2006

Analysis on P shipping company's capacity rearrangement in SE Asia feeder route / by Zhang Shenjun.

Shenjun Zhang
WMU

WORLD MARITIME UNIVERSITY

Shanghai, China

ANALYSIS ON P SHIPPING COMPANY'S CAPACITY REARRANGEMENT IN SE ASIA FEEDER ROUTE

By

ZHANG SHENJUN

China

A research paper submitted to the World Maritime University in partial Fulfillment of the requirements for the award of the degree of

MASTER OF SCIENCE

INTERNATIONAL TRANSPORT AND LOGISTICS

2006

DECLARATION

I declare that the work in this dissertation was carried out in accordance with the Regulations of the World Maritime University. The work is original, except where indicated by special reference in the text, and no part of the dissertation has been submitted for any other academic award. Any views expressed in the dissertation are those of the author.

(Signature): ……..

(Date): ……..

Supervised by
Professor Prof. Liu Wei
Shanghai Maritime University

Assessor
Associate Professor Pierre Cariou
World Maritime University

Co-Assessor
Professor Prof. Wang Xuefeng
Shanghai Maritime University

ACKNOWLEDGEMENT

After great efforts of over than half a year, my dissertation of Research on “Shipping Company Capacity Rearrangement” has finally come to an end. This dissertation is completed under the instructions of my supervisor, Professor Liu Wei. And at the end of this work, I will gratefully thank Professor Liu Wei, because I have been profoundly impressed by Professor Liu Wei’s strict requirements of study, great passion for working and respectable high efficiency. Hence, these influential personalities will continuously affect my attitudes towards study and work tremendously in the rest of my life. I have also benefited quite a lot from the strict ability-training by Professor Liu Wei during the daily communication in the progression of this dissertation. During the progression of this dissertation, I have also got enormous help from many classmates and friends like and they have contributed to my dissertation very much as well. Hereby, I will give sincere thanks to them. Finally, I am going to thank my beloved parents who give me strong support both in life and study during these two years.

ABSTRACT

Title of research paper: **Analysis on P Shipping Company's Capacity Rearrangement in SE Asia Feeder Route**

Degree: **MSc**

With the size of container ships getting bigger and bigger in main routes, the advantages from which are the raise of carried container amounts of each voyage and the reduction of the ports of call, thus lead to the economic of scales through the greatly lower the average transport cost of each container. While shipping companies need more and more cargoes transported in containers, under this circumstance, it will also stimulate the development of coastal transportation as well as short-distance feeder line transportation.

As one of the most important export transport route, Southeast Asia (SE Asia) Feeder Route plays a decisive role to some domestic shipping companies on their benefits. P shipping company, one of the most powerful liner carrier in China, now has 9 vessels transported in this route, is one of the several key carriers in SE Asia Feeder Route. Port Kelang acts as the headquarter of P shipping company in this area, from where the cargo transship both imported or exported from/to other ports in SE Asia area, shipped by the subsidiaries of P shipping company. Effected by the factors like the surplus of total container capacity, the extremely unbalance of import and export volume, price battle, etc, SE Asia Feeder Route has become the bottleneck that restricted the raise of P shipping company's benefits. In the precondition of the stale market, it is necessary to reasoning the vessel's capacity arrangement and through the integration of line capacity to reduce the cost to meet the needs of the low-freight shipping market. It is quite meaningful to assure the benfits of shipping companies as

well as their sustainable development.

By the analysis of the China/SE Asia (ASEAN) trade condition and operation condition of P shipping company on this route, I will reason the capacity arrangement and its allocation in SE Asia Feeder Route from a technique and commercial angle. In this article, I set the new route-Port Kelang/Surabaya-as an example. In order to get the optimal plan on capacity arrangement in this route, I will introduce the “index tests on multi-target systematic optimizations” to select the optimal ship’s form, and furthermore compare with the different NPVs under different ship’s speed will tell us which one is “economical speed”, and the feasibility of this optimal plan.

At the end of this article, I propose three comprehensive advises on the vessel’s capacity arrangement in SE Asia Feeder Route which have some meaningful directions on the shipping companies optimizing their management in SE Asia Feeder Route.

KEYWORDS: Capacity rearrangement, SE Asia Feeder Route, P Shipping Company

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

AC	Admiralty Coefficient
ASEAN	Association of Southeast Asian Nations
EDI	Electronic Data Interchange
E_{SH}	Ship's Efficiency
FTD	Foreign Trade Dependence
RFR	Freight Rate
R_P	Power Ration of DWT
SE Asia	Southeast Asia
SITC	Standard International Trade Classification
TEU	Twenty-foot Equivalent Unit
UCO	Unit Capacity Output

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF THE RESEARCH

The increase of world economic, world trade, international container transport volume indicates that, each 1% increase of world economic will result to about 2% increase of world trade and 5% increase of international container transport volume. China, as one of the countries who has most vessels' calls in the world, has an average annual growth rate of 30% in container transport in recent 10 years. After entering into WTO, the trade and investment environment of China would be further improved; external trade volume would continue increasing. Anticipate in 2008, the total sum of external trade from China will reach to 600 billion USD. In China, 90% of total external trade cargo is transported by sea, besides most medium and top-class goods are carried in containers, therefore, container transportation in China has a very brilliant future.

