as best for tangible product but there are not. Success factors of local 3PLs are technology, human resource, good relationship with customers, good relationship with sub-contract 3PLs, big scale of volume, and strategy while success factors of foreign 3PLs are technology, experience, human resource, high quality services, and meeting customer's needs. The concept of 3PLs in Thailand in local firms opinions are people are not really understand about logistics, there is a lot of competitors in the market, the oversea multinational company focus on using service from oversea 3PLs, this make local 3PLs loose the opportunities to do business, and it is a crisis for local 3PLs while foreign firms think that there is lack of personnel in logistics field, people do not really understand about logistics, most of leader of 3PL market in Thailand are the multi-national logistics service provider, and there is a lot of competitors in market.

3PLs in Singapore most of 3PLs in Singapore are local companies, have a small to medium size. There is lack of IT personnel compare with totally employee. The services are different value-added service such as order processing, product assembly, inventory control and reverse logistics. The 3PLs in Singapore seldom offer a single core service to their customers The majority of the 3PLs have indicated that having expert knowledge or specialized skills was one of the key differentiating factors that gave them the competitive edge. Most of them are already using IT in network modeling and accounting. Depending upon the nature of their services at present and their planned expansion. Wireless communication technology seems to be another important area for warehousing operators. The use of radio frequency technology for warehouse management is becoming popular due to better data accuracy and lesser human intervention. Network modeling system, including spatial location system, is getting popular in 3PLs providing transportation services and E-commerce solutions are becoming popular as they provide on-line booking and on-line inquiry on the cargo status to their clients. The top five motivating factors for adoption of IT in 3PLs are increasing data accuracy seems to be the prime motivation for IT adoption. 3PLs are beginning to realize that with increased adoption of EDI and E-commerce, information received by one party can be directly fed into its in-house application systems for planning and execution. The main barriers to the adoption of IT in 3PLs shows that one of the main concerns for adoption of IT is the speed of IT development itself. More than half of 3PLs feel that by the time they plan and execute IT programmes, the technology could become obsolete. At the same time, because of the obsolescence, it is difficult to justify the use of IT in financial terms as well.

Comparing 3PLs in Thailand with 3PLs in Singapore found that there is the same high growth rate of 3PLs both in Thailand and Singapore that most of 3PLs in Thailand are small and in Singapore are small to medium size. But 3PLs in Singapore have higher MNC 3PLs more than Thailand. The services of 3PLs in Thailand are fundamental services compare with Singapore which provide different value added service to their customers. The majority of the 3PLs in Singapore focus on having expert knowledge or specialized skills which was one of the key differentiating factors that gave them the competitive edge while 3PLs in Thailand also focus on human resource but there is the limited of expert knowledge and budget. For IT

implementing, it is clearly that 3PLs in Singapore are better than 3PLs in Thailand. Most of Singapore 3PLs already have fundamental systems and going to develop higher level systems while 3PLs in Thailand still lack of adoption IT even the fundamental systems. The motivation to adopting IT into organization of 3PLs in Thailand and Singapore are not difference. Both of them want to increase their capability in services. But the barriers are significantly different, the results show that 3PLs in Thailand really lack of knowledge about IT so they cannot optimize advantage from IT implementation.

In order to compare 3PLs in Thailand with Singapore, China, and Hong Kong, it was found that 3PLs of Thailand are in the same position of 3PLs in Hong Kong for service and IT adopting sides but Hong Kong has comparative in channels to improve their service and IT due to their environments and infrastructure. Without that, 3PLs in Thailand are behind Singapore for both of services and IT adoption. Singapore has many logistics factors better than Thailand such as logistics knowledge, infrastructure, environments, IT personal, and logistics cost. In addition, 3PLs of Thailand now are ahead 3PLs of China for service and IT adoption but China has a lot of factors to push its 3PLs to be improved. So China is a country that Thailand can not look over. However Thailand government is also has a lot of project to enhance logistics activities within country for being logistics hub in Asia too like FTA project, logistics research project, basic infrastructure improvement project, IT developing project, and SMEs enhancement project so 3PLs in Thailand should be a country who can be competitive with others.

The problems of 3PLs in Thailand that should be solved, are divided into service perspective (lack of value-added service, lack of logistics knowledge, high logistics cost due to mode of transportation, lack of effective inter-modal connection, lack of network) and IT perspective (unaware new technology, lack of IT adoption in SMEs, lack of budget to invest IT in SMEs, lack of IT personnel)

The government should develops infrastructure within country, supports SMEs providers by law, tax, and loan that help them to be competitive with others by budget increasing, cost decreasing and more convenient. In addition, pushing IT into other industries such as food, chemical, textile etc. should be concern to increase IT usage in country.

3PLs can develop themselves by improve their service performance which are increase value-added service, specify market sector, and measure their logistics services performance. Improve their IT by adoption logistics system, communication technology, and supply chain monitoring system.

For establish IT skill of personnel in 3PLs organization, the IT skill that should concern are word & spreadsheet, operating system & networking, EDI & ERP & E-commerce, TMS & WMS & DMS, and supply chain monitoring system.

6.2 Recommendations

This research aims to get the basic results of 3PLs in Thailand in their strategies and IT perspective. The limitations of research are the cost of sending questionnaires, the duration of the research, and the number of sample that are selected.

For further research, the researchers should use more samples than the sample in this research. The point of service performance measurement is interesting to find out the appropriate indexes to determine standard of logistics service in Thailand. And detail of service characteristics in each providers should be studied to provide 3PLs's information to help customers in decision of 3PLs choosing. Without that, the studying of using logistics service in customer's perspective is the one should be concern.

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APPENDIX

แบบสอบถามเชิงสำรวจ

ส่วนที่ 1 : ข้อมูลองค์กรในปัจจุบัน

กรุณาใส่เครื่องหมาย √ ลงในข้อที่ตรงกับข้อมูลภายในองค์กรของท่าน

1. ประเภทกิจการขององค์กร

   ❍ 1. ตัวแทนด้านขนส่ง (Transportation Based)

   ❍ 2. ตัวแทนด้านคลังสินค้า/ การกระจายสินค้า (Warehouse/ Distribution Based)

   ❍ 3. ตัวแทนรับจัดการขนส่ง (ไม่มียานพาหนะเป็นของตนเอง) (Forwarder Based)

   ❍ 4. ตัวแทนรับจัดการทางด้านการเงิน (Financial Based)

   ❍ 5. ตัวแทนรับจัดการทางด้านเทคโนโลยีสารสนเทศ (Information Based)

   ❍ 6. อื่นๆ ระบุ _____

2. ที่มาขององค์กร

   ❍ 1. รัฐวิสาหกิจ

   ❍ 2. องค์กรในประเทศ ที่มีการถือหุ้นในส่วนของคนไทยมากกว่า 30 %

   ❍ 3. องค์กรในประเทศ ที่มีการถือหุ้นในส่วนของคนไทยน้อยกว่า 30 %

   ❍ 4. บรรษัทข้ามชาติ (ที่ตั้งสำนักงานใหญ่ : _____)

   ❍ 5. อื่นๆ ระบุ_____

3. ระยะเวลาที่องค์กรเปิดให้บริการ_____ปี

   มีสาขาทั้งหมด _____ แห่ง

   - ในประเทศ _____ แห่ง ภาคเหนือ _____ แห่ง ภาคกลาง _____ แห่ง
     ภาคใต้ _____ แห่ง ภาคตะวันออก_____ แห่ง
     ภาคตะวันออกเฉียงเหนือ _____ แห่ง
   - ต่างประเทศ _____ แห่ง ระบุภูมิภาค _____

4. มาตรฐานหรือรางวัลที่องค์กรได้รับ เช่น ISO9000 เป็นต้น

   ❍ 1. ไม่มี

   ❍ 2. มี ระบุ _____

5. รายได้เฉลี่ยประจำปีขององค์กร

- ❍ 1. น้อยกว่า 25 ล้านบาท
- ❍ 2. 26 – 50 ล้านบาท
- ❍ 3. 51 – 100 ล้านบาท
- ❍ 4. 101 – 250 ล้านบาท
- ❍ 5. 251 – 500 ล้านบาท
- ❍ 6. 501 – 1,000 ล้านบาท
- ❍ 7. มากกว่า 1,000 ล้านบาท

6. จำนวนพนักงานในองค์กร

a. จำนวนพนักงานทั้งหมด (โปรดระบุ) _____ คน

b. จำนวนพนักงานที่ทำด้านลอจิสติกส์ทั้งหมด (ไม่รวมพนักงาน IT): _____

c. จำนวนพนักงานที่ทำหน้าที่เกี่ยวกับระบบเทคโนโลยีสารสนเทศ (IT) (โปรดระบุ) _____ คน

7. ประเภทของสินค้าที่องค์กรให้บริการ

- ❍ 1. อาหาร/ เครื่องดื่ม
- ❍ 2. เครื่องอุปโภคต่างๆ
- ❍ 3. ยาและอุปกรณ์ทางการแพทย์
- ❍ 4. ผลิตภัณฑ์เพื่อสุขภาพ
- ❍ 5. ชิ้นส่วนอิเล็กทรอนิกส์
- ❍ 6. ผลิตภัณฑ์เยื่อกระดาษ
- ❍ 7. สิ่งทอ
- ❍ 8. เคมีภัณฑ์
- ❍ 9. เฟอร์นิเจอร์
- ❍ 10. เครื่องจักรกล
- ❍ 11. อุปกรณ์สื่อสาร
- ❍ 12. อื่นๆ (โปรดระบุ) _____

8. จำนวนลูกค้าที่ให้บริการ

- ❍ 1. น้อยกว่า 5 ราย
- ❍ 2. 5 – 19 ราย
- ❍ 3. 20 – 99 ราย
- ❍ 4. 100 รายขึ้นไป

9. ประเภทของลูกค้าที่ให้บริการ

- ❍ 1. รัฐบาล
- ❍ 2. รัฐวิสาหกิจ
- ❍ 3. บริษัทเอกชน
- ❍ 4. บรรษัทข้ามชาติ
- ❍ 5. ประชาชนทั่วไป
- ❍ 6. อื่นๆ ระบุ_____

10. การให้บริการลูกค้าขององค์กร (ตอบได้มากกว่า 1 ข้อ)

- ❍ 1. การบริการลูกค้า (Customer Service)
- ❍ 2. การพยากรณ์และการวางแผนอุปสงค์ (Demand Forecasting)
- ❍ 3. การบริหารสินค้าคงคลัง (Inventory Management)
- ❍ 4. การติดต่อสื่อสารด้านลอจิสติกส์ (Logistics Communication)
- ❍ 5. การจัดการวัตถุดิบ (Material Handling)
- ❍ 6. กระบวนการสั่งซื้อ (Order Processing)
- ❍ 7. การห่อและบรรจุภัณฑ์ (Packaging)
- ❍ 8. อะไหล่และการให้บริการ (Parts and Service Support)
- ❍ 9. การเลือกสถานที่ตั้งโรงงานและคลังสินค้า (Plant and Warehouse Site Selection)
- ❍ 10. การจัดหาสินค้า/ วัตถุดิบ (Procurement)
- ❍ 11. การจัดการสินค้ารับคืน (Reverse Logistics)
- ❍ 12. การจราจรและการขนส่ง (Traffic and Transportation)
- ❍ 13. คลังสินค้าและการจัดเก็บสินค้า (Warehousing and Storage)
- ❍ 14. อื่นๆ (โปรดระบุ) _____

11. ลักษณะการให้บริการขนส่ง

- ❍ 1. ทางบก
- ❍ 2. ทางน้ำ
- ❍ 3. ทางอากาศ
- ❍ 4. ทางรถไฟ
- ❍ 5. ทางทะเล

12. เวลา**โดยเฉลี่ย**สำหรับการส่งสินค้า (a) จากซัพพลายเออร์ (b) ไปถึงลูกค้า เป็นเท่าใด?

	(a) ผู้จัดส่งวัตถุดิบ		**(b) ลูกค้า**	
	ในประเทศ	**ต่างประเทศ**	**ในประเทศ**	**ต่างประเทศ**
1. วันเดียวกัน	❍	❍	❍	❍
2. วันถัดไป	❍	❍	❍	❍
3. 3 – 6 วัน	❍	❍	❍	❍
4. 1 – 2 สัปดาห์	❍	❍	❍	❍
5. มากกว่า 2 สัปดาห์แต่น้อยกว่า 1 เดือน	❍	❍	❍	❍
6. 1 - 3 เดือน	❍	❍	❍	❍
7. มากกว่า 3 เดือน	❍	❍	❍	❍

ส่วนที่ 2 : กลยุทธ์และทิศทางในการให้บริการด้านลอจิสติกส์

13. **คำชี้แจง** คำกล่าวด้านล่างเกี่ยวข้องกับกลยุทธ์ที่องค์กรของท่านนำมาใช้ โปรดจัดลำดับ 1 - 5 โดย 1 = “ไม่เห็นด้วยอย่างยิ่ง” และ 5 = “เห็นด้วยอย่างยิ่ง”

		ไม่เห็นด้วยอย่างยิ่ง				**เห็นด้วยอย่างยิ่ง**
a)	องค์กรมีการพัฒนาแล้วปฏิบัติตามแผนงานเพื่อสร้างและรักษาหุ้นส่วนทางธุรกิจ	1	2	3	4	5
b)	องค์กรดำเนินการวัดประสิทธิภาพของลอจิสติกส์ในเรื่องของต้นทุน, ความสามารถในการผลิต, การบริการลูกค้า, การบริหารผลประโยชน์และคุณภาพ	1	2	3	4	5

		ไม่เห็นด้วยอย่างยิ่ง				เห็นด้วยอย่างยิ่ง
c)	องค์กรให้ความสำคัญกับเวลาเป็นหลักโดยจะต้องมีสินค้าคงคลังอย่างต่อเนื่องและให้บริการลูกค้าอย่างรวดเร็ว ทันเวลาตามความต้องการของลูกค้า	1	2	3	4	5
d)	องค์กรมีหุ้นส่วนกับผู้จัดหาวัตถุดิบหรือลูกค้า	1	2	3	4	5
e)	ทั้งองค์กรมีมาตรฐานเดียวกันในการดำเนินงานทางด้านลอจิสติกส์	1	2	3	4	5
f)	องค์กรมีการใช้กลยุทธ์จำนวนมากเพื่อที่จะเพิ่มกำลังในการเคลื่อนย้ายสินค้าให้ได้มากกว่าสองปีก่อน	1	2	3	4	5
g)	องค์กรมีวิธีจัดการเพื่อที่จะทำให้การส่งสินค้าตีกลับเป็นไปอย่างสะดวก	1	2	3	4	5
h)	องค์กรมีการปรับโครงสร้างทางลอจิสติกส์ระหว่างช่วง 2 ปีที่ผ่านมา	1	2	3	4	5
i)	องค์กรเลือกลอจิสติกส์เป็น 1 ในจุดแข็งหลัก	1	2	3	4	5
j)	องค์กรเห็นคุณค่าของการใช้ IT ในซัพพลายเชนขององค์กร ดังนั้น ฝ่ายบริหารระดับสูงจะวางแผนและผลักดันการพัฒนา IT	1	2	3	4	5

14. เวลาโดยเฉลี่ยสำหรับการตอบสนองต่อการถามของลูกค้า

- ❍ 1. ทันทีทันใด
- ❍ 2. น้อยกว่าครึ่งชั่วโมง
- ❍ 3. ครึ่งชั่วโมงถึง 1 ชั่วโมง
- ❍ 4. มากกว่า 1 ชั่วโมง แต่ไม่เกิน 4 ชั่วโมง
- ❍ 5. 4 ชั่วโมงหรือมากกว่า

15. การวัดประสิทธิภาพการทำงานด้านลอจิสติกส์ขององค์กร

❍ 1. มี

❍ 2. ไม่มี (ไปที่คำถามข้อถัดไป)

ถ้ามี กรุณาจัดลำดับวิธีการวัดประสิทธิภาพด้านลอจิสติกส์ของบริษัทคุณ 3 อันดับ (โดย 1 = "สำคัญที่สุดอันดับ 1" 2 = "สำคัญที่สุดอันดับ 2" และ 3 = "สำคัญที่สุดอันดับ 3")

	a)	การจัดส่งแบบตรงเวลา (On-time delivery)
	b)	การส่งคืนสินค้ากลับ (Back-orders)
	c)	ผลตอบแทนการลงทุน (Return on investment)
	d)	การใช้พื้นที่การจัดเก็บสินค้าให้เป็นประโยชน์
	e)	ค่าใช้จ่ายจริง vs. งบประมาณ
	f)	ระยะเวลาในการสั่งสินค้า
	g)	ความถูกต้อง, ความสมบูรณ์ และการส่งที่เสียหาย (damage-free delivery)
	h)	อัตราการหมุนเวียนสินค้าคงคลัง (Inventory Turnover)
	i)	ความสามารถในการผลิตของพนักงาน
	j)	ความถูกต้องของข้อมูล
	k)	อื่นๆ (โปรดระบุ : _____)

ส่วนที่ 3 : เทคโนโลยีสารสนเทศ

16. สถานภาพของงานประยุกต์ด้าน IT ที่ใช้สนับสนุนซัพพลายเชนของบริษัทเป็นอย่างไร?

		ถูกนำไปใช้/ถูกพัฒนาแล้ว	กำลังจะนำไปใช้ / พัฒนา	วางแผนว่าจะนำไปใช้/พัฒนาภายใน 2 ปี นับจากนี้	ไม่มีแผนการใดๆ
a)	การวางแผนการกระจายทรัพยากร Distribution Resource Planning (DRP)	❍	❍	❍	❍
b)	การพยากรณ์ (Forecasting)	❍	❍	❍	❍

		ถูกนำไปใช้/ ถูกพัฒนาแล้ว	กำลังจะ นำไปใช้ / พัฒนา	วางแผนว่าจะนำ ไปใช้/พัฒนา ภายใน 2 ปี นับจากนี้	ไม่มีแผน การใดๆ
c)	ระบบการบริหารจัดการการขนส่ง Transportation Management System	❍	❍	❍	❍
d)	แบบจำลองเครือข่ายทางลอจิสติกส์ Logistics Network Modeling	❍	❍	❍	❍
e)	ระบบการบริหารคลังสินค้า Warehouse Management System	❍	❍	❍	❍
f)	การวางแผนความต้องการวัสดุ Manufacturing Resource Planning (MRP II)	❍	❍	❍	❍
g)	ระบบการบริหารโครงการ Project Management System	❍	❍	❍	❍
h)	ระบบการบริหารกำลังการผลิต/ความสามารถในการผลิต Capacity Management System	❍	❍	❍	❍
i)	ระบบการจัดการตาราง/กำหนดการที่แน่นอน Finite Scheduling System	❍	❍	❍	❍
j)	ระบบการบริหารคลังสินค้า Inventory Management System	❍	❍	❍	❍
k)	ระบบการบริหารการเงิน Financial Management System	❍	❍	❍	❍
l)	ระบบการบริหารเวลา Time Management System	❍	❍	❍	❍
m)	ระบบการจัดตารางการผลิตหลัก Master Production Scheduling System	❍	❍	❍	❍

		ถูกนำไปใช้/ถูกพัฒนาแล้ว	กำลังจะนำไปใช้ / พัฒนา	วางแผนว่าจะนำไปใช้/พัฒนาภายใน 2 ปี นับจากนี้	ไม่มีแผนการใดๆ
n)	การประมวลผลการสั่งขายสินค้า Sales Order Processing	❍	❍	❍	❍
o)	ระบบการบริหารการจัดซื้อ Purchasing Management System	❍	❍	❍	❍
p)	ระบบควบคุมการผลิต Production Control System	❍	❍	❍	❍
q)	ระบบการบริหารคุณภาพ Quality Management System (e.g. SPC)	❍	❍	❍	❍
r)	เทคนิคการจัดแยกประเภทวัสดุในคลังสินค้า Activity Based Costing (ABC)	❍	❍	❍	❍
s)	ระบบคิดเงิน ณ จุดขาย Point of Sales Systems (POS)	❍	❍	❍	❍
u)	ระบบการบริหารข้อมูลสินค้า Product Data Management System (PDM)	❍	❍	❍	❍
v)	การบริหารลูกค้า/การบริหารวัตถุดิบที่ถูกส่งคืน Customer Service/Return Material Management	❍	❍	❍	❍
w)	ระบบการบริหารการบำรุงรักษา Maintenance Management System	❍	❍	❍	❍
x)	ระบบการบริหารข้อมูลห้องปฏิบัติการ/ห้องทดลอง Laboratory Information Management System	❍	❍	❍	❍
y)	ระบบการบริหารความสัมพันธ์กับลูกค้า Customer Relationship Management System (CRM)	❍	❍	❍	❍
z)	ระบบการวางแผนโซ่อุปทาน Supply Chain Planning System (SCP)	❍	❍	❍	❍

17. การใช้ระบบ E – Commerce

❍ 1. **มี (ทำต่อข้อ 19)**

❍ 2. ไม่มี (ข้ามไปข้อ 21)

18. การนำระบบ E – Commerce ไปใช้

❍ 1. บริการเตือนล่วงหน้า (Pre – alert service)

❍ 2. การติดตามการเสนอราคา (Track and trace)

❍ 3. การตรวจสอบสถานะของคลังสินค้าแบบออนไลน์ (Checking stock status online)

❍ 4. การตรวจสอบการให้บริการ (Delivery monitoring service)

19. วิธีการสื่อสารเพื่อแลกเปลี่ยนข้อมูลกับ (i) **ลูกค้า** , (ii) **ผู้เกี่ยวข้องและ** (iii) **ภายในบริษัท** (เช่น สาขาใหญ่หรือสาขาย่อย)

โปรดใส่เครื่องหมาย/เลือกทางเลือกทั้งหมดที่มีให้ และถ้าหากว่าไม่ได้ใช้ก็ให้ปล่อยว่างไว้

		Internet/ Email	**Postal Mail/ Courier (จดหมาย)**	**VAN Network/ EDI**	**Point-to-Point**	**Wireless Network**	**Diskette/ Tape**	**Fax/ Telex (แฟกซ์)**
a)	สถานะ/สถานภาพของสินค้าคงคลัง							
	i. กับลูกค้า	❍	❍	❍	❍	❍	❍	❍
	ii. กับผู้เกี่ยวข้อง	❍	❍	❍	❍	❍	❍	❍
	iii. ภายในบริษัท	❍	❍	❍	❍	❍	❍	❍
b)	สถานะของการสั่งซื้อ							
	i. กับลูกค้า	❍	❍	❍	❍	❍	❍	❍
	ii. กับผู้เกี่ยวข้อง	❍	❍	❍	❍	❍	❍	❍
	iii. ภายในบริษัท	❍	❍	❍	❍	❍	❍	❍
c)	การพยากรณ์							
	i. กับลูกค้า	❍	❍	❍	❍	❍	❍	❍
	ii. กับผู้เกี่ยวข้อง	❍	❍	❍	❍	❍	❍	❍
	iii. ภายในบริษัท	❍	❍	❍	❍	❍	❍	❍

		Internet/ Email	Postal Mail/ Courier (จดหมาย)	VAN Network/ EDI	Point-to-Point	Wireless Network	Diskette/ Tape	Fax/ Telex (แฟกซ์)
d)	แผน/ตารางการผลิต							
	i. กับลูกค้า	❍	❍	❍	❍	❍	❍	❍
	ii. กับผู้เกี่ยวข้อง	❍	❍	❍	❍	❍	❍	❍
	iii. ภายในบริษัท	❍	❍	❍	❍	❍	❍	❍
e)	สารสนเทศที่ใช้ในระบบคิดเงิน ณ จุดขาย							
	i. กับลูกค้า	❍	❍	❍	❍	❍	❍	❍
	ii. กับผู้เกี่ยวข้อง	❍	❍	❍	❍	❍	❍	❍
	iii. ภายในบริษัท	❍	❍	❍	❍	❍	❍	❍
f)	สารสนเทศที่ใช้สำหรับการออกแบบสินค้า **(เช่น การใช้คอมพิวเตอร์ในการออกแบบสินค้า (CAD))**							
	i. กับลูกค้า	❍	❍	❍	❍	❍	❍	❍
	ii. กับผู้เกี่ยวข้อง	❍	❍	❍	❍	❍	❍	❍
	iii. ภายในบริษัท	❍	❍	❍	❍	❍	❍	❍
g.	การตลาด/การส่งเสริมการขาย							
	i. กับลูกค้า	❍	❍	❍	❍	❍	❍	❍
	ii. กับผู้เกี่ยวข้อง	❍	❍	❍	❍	❍	❍	❍
	iii. ภายในบริษัท	❍	❍	❍	❍	❍	❍	❍
h.	การควบคุมกระบวนการด้านคุณภาพ/ทางสถิติ							
	i. กับลูกค้า	❍	❍	❍	❍	❍	❍	❍
	ii. กับผู้เกี่ยวข้อง	❍	❍	❍	❍	❍	❍	❍
	iii. ภายในบริษัท	❍	❍	❍	❍	❍	❍	❍

		Internet/ Email	Postal Mail/ Courier (จดหมาย)	VAN Network/ EDI	Point-to-Point	Wireless Network	Diskette/ Tape	Fax/ Telex (แฟกซ์)
i.	ธุรกรรมการซื้อ/ขาย (เช่น รายการส่งซื้อ / ขาย)							
	i. กับลูกค้า	❍	❍	❍	❍	❍	❍	❍
	ii. กับผู้เกี่ยวข้อง	❍	❍	❍	❍	❍	❍	❍
	iii. ภายในบริษัท	❍	❍	❍	❍	❍	❍	❍
j.	การกำหนดราคา							
	i. กับลูกค้า	❍	❍	❍	❍	❍	❍	❍
	ii. กับผู้เกี่ยวข้อง	❍	❍	❍	❍	❍	❍	❍
	iii. ภายในบริษัท	❍	❍	❍	❍	❍	❍	❍
k.	รายการค่าใช้จ่าย (รายรับ/รายจ่าย)							
	i. กับลูกค้า	❍	❍	❍	❍	❍	❍	❍
	ii. กับผู้เกี่ยวข้อง	❍	❍	❍	❍	❍	❍	❍
	iii. ภายในบริษัท	❍	❍	❍	❍	❍	❍	❍

20. สถานภาพในการนำเทคโนโลยีต่อไปนี้มาใช้ในองค์กร

		ถูกนำไปใช้/ ถูกพัฒนาแล้ว	กำลังจะนำไปใช้ / พัฒนา	วางแผนว่าจะนำไปใช้/พัฒนาภายใน 2 ปี นับจากนี้	ไม่มีแผนการใดๆ
a)	ฐานข้อมูลเชิงสัมพันธ์ (RDBMS) (เช่น Informix, Oracle, Sybase, etc)	❍	❍	❍	❍
b)	การพัฒนาซอฟต์แวร์แบบอ๊อบเจ็ก	❍	❍	❍	❍
c)	สถาปัตยกรรมผู้รับบริการ- ผู้ให้บริการ (Client - Server)	❍	❍	❍	❍
d)	การแลกเปลี่ยนข้อมูลทางอิเล็กทรอนิกส์ (EDI)	❍	❍	❍	❍

		ถูกนำไปใช้/ถูกพัฒนาแล้ว	กำลังจะนำไปใช้ / พัฒนา	วางแผนว่าจะนำไปใช้/พัฒนาภายใน 2 ปี นับจากนี้	ไม่มีแผนการใดๆ
e)	การระบุอัตโนมัติ (เช่น barcode, RFID)	❍	❍	❍	❍
f)	การประมวลผลข้อมูลแบบเรียลไทม์ (เช่น การใช้ Radio-Frequencies technologies ฯลฯ)	❍	❍	❍	❍
g)	สถาปัตยกรรมระบบเปิด (เช่น Linux, Windows OS ฯลฯ)	❍	❍	❍	❍
h)	Fault tolerance (เช่น automatic backup and recovery)	❍	❍	❍	❍
i)	Process automation (เช่นASRS, AGV)	❍	❍	❍	❍
j)	Enterprise solution software (เช่น BAAN, SAP ฯลฯ)	❍	❍	❍	❍
k)	กรุ๊ปแวร์ (เช่น MS Exchange, Lotus Notes ฯลฯ)	❍	❍	❍	❍

21. สถานภาพของการรวมระบบงานประยุกต์ของคุณเข้ากับเทคโนโลยีต่อไปนี้เป็นอย่างไร?

		ถูกนำไปใช้/ถูกพัฒนาแล้ว	กำลังจะนำไปใช้ / พัฒนา	วางแผนว่าจะนำไปใช้/พัฒนาภายใน 2 ปี นับจากนี้	ไม่มีแผนการใดๆ
a)	อินเตอร์เน็ต/ระบบอีเมล์	❍	❍	❍	❍
b)	แฟกซ์	❍	❍	❍	❍
c)	Value-added network/EDI	❍	❍	❍	❍
d)	การเชื่อมต่อแบบจุดต่อจุด/โดยตรง	❍	❍	❍	❍
e)	ระบบบาร์โค้ด	❍	❍	❍	❍
f)	เครือข่ายแบบไร้สาย	❍	❍	❍	❍

ตอนที่ 4 : ความสำเร็จขององค์กรที่ได้ประโยชน์จากการนำเอาลอจิสติกส์มาใช้และทิศทางในอนาคตขององค์กร

22. จากคำกล่าวต่อไปนี้ที่สะท้อนถึงความสำเร็จขององค์กรของท่านที่ได้ประโยชน์หรือผลกำไรจากการนำเอา ลอจิสติกส์มาใช้เป็นเวลากว่า 2 ปี **โปรดจัดลำดับโดยใช้ตัววัด** 1 - 5 **โดย** 1 = **"ไม่เห็นด้วยอย่างยิ่ง" และ** 5 = **"เห็นด้วยอย่างยิ่ง"**

		ไม่เห็นด้วยอย่างยิ่ง				**เห็นด้วยอย่างยิ่ง**
a)	ต้นทุนการดำเนินงานของบริษัทลดลง	1	2	3	4	5
b)	บริษัทลดเวลาในการส่งรายการสินค้าของลูกค้าเป็นอย่างมาก	1	2	3	4	5
c)	ความสม่ำเสมอของการส่งสินค้าของบริษัทเพิ่มขึ้น	1	2	3	4	5
d)	บริษัทบรรลุเป้าหมายด้านประสิทธิภาพของลอจิสติกส์ (ทั้งบริการและประสิทธิผล) ที่ได้กล่าวไว้	1	2	3	4	5
e)	บริษัทสามารถลดความน่าเชื่อถือในการพยากรณ์ได้	1	2	3	4	5
f)	บริษัทสามารถลดจำนวนรวมของระบบสินค้าคงคลัง	1	2	3	4	5
g)	คุณภาพของข้อมูลดีขึ้น	1	2	3	4	5
h)	ข้อมูลที่ได้จากการวัดประสิทธิภาพของการปฏิบัติงานถูกนำมาใช้อยู่เสมอๆจนถึงทุกวันนี้	1	2	3	4	5
i)	บริษัทมีกระบวนการเพิ่มประสิทธิภาพการปฏิบัติงานอยู่เสมอจนถึงทุกวันนี้	1	2	3	4	5

23. สิ่งที่เป็นตัวกระตุ้นหลักของบริษัทคุณที่มีต่อการนำเอา IT มาใช้ หรือการวางแผนเพื่อนำ IT มาใช้งานด้านลอจิสติกส์

- <u>สำคัญมาก</u> ถ้าไม่เพราะเหตุผลนี้ เราคงจะไม่สามารถทำมันเสร็จได้
- <u>สำคัญ</u> ไม่ใช่ปัจจัยในการตัดสินใจเดี่ยว แต่เป็นการพิจารณาหลัก
- <u>สำคัญเล็กน้อย</u> ในการตัดสินใจของเรา
- <u>ไม่สำคัญ</u> ไม่มีส่วนในการตัดสินใจของเรา
- <u>ไม่เกี่ยวข้อง</u> ไม่มีส่วนเกี่ยวข้องใดๆเลย

		สำคัญมาก	สำคัญ	สำคัญน้อย	ไม่สำคัญ	ไม่เกี่ยวข้อง
a)	ต้นทุนด้านแรงงานลดลง	❍	❍	❍	❍	❍
b)	การปรับโครงสร้างของกระบวนการทางธุรกิจ/ การออกแบบระบบงานใหม่	❍	❍	❍	❍	❍
c)	ความสามารถในการพยากรณ์การส่งสินค้าที่เพิ่มขึ้น	❍	❍	❍	❍	❍
d)	นโยบายของหลายหน่วยงาน	❍	❍	❍	❍	❍
e)	ความกดดันจากลูกค้า	❍	❍	❍	❍	❍
f)	ความกดดันจากผู้จัดหาวัตถุดิบ	❍	❍	❍	❍	❍
g)	ลดความผิดพลาดในการนำข้อมูลเข้า	❍	❍	❍	❍	❍
h)	ลดระยะเวลาในการส่งสินค้า	❍	❍	❍	❍	❍
i)	ลดสินค้าคงคลัง	❍	❍	❍	❍	❍
j)	การจ่ายเงินที่ตรงเวลา (จากผู้จัดหาวัตถุดิบ)	❍	❍	❍	❍	❍
k)	ความชัดเจนในซัพพลายเชนที่ดีขึ้น	❍	❍	❍	❍	❍
l)	อื่นๆ (โปรดระบุ) _____	❍	❍	❍	❍	❍

24. **<u>คำชี้แจง</u>** ส่วนนี้เป็นอุปสรรคของการใช้เทคโนโลยีสารสนเทศ โปรดจัดอันดับอุปสรรคเหล่านี้ ซึ่งอิงตัววัด 1 ถึง 5 โดย 1 = “ไม่เห็นด้วยอย่างยิ่ง” และ 5 = “เห็นด้วยอย่างยิ่ง”

		ไม่เห็นด้วยอย่างยิ่ง				เห็นด้วยอย่างยิ่ง
a)	ขาดความรู้/การฝึกอบรม ในด้าน IT	1	2	3	4	5
b)	ไม่รู้จักเทคโนโลยีใหม่ๆ	1	2	3	4	5
c)	มีประสบการณ์ไม่ดีกับ บริษัทผู้ขาย/ ติดตั้ง ระบบ IT	1	2	3	4	5
d)	ขาดความสมเหตุสมผลด้านการเงิน	1	2	3	4	5
e)	ขาดการสนับสนุนจากฝ่ายบริหาร	1	2	3	4	5
f)	มีมาตรฐานของอุตสาหกรรมเป็นจำนวนมากที่ต้องปฏิบัติตาม (Interoperability problems)	1	2	3	4	5
g)	มีความลำบากในการกำหนดปริมาณผลประโยชน์ที่จับต้องไม่ได้	1	2	3	4	5

		ไม่เห็นด้วยอย่างยิ่ง				เห็นด้วยอย่างยิ่ง
h)	ระยะเวลาในการนำไปใช้ (implement) ที่ยาวนาน	1	2	3	4	5
i)	ปัญหาการรวม IT กับระบบการทำงานแบบดั้งเดิมที่มีอยู่	1	2	3	4	5
j)	อุปสรรคขององค์กรเอง	1	2	3	4	5
k)	วิธีในการใช้ IT ทางการค้าไม่ตรงกับความต้องการขององค์กร	1	2	3	4	5
l)	ขาดแคลนทรัพยากรด้าน IT	1	2	3	4	5
m)	หุ้นส่วนทางธุรกิจขาดความสามารถทางด้าน IT	1	2	3	4	5
n)	ระยะเวลาในการตอบสนองของแบนด์วิธช้า	1	2	3	4	5
o)	ล้าสมัยง่าย	1	2	3	4	5
p)	ไม่ใช่สิ่งที่จำเป็น	1	2	3	4	5
q)	อัตราความล้มเหลวในการนำ IT ไปใช้มีสูง	1	2	3	4	5

25. ระบุประเภทของทักษะต่างๆทาง IT ที่สำคัญสำหรับฝ่ายบุคคลด้านลอจิสติกส์ เพื่อที่จะสนับสนุนการทำงานด้านลอจิสติกส์อย่างมีประสิทธิผล โดยใช้มาตรวัด 1 ถึง 5 โดย 1 = “สำคัญน้อยที่สุด” และ 5 = “สำคัญมากที่สุด”.

		สำคัญน้อยที่สุด				สำคัญมากที่สุด
a)	การวางแผนความต้องการวัสดุ MRP II (เช่น APICS course)	1	2	3	4	5
b)	Spreadsheet (เช่น Microsoft Excel)	1	2	3	4	5
c)	Word processing (เช่น Word ฯลฯ)	1	2	3	4	5
d)	ระบบปฏิบัติการ (เช่น Windows, Linux)	1	2	3	4	5
e)	ระบบเครือข่ายคอมพิวเตอร์ (เช่น LAN, WAN ฯลฯ)	1	2	3	4	5
f)	ระบบสนับสนุนการตัดสินใจ (เช่น การวางแผนการขนส่ง)	1	2	3	4	5
g)	การแลกเปลี่ยนข้อมูลทางอิเล็กทรอนิกส์ (EDI)	1	2	3	4	5
h)	เครื่องมือพัฒนาซอฟต์แวร์ (เช่น ภาษา C, ภาษา Java)	1	2	3	4	5
i)	การประมวลผลเอกสารทางการค้า (เช่น TRADENET)	1	2	3	4	5

		สำคัญน้อยที่สุด				สำคัญมากที่สุด
j)	ความรู้เกี่ยวกับซอฟต์แวร์ระบบการวางแผนทรัพยากรวิสาหกิจ (เช่น SAP, MFG/PRO)	1	2	3	4	5
k)	อื่นๆ (โปรดระบุ: _____)	1	2	3	4	5

ขอบคุณสำหรับการมีส่วนร่วม หากท่านต้องการที่จะได้สำเนาผลการสำรวจ กรุณาใส่ชื่อและอีเมล์ของท่านด้านล่าง

ชื่อ : _____

Email: _____

INTERVIEW FORM

Part I : General Trends

1. Goals of business (Visual & Mission).
2. Capability of organization to complete that goals.
3. What is your target market in Thailand and global?
4. Do you have long term relationship between firm and customers?
5. What do you think about logistics cost of your customer firms? (about your price for customers)
6. What is the best service in your company?
7. What are the directions/ policies in order to improve your company?
   - With in Thailand/ others
   - Merger and acquisition (M&A) activities
   - Collaborative with other 3PLs

Part II

Globalization

1. How is globalization trend in the present world effect to your company?
2. What do you think about FTA (Free Trade Area) due to advantages, opportunities or problems with your company ?
3. Do you have plan to expand your network with in and aboard of Thailand?

SCM

1. Is IT important to your company ? How important is it?
2. What are technologies which you use to improve organization and service?
3. What are the barriers/ motivations in adopting IT into your organization?

E-commerce

1. Do you have E-commerce services?
    - Pre-alert service
    - Track & Trace
    - Checking stock status online
    - Delivery monitoring service
2. How E-commerce important to your companies?
3. What are advantages/ opportunity from using E-commerce?
4. Does your company use E-commerce as strategy to improve the business?

Part III : Positioning & Critical Success Factors

1. What is your company position in 3PL market?
2. Does your company tends to place position in Globalization & SCM & Ecommerce?
3. What are your success factors in 3PL business?

Part IV : General concept of 3PL in Thailand

1. What do you think about 3PL in Thailand now?
2. What are the strengths of foreign 3PL ?
3. What are the weaknesses of foreign 3PL ?
4. Do you have comments or suggestions to improve 3PL in Thailand?

INTERVIEW REPORT

Interview notes approved by : Dr. Thanakorn Naenna

Person interviewed :

Mr. Sunyawit Sethapokin (Business Development Director)

Blue & White Logistics Limited.

Interviewer : Ms. Atchara Dokkulab

Date : October 18th, 2004

Primary purpose :

1. To know general trends of company.
2. To know globalization, supply chain and e-commerce trends of company.
3. To know positioning & critical success factors of company.
4. To know opinion about general concept of 3PL in Thailand.

Summary of interview :

Part I : General trends

1. Goals of business (Visual & Mission).

Blue & White Logistics want to achieve goals in order to expand his network to across the country and to be the leader of local 3PL in Thailand

2. Capability of organization to complete that goals.

He has almost 2,000 clients to support company for goals achieving and company already be the leader and famous in Thailand.

3. What is your target market in Thailand and global?

Goods producers and goods sellers. In the present, Blue & White Logistics service to firms in several size, it can estimates that 25% are the big firms, 50% are the

middle firms, and 25% are the small firms. All of firm size support together so the amount of using service of company always balance.

4. Do you have long term relationship between firm and customers?

Most of customers have long term relationship with company. Long term relationship between company and clients depend on ability to respond their needs. There is continually increasing of clients such as Nestle, Colgate, P&G etc.

5. What do you think about logistics cost of your customer firms? (about your price for customers)

The costs of company's services are in the same level of others logistics company's costs. The competitive of Blue & White Logistics is a lot of customers so there are frequently cycle of transport, this make company transports goods to destination by on time.

6. What is the best service in your company?

Company focus on on- time delivery and accurate, complete and damage-free delivery. The strength of company is a big scale of order so there are great order cycle time then delivery goods will be on time. In addition, company do focus on data accuracy, company can response the customers questions by using tracking system.

7. What are the directions/ policies in order to improve your company?

- **With in Thailand/ others**

Company tries to expand network to across the country especially to cover the retailer in all region by using Bangkok to be the center of goods distribution.

In abroad, company plans to expand the business in Malaysia and China because the core business of company is land transportation so there are channels and opportunities to do business there.

- **Merger and acquisition (M&A) activities**

No.

- **Collaborative with other 3PLs**

For local 3PLs, there are organizations of transportation companies to increase bargaining power of members. Company is collaborated with them too.

Part II : Globalization, Supply Chain Management and E-commerce trends

Globalization

1. **How is globalization trend in the present world effect to your company?**

Make company to use IT and have to increase effective of service to be competitive in logistics market.

2. **What do you think about FTA (Free Trade Area) due to advantages, opportunities or problems with your company ?**

Free Trade Area commitment of Thailand effect to both of inbound and outbound transportation, there is increasing of competitors from abroad. None advantage belong to company.

3. **Do you have plan to expand your network with in and aboard of Thailand?**

Company plans to expand the business in Malaysia and China.

Supply Chain Management

1. **Does IT important to your company ? How much it important?**

Company cannot be existed without IT in the present world.

2. **What are technologies which you use to improve organization and service?**

Most of software was develop by company's officers. There is using database for inventory management and lease line for branches linking.

3. What are the barriers/ motivators in order to adopt IT into organization?

Barriers to use IT are high investment, lack of using with customers, and staff do lack of IT skill. Motivators include survival, modernization, increase accuracy of data, and decrease complicated of work.

E-Commerce

1. Do you have E-commerce services?

Yes, Track & Trace service.

2. How E-commerce important to your companies?

Not so much, because directly connecting by telephone or meeting is better to do agreement because it can provide more detail and more flexible than using e-commerce. E-commerce is not appropriate with this business, it should be using by tangible product.

3. What are advantages/ opportunity from using E-commerce?

There is a little opportunity and advantages to use e-commerce now because there is no need from customers.

4. Does your company use E-commerce as strategy to improve the business?

No.

Part III : Positioning and Success factors

1. What is your company position in 3PL market?

Company is the leader of local 3PL, There is high quality of transport in the normal price.

2. Does your company tends to place position in Globalization & SCM & Ecommerce?

Company focus on IT strategy to increase data accuracy and decrease work complicated due to a lot of volume in order cycle. Blue& White Logistics ready to use IT to support quality of service but the business cannot do alone, it must depend on customers too.

3. What are your success factors in 3PL business?

1) IT : There is a lot of investment in IT comparing with other local 3Pls.
2) Personnel : There is great motivator for employees and encourage them to have service mind by training. In addition, personnel in company has a lot of loyalty to company due to the power of control by the company owner.
3) Big scale of volume : It make company to ready to send goods to destination in short cycle time.

Part IV : General concept of 3PL in Thailand

1. What do you think about 3PL in Thailand now?

1) The oversea multinational company focus on using service from oversea 3PLs, this make local 3PLs lose the opportunities to do their businesses.
2) It is the crisis of local 3PLs, local 3PLs should expand their businesses or do the core businesses which they are expert of.

2. What are the strengths of local 3PL ?

The strengths of local 3PLs is the strength of personnel administrative compare with oversea 3PLs, especially controlling operational workers.

3. What are the weaknesses of local 3PL ?

There is lack of investment budget.

4. Do you have comment or suggestion to improve 3PL in Thailand?

Local 3Pls have to be collaborated into the big organization to increase power of bargaining. In the future, it will be increasing of out-sourcing because logistics activity will be harder because hard to find workers and higher cost so 3PL will be the choices that may decrease logistics cost. The government should support investment budget to local 3PLs to develop their businesses.

INTERVIEW REPORT

Interview notes approved by : Dr. Thanakorn Naenna

Person interviewed :

Mr. Tanoos Pha-obsaeng (Analyst : System Management Department)

Cementhai Logistics Company Limited.

Interviewer : Ms. Atchara Dokkulab

Date : November 3rd, 2004

Primary purpose :

1. To know general trends of company.
2. To know globalization, supply chain and e-commerce trends of company.
3. To know positioning & critical success factors of company.
4. To know opinion about general concept of 3PL in Thailand.

Summary of interview :

Part I : General trends

1. Goals of business (Visual & Mission).

Vision : The best of 3PL. Company want to be the leader in order to service integrated logistics activity to industrial, household, and consumer sectors by the modern technology.

Mission : Establish unlimited capability in logistics activity by :

- Using modern technology to increase ability of logistics service.
- Network expansion to respond customer's needs and build differentiation.
- Continually logistics skill developing to personnel.
- Effective of cost management by improve operational process frequently.

2. Capability of organization to complete that goals.

Company has high quality personnel, high investment in IT, a lot of logistics provider to serve logistics activities to customers. In addition, company already has a lot of clients that are the company in line of Cimenthai to support.

3. What is your target market in Thailand and global?

Thai industrial, household, and consumer sectors

4. Do you have long term relationship between firm and customers?

Most of customers have long term relationship with company especially company in line of Cimenthai.

5. What do you think about logistics cost of your customer firms? (about your price for customers)

If compare with small logistics providers, company has a little higher price but complete with high quality because all of employee even the drivers has been trained for great operation.

6. What is the best service in your company?

Company is the leader of transportation due to systems that mostly support transportation and network across the country which is service providers that have contacted with company so company can transport goods for customers across the country.

7. What are the directions/ policies in order to improve your company?

- **With in Thailand/ others**

Company always plan to expand hubs to distribution goods to destination for cost reducing.

There is no plan to expand network abroad now, company focus on delivery within country.

- **Merger and acquisition (M&A) activities**

  Not now.

- **Collaborative with other 3PLs**

There is other companies want to collaborate with company but he think Cimenthai logistics strong enough to do business in Cimenthai brand.

Part II : Globalization, Supply Chain Management and E-commerce trends

Globalization

1. **How is globalization trend in the present world effect to your company?**

   It pushes company to use modern technology to service customers.

2. **What do you think about FTA (Free Trade Area) due to advantages, opportunities or problems with your company ?**

   It may not be advantage or effect to company because company focus on delivery within country. It will be trouble to company if there is good import from international with condition to use 3PL of that country.

3. **Do you have plan to expand your network with in and aboard of Thailand?**

   Company always plan to expand network within country but not for abroad.

Supply Chain Management

1. **Does IT important to your company ? How much it important?**

   IT does important to company so much to improve service, manage complicated of work due to grower of order volume, and reduce cost.

2. **What are technologies which you use to improve organization and service?**

   WMS (Warehouse Management System) to control inventory and warehouse, TMS (Transportation Management System) to manage good distribution, and choose

effective way to transport, RFID to scan goods, GPS to support in transportation, Track & Trace system to increase confidence and comfort in transportation for customers to track goods. Most of system develop by i2 Technology, which is the leader logistics software company in USA.

3. What are the barriers/ motivators in order to adopt IT into organization?

Barriers to use IT is not realizing important of IT of customers, Motivators are decrease complicated of work and mistake of data accuracy.

E-Commerce

1. Do you have E-commerce services?

Yes, Track & Trace service.

a. How E-commerce important to your companies?

Important so much, it decreases complicated of work, extends data accuracy, increases flexibility of work.

b. What are advantages/ opportunity from using E-commerce?

It decreases complicated of work, extends data accuracy, and increases flexibility of work.

c. Does your company use E-commerce as strategy to improve the business?

Yes.

Part III : Positioning and Success factors

1. What is your company position in 3PL market?

The leader of local 3PL that provide service across the country.

2. Does your company tends to place position in Globalization & SCM & Ecommerce?

Not for globalization because company focus on service within country.

3. What are your success factors in 3PL business?

a. High quality of personnel.
b. Modern technology.
c. Good relationship between customers and small service providers.

Part IV : General concept of 3PL in Thailand

1. What do you think about 3PL in Thailand now?

There is a lot of competitor in market, small companies must try to survive in business.

2. What are the strengths of local 3PL ?

The strengths of local 3PLs is understanding of Thai culture that is a culture of operational workers.

3. What are the weaknesses of local 3PL ?

Technology and visual to develop business.

4. Do you have comment or suggestion to improve 3PL in Thailand?

It should be collaborated of local 3PL to be big organization for power bargaining and shared resources to other local 3PLs.

INTERVIEW REPORT

Interview notes approved by : Dr. Thanakorn Naenna

Person interviewed :

Mr. Chanont Rochwirat (Assistant Managing Director : Administration)

JWD Info Logistics Limited.

Interviewer : Ms. Atchara Dokkulab

Date : November 4th, 2004

Primary purpose :

1. To know general trends of company.
2. To know globalization, supply chain and e-commerce trends of company.
3. To know positioning & critical success factors of company.
4. To know opinion about general concept of 3PL in Thailand.

Summary of interview :

Part I : General trends

1. Goals of business (Visual & Mission).

Leveraging his Asian heritage and his international focus, to be long term logistics partner of choice for leading companies in the region.

2. Capability of organization to complete that goals.

Within country, company is quiet ready to be the leader of local 3PLs.

3. What is your target market in Thailand and global?

Thai nationalities companies such as Hong Tong rice, Mitphol because there is threat to do contact with global company due to global contacting of head quarter with global 3PLs that the branches of industries in Thailand have to follow.

4. Do you have long term relationship between firm and customers?

No, because customers always compare company with others 3PLs, if there is better 3PL to solve their problem in their constrains, they will choose the better 3PL.

5. What do you think about logistics cost of your customer firms? (about your price for customers)

If compare with small logistics providers, company has a little higher price but complete with high quality because all of employee even the drivers has been trained for great operation.

6. What is the best service in your company?

Integrated logistics service, company has long experience to solve customer's problem. The solution is varied by customer's problem that can be competitive with global 3PL because global 3PLs usually have their solution for customers to follow but JWD make solution based on customer's problem.

7. What are the directions/ policies in order to improve your company?

- **With in Thailand/ others**

Company plan to expand network across the country. In order expansion network to abroad, company focus on Indo-China region.

- **Merger and acquisition (M&A) activities**

Not now.

- **Collaborative with other 3PLs**

Now company is a member of Thai non-profit logistics organization to enhance local 3PL stronger and educate to people to understand roles of 3PL to make more understanding of out-sourcing to customers.

Part II : Globalization, Supply Chain Management and E-commerce trends

Globalization

1. **How is globalization trend in the present world effect to your company?**

It pushes company to have more capability to respond customer's needs

2. **What do you think about FTA (Free Trade Area) due to advantages, opportunities or problems with your company ?**

It will be problem if the foreign companies do not fare in trading which is focus on their nationality companies.

3. **Do you have plan to expand your network with in and aboard of Thailand?**

Yes, across the country and Indo-China Region.

Supply Chain Management

1. **Does IT important to your company ? How much it important?**

IT does important to company so much to improve operational in stock management, inventory report, preparing information to customers, etc.

2. **What are technologies which you use to improve organization and service?**

WMS (Warehouse Management System) to control inventory and warehouse, DMS (Distribution Management System) to manage good distribution and transportation, TMS (Transport Management System) to help in transportation, and real time system to contact with customers and within company. All system has been developed by IT officers of company.

3. **What are the barriers/ motivators in order to adopt IT into organization?**

Barriers to use IT are not enough budget to invest and not standardization of software solution. Motivator to use IT is modernization.

E-Commerce

1. Do you have E-commerce services?

Yes, Track & Trace service.

a. How E-commerce important to your companies?

Not important so much, because company is cleared in customer's cycle time and company's operation time.

b. What are advantages/ opportunity from using E-commerce?

Make more comfort ability to customers.

c. Does your company use E-commerce as strategy to improve the business?

No.

Part III : Positioning and Success factors

1. What is your company position in 3PL market?

The leader of local 3PL that service high quality in not low price to customers like Cementhai Logistics.

2. Does your company tends to place position in Globalization & SCM & Ecommerce?

Yes, but not for E-commerce. It seems company see e-commerce is an unnecessary tool.

3. What are your success factors in 3PL business?

a. Personnel, it is hard to build a knowledge worker in the short time.

b. Strategy, company tries to be a niche player to find the unrevealed market.

Part IV : General concept of 3PL in Thailand

1. **What do you think about 3PL in Thailand now?**

It is still fresh for Thailand, most of Thai providers do not really understand out-sourcing activity because most of people only think about lower cost assist of establish network of business.

2. **What are the strengths of local 3PL ?**
   - Easy to talk to workers.
   - More flexible than multinational 3PL.
   - Lower cost in work management.

3. **What are the weaknesses of local 3PL ?**
   - Lack of networking.
   - Lack of budget.

4. **Do you have comment or suggestion to improve 3PL in Thailand?**
   - It should upgrade knowledge of operation workers to have more capacity to work.
   - Government should has more take care of local 3PL to be competitive with global 3PL.
   - Government should take care about driver license more than now because it will be the root of accident.

INTERVIEW REPORT

Interview notes approved by : Dr.Thanakorn Naenna

Person interviewed :

Mr. Matee Ruenglin (General Manager)

Mr. Danai Makepoowadol (Operation Manager)

Exel Logistics (Far East) Limited

Interviewer : Ms. Atchara Dokkulab

Date : October 19th, 2004

Primary purpose :

1. To know general trends of company.
2. To know globalization, supply chain and e-commerce trends of company.
3. To know positioning & critical success factors of company.
4. To know opinion about general concept of 3PL in Thailand.

Summary of interview :

Part I : General trends

1. Goals of business (Visual & Mission).

Company wants to service on worldwide by focus on Integrated Logistics (Freight Management & Contract Logistics)

2. **Capability of organization to complete that goals.**

Exel has a lot of client to do business, has high quality personnel, has high technology to serve to customers, and has excellence operation system to consistent processes.

3. What is your target market in Thailand and global?

All of sectors especially consumer goods such as P&G, Nestle, Top, Jiffy, Nokia, etc.

4. Do you have long term relationship between firm and customers?

Most of the agreements are the long term relationship especially global clients.

5. What do you think about logistics cost of your customer firms? (about your price for customers)

It depends on customer's needs to determine costs, services will be varied by costs. Most of service costs of Exel are not cheap but high quality because customers do not usually focus on low costs, they interest ability of 3PL to solve their problem as they want.

6. What is the best service in your company?

Freight management because Exel has been established in Thailand for long time which is the beginning of freight management so there is a lot of long relationship with customers in this area.

7. What are the directions/ policies in order to improve your company?

- **With in Thailand/ others**

Company want to expand his network across the world to increase ability to service his customers.

- **Merger and acquisition (M&A) activities**

Exel just deal with Fujitsu a leading provider of customer-focused information technology and communications solutions to Fujitsu's companies in Japan and Tibbett & Britten, a multi-national logistics service provider, to do acquisition activities for increasing capability in order to service to customers in all segment.

- **Collaborative with other 3PLs**

No idea.

Part II : Globalization, Supply Chain Management and E-commerce trends

Globalization

1. How is globalization trend in the present world effect to your company?

It stimulates company to develop quality and channel of services, especially providing IT to customer in the globalization world to decrease costs and increase accuracy of data and quality of service to customers.

2. What do you think about FTA (Free Trade Area) due to advantages, opportunities or problems with your company ?

Free Trade Area commitment of Thailand helps company to improve opportunities as across border activities increase.

3. Do you have plan to expand your network with in and aboard of Thailand?

Exel plans to expand network to across the world for being the number one of the world in 3PL market.

Supply Chain Management

1. Does IT important to your company ? How much it important?

IT is the first priority, business cannot operate without IT

2. What are technologies which you use to improve organization and service?

Inventory Management System, WMS (Warehousing Management System), EDI, barcode, etc. Exel has all famous software on shelf for 3PL.

3. What are the barriers/ motivators in order to adopt IT into organization?

Barriers to use IT is lacking of use it in the real situation, most of customer are not ready to collaborate it with company. Motivators are lower cost and higher quality of services.

E-Commerce

1. **Do you have E-commerce services?**

Yes, Track & Trace service.

a. **How E-commerce important to your companies?**

Not so much in Thailand, because customers want direct contact through company more than contact by e-commerce, it involve the reliability attitude of customers.

b. **What are advantages/ opportunity from using E-commerce?**

Depend on customer's needs.

c. **Does your company use E-commerce as strategy to improve the business?**

No, company prefers to focus on service level that can maximize respond to customer's need.

Part III : Positioning and Success factors

1. **What is your company position in 3PL market?**

Exel is the number one of 3PL in Thailand market and want to be number one in the world market too.

2. **Does your company tends to place position in Globalization & SCM & Ecommerce?**

Yes, for Globalization and SCM but not for e-commerce.

3. **What are your success factors in 3PL business?**

1) Technology : Exel in Thailand has support technology from the head quarter in UK.
2) Experience : Exel in Thailand has knowledge transfer from experience of the head quarter in UK.

3) Human resource : Exel focus on human resource to be one of strategies to achieve goals of business, there are great training to establish excellence personnel.

Part IV : General concept of 3PL in Thailand

1. What do you think about 3PL in Thailand now?

- There is lack of personnel in logistics field.
- People are not really understand about logistics.
- Most of leader of 3PL market in Thailand are the multi-national logistics service provider. Now Exel does not has competitor in the same position in Thailand.

2. What are the strengths of foreign 3PL ?

The strengths of foreign 3PLs are great technology, excellence training, very long experience in business, good systematic in process, and great vision to develop business.

3. What are the weaknesses of foreign 3PL ?

Lack of Thai customers, this problem company tries to improve by intend to educated logistics activities knowledge to Thai customers and students in universities.

4. Do you have comment or suggestion to improve 3PL in Thailand?

It should has knowledge distribution in logistics area across the country to improve understanding of out-sourcing and doing logistics activities.

INTERVIEW REPORT

Interview notes approved by : Dr.Thanakorn Naenna

Person interviewed :

Mr. Chaichot Limaphan (MIS & ISO Manager)

Tokyu World Transport (Thailand) Limited

Interviewer : Ms. Atchara Dokkulab

Date : November 15th, 2004

Primary purpose :

1. To know general trends of company.
2. To know globalization, supply chain and e-commerce trends of company.
3. To know positioning & critical success factors of company.
4. To know opinion about general concept of 3PL in Thailand.

Summary of interview :

Part I : General trends

1. Goals of business (Visual & Mission).

To be the leader of 3PL in the world, for Thailand company want to be top 3 of Japanese 3PL in Thailand and top 10 of all 3PL in Thailand to establish the best satisfying to customers.

2. Capability of organization to complete that goals.

It is the challenge to that goals, company is already focus on company personnel and customer satisfying. Now company got ISO 9001:2000 to be company honor.

3. What is your target market in Thailand and global?

Most of product sector is electronic, garment is the second, focus on local customers.

4. Do you have long term relationship between firm and customers?

Most of the agreements are the long term relationship.

5. What do you think about logistics cost of your customer firms? (about your price for customers)

It depends on customer's satisfying and bargaining about cost per volume of service using.

6. What is the best service in your company?

Freight management, company only focus to establish the best freight management to customers.

7. What are the directions/ policies in order to improve your company?

- **With in Thailand/ others**

Company focus on IT developing to increases management capacity and expands network to across the world.

- **Merger and acquisition (M&A) activities**

Up to head quarter of company in Japan.

- **Collaborative with other 3PLs**

No.

Part II : Globalization, Supply Chain Management and E-commerce trends

Globalization

1. How is globalization trend in the present world effect to your company?

It stimulates company to focus on IT developing for being competitive in 3PL market.

2. What do you think about FTA (Free Trade Area) due to advantages, opportunities or problems with your company ?

Free Trade Area commitment of Thailand helps company in order to increase customers volume of import-export.

3. Do you have plan to expand your network with in and aboard of Thailand?

Company always plans to expand network to across the world.

Supply Chain Management

1. Does IT important to your company ? How much it important?

IT is the first priority, management of customers, documents, and operation will be problem if there is no IT.

2. What are technologies which you use to improve organization and service?

EDI to connect to bureau and Logistics system that develop from famous software company in Singapore by head quarter in Japan's demand.

3. What are the barriers/ motivators in order to adopt IT into organization?

Barriers to use IT are training and educating how to use IT to company workers, and waiting for authorizing to establish whatever IT to company from headquarter in Japan. Motivators are business environment, lower cost, and customer satisfaction.

E-Commerce

1. Do you have E-commerce services?

Yes, Track & Trace service.

a. How E-commerce important to your companies?

Not important so much, company focus on other IT in operation and management.

b. What are advantages/ opportunity from using E-commerce?

Not so much, it depends on business environment.

c. Does your company use E-commerce as strategy to improve the business?

No, company prefers to focus on management and operation to improve capacity of service.

Part III : Positioning and Success factors

1. What is your company position in 3PL market?

The leader of Asian 3PL in Thailand.

2. Does your company tends to place position in Globalization & SCM & Ecommerce?

Yes, for Globalization and SCM but not for e-commerce.

3. What are your success factors in 3PL business?

The best of responding to customer's needs.

Part IV : General concept of 3PL in Thailand

1. What do you think about 3PL in Thailand now?

It depends on import-export business, there is a lot of competitors in market that make the service providers have to extend their capacity to serve logistics activity to customers.

2. What are the strengths of foreign 3PL ?

The strengths of foreign 3PLs are stability of company, great unique management, and a lot of network to upgrade the level of service for customers.

3. What are the weaknesses of foreign 3PL ?

Lack of empowerment to decide about management and investment, and it has to send income from operation service back to the headquarter.

4. Do you have comment or suggestion to improve 3PL in Thailand?

It should bring IT to use in processes to avoid mistaken and increase customer satisfaction. Connecting to bureau should be more comfortable because it always has problem about response time of bandwidth in the beginning and the end of month.

INTERVIEW REPORT

Interview notes approved by : Dr.Thanakorn Naenna

Person interviewed :

Mr.Dale Lapthorne (Country Manager)

DHL Logistics (Thailand) Limited

Interviewer : Ms. Atchara Dokkulab

Date : November 8th, 2004

Primary purpose :

1. To know general trends of company.
2. To know globalization, supply chain and e-commerce trends of company.
3. To know positioning & critical success factors of company.
4. To know opinion about general concept of 3PL in Thailand.

Summary of interview :

Part I : General trends

1. Goals of business (Visual & Mission).

Company's vision : Customer trust DHL as the preferred global express and logistics partner, leading the industry in term of quality, profitability and market share.

Company's mission : DHL enhances the business of his customers by offering highest quality express and logistics solution based on strong local expertise combined with the most extensive global network presence

2. Capability of organization to complete that goals.

DHL has developed into a global organization capable of handling the logistics requirement of clients across a wide scope of services. Services include freight

forwarding both air and sea, locally based 3PL services including warehousing, distribution and inventory management. Despite operating four business units he provides connectivity across the units as his customers select the service platform to suit their needs.

3. What is your target market in Thailand and global?

On the 3PL side of DHL's operations he target customers requiring value added services and quality in handling and distribution process. This generally involves providing quality facilities, manned by competent well trained staff and support processes that ensure the best quality and timely service is provided to their customers. DHL's customers in Thailand are looking for :

- Skilled management in logistics functionality.
- Pay for what they use.
- Minimal investment in equipment, IT and facilities.
- Efficiencies through sharing resources particularly in distribution and information.
- Reduce liabilities.
- Painless expansion capabilities.

4. Do you have long term relationship between firm and customers?

Most of the agreements DHL has with his clients are long term 2 to 5 years. The length of the term generally relates to investment required to provide the require services to clients, and the degree of expertise developed in managing each client's specific needs.

5. What do you think about logistics cost of your customer firms? (about your price for customers)

For logistics cost of DHL's clients, he think if all costs are included, he is very competitive, but unfortunately many businesses cannot understand what their real costs and liabilities are. This view is support by looking at his customer base which includes many of the world's most successful companies. If he did not offer value they would not be his customers. The advantage of his service is in that his clients do not

have to invest in infrastructure and equipment, do not have the staffing liabilities and can gain from efficiencies in sharing equipment, staff, facilities and management systems.

6. What is the best service in your company?

Service.

7. What are the directions/ policies in order to improve your company?

- **With in Thailand/ others**

In order to improve his business, he is constantly seeking to develop the capabilities of his staff in all facets of DHL's business from operations, support such as client management and information systems. Developing methodologies and implementing practices that reduce risk, improve service and information to our clients are of utmost importance and require high competency skills to manage effectively.

- **Merger and acquisition (M&A) activities**

For merger and acquisition activities, DHL is always looking for suitable acquisitions both globally and in Thailand. The acquisition must be seen to add value to his business in customer base, staff capabilities and existing infrastructure.

- **Collaborative with other 3PLs**

Demand on service providers are now so great that it is not often difficult for one provider to deliver every aspect of the service so some collaboration with local 3PLs often provides the most effective outcome.

Part II : Globalization, Supply Chain Management and E-commerce trends

Globalization

1. How is globalization trend in the present world effect to your company?

DHL is one of the major global players in Logistics. His clients often look for one provider for services across borders especially as barriers to trading in goods are being removed and manufacturers are looking to low cost production regions.

2. What do you think about FTA (Free Trade Area) due to advantages, opportunities or problems with your company ?

Free Trade Area commitment of Thailand helps company to improve opportunities as across border activities increase.

3. Do you have plan to expand your network with in and aboard of Thailand?

Without that, DHL solution responsibilities have recently expanded to other countries in the region and this expansion is expected to escalate over the next 3 years.

Supply Chain Management

1. Does IT important to your company ? How much it important?

The business is based around IT capabilities as most clients do not just want warehousing and transport, but require service which are most likely linked to inventory management and tracking, delivery or order status information. Providing a flexible IT environment that meet the numerous demand of his client is critical to his success both in satisfying customer needs and business growth.

2. What are technologies which you use to improve organization and service?

DHL is an IT based organization but also creative management recognizing inefficiencies in the business and how he can better utilize resources. Use of bar-coding in suitable applications, real-time technology and processes which deliver value to clients, improve his decision making capability and improve accuracies.

3. What are the barriers/ motivators in order to adopt IT into organization?

Barriers to use IT include operational skill of his staff and to some extend cost. Motivators include reducing risks, lowering cost and differentiation.

E-Commerce

1. Do you have E-commerce services?

Yes, Track & Trace service.

a. How E-commerce important to your companies?

Not so much in Thailand, because using e-commerce is depended on customer's needs.

b. What are advantages/ opportunity from using E-commerce?

There is a little opportunity and advantages to use e-commerce now because there is no need from customers.

c. Does your company use E-commerce as strategy to improve the business?

The main activity of e-commerce in Thailand is web access related. In the 3PL business there is not great demand at present except on inbound activities.

Part III : Positioning and Success factors

1. What is your company position in 3PL market?

2. Does your company tends to place position in Globalization & SCM & Ecommerce?

3. What are your success factors in 3PL business?

In 3PL, DHL is No.5 in the world market. In Thailand he has a good positioning but probably not in the top 10. This position he want to improve. Due to success factors of company, IT is one of factors make differentiate to company's services and meeting customer's needs with high quality services is the heart of his services.

Part IV : General concept of 3PL in Thailand

1. What do you think about 3PL in Thailand now?

3PL in Thailand today is generally only understood by multi-nationals intent on concentrating on their core activities and using “on demand” services. This will change in markets such as Thailand as trading barriers are reduced and companies including Thai have to manage their operations more cost effectively on the world stage.

2. What are the strengths of foreign 3PL ?

The strengths of foreign 3PLs are the extensive experience in managing their clients businesses and understanding the factors in the success of the business.

3. What are the weaknesses of foreign 3PL ?

No comment.

4. Do you have comment or suggestion to improve 3PL in Thailand?

For suggestion to improve 3PL in Thailand, his greatest desire is to see an improvement transport efficiency in Thailand.

BIOGRAPHY

NAME	Miss. Atchara Dokkulab
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PLACE OF BIRTH	Kamphaengphet, Thailand.
INSTITUTIONS ATTENDED	Chiangmai University, 1999-2003 Bachelor of Science (Psychology) Mahidol University, 2004-2005 Master of Science (Technology of Information System Management)
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