ASEAN is the fifth trade company in the China's foreign trade list, the trade expansion between China and SE Asia will has a positive effect on China's container transportation. In this circumstance, either China/SE Asia Route or SE Asia Feeder Route is very attractive to Chinese liner companies, and they will play a very

important role to the effectiveness of Sino carriers.

Currently, in SE Asia Feeder Route, the ratio of carrying goods on Chinese ships is more than 50%. P shipping company, one of the most powerful liner shipping companies in China, now has 9 vessels transported in this line, is one of the several key carriers in SE Asia Feeder Route. Effected by the factors like the surplus of total line capacity, the extremely unbalance of import and export goods, price battle, etc, the SE Asia Feeder Route has become the bottleneck that limited the raise of P shipping company's benefits. According to the financial report of P shipping company, in 2004 from Jan to Jul, when the whole global shipping market was in a very good condition, the SE Asia Feeder Route managed by P shipping company still lost more than 5 million RMB. So facing the current downturn of shipping market, the operation of SE Asia Feeder Route could be a disaster.

Meanwhile, when the speed of the transference on international commercial goods was greatly slowed down, the carriage capacity of container ships in global shipping market was greatly increased which resulted to a terrible situation on capacity surplus. Based on the data from BRS-AIPHALINER, till Jan 31st, 2006, the global container capacity reached to 9.13 million TEUs, while in Jan 31st, 2000, the record was only 5.15 million TEUs, it increased by 77.4% in only 6 years. From 2001, in SE Asia Feeder Route, the annual carriage capacity was surplus by more than 30%. So in the precondition of the stale market, it is necessary to reasoning the ship forms and through the integration of line capacity to reduce the cost to meet the needs of the low-freight shipping market. It is quite meaningful to assure the benefits of shipping companies as well as their sustainable development.

1.2 THE AIM OF RESEARCH

To shipping companies, a very effective way to enlarge their scales, enhance their status and strengthen their power is catch the favorable chance of set up a new route. However, because setting up a new route needs huge investment, besides shipping market is that changeable with intensive competition, the new-route decision belongs to high-level management strategies needs much more careful research.

To P shipping company, her status of a main carrier in SE Asia Feeder Route meets much more challenges that never happened before. For the entry barrier is relatively low in this route that resulted to a surplus of vessel capacity in this market, the freight rate keeps on lower and lower. Under this circumstance, although the whole shipping market is rapidly developing, the operation of SE Asia area by P shipping company is not as good as expected.

Inspired by some good news like stable and sustainable development of world economic, political stability of each member of SE Asia, the great demand of import and export, etc, a new wave of capacity rearrangement is under preparation by P shipping company to optimize her own resource, improve her integrate competitiveness, add with first-class service to ensure her 25% market share in SE Asia area. Besides that the research on capacity rearrangement will have a directive meaning which is quite helpful for her further development especially in strategic coordination and higher economic effectiveness.

1.3 THE SCOPE OF RESEARCH

Through the analysis on the trends of trade development between China and ASEAN

in this article, I will predict the container throughput till 2010, on basis of which the total container throughput transport by sea within SE Asia area will be calculated, and that data will help P shipping company in exploiting her container transport business in SE Asia Feeder Route. Furthermore, according to the market situation as well as the current vessel capacity framework of P shipping company, the proper vessels will be selected and a corresponding voyage benefit will be calculated to make sure whether the strategy on capacity rearrangement of P shipping company is feasible or sustainable.

1.4 THE METHOD OF RESEARCH

The problem of vessel's capacity rearrangement by relevant shipping companies is a historical issue that aroused at the beginning of the ships was birthed to the world and started their business lives. What size of vessels they need, what are their sharps and capacities, to meet the need of the businessmen for helping them to earn the maximum profit and got the lowest cost. With the development of science and technology, as long as the changes of industry productivities and people diversity daily demands caused by the advanced of living standard, transport vehicles, including vessels also changed a lot.

Looking back into the history of container ships, which was first invented in year 1956, modified from a tanker ship by U.S Trans-Atlantic Shipping Company. It is not until 1960s was the true meaning container ships generate that particular built for container transportation. The most obvious characteristic of the development of container ships is its capacity. At the beginning of 1970s, the biggest container ship can only carry about 2,000 TEUs , and 3,000 TEU container ship was built in 1980s.

The record was broke year by year, when time turns to the new century—21 century, the current capacity record is temporary stopped at 9,600 TEU, shipbuilding orders by some shipping giants like Maersk Sealand, China Shipping, CMA etc.

However, there still existed the problem: whether shipping companies can properly adjust their vessels capacity on different routes to have optimal operation.

Stephen Matthews, a British maritime economist, once pointed out that the highest risk facing to owners is they were driving by high returns of shipping industry and continuing invest on shipbuilding. However, as he insisted, that the most critical task of container shipping companies to maintain their existence and development should be control the cost permanently and strictly.

So, lots of theories about controlling shipping operational cost were generated and put into realities. Among them, there are two point of views which were most famous and still useful in today's container shipping companies. One is shortening the sailing frequency and reduce ports of call as far as possible to raise the turnover of liner transportation. This method can help shipping companies optimize their sailing benefit and reduce transport cost, to gain maximum container throughput with minimum vessel capacities. Another is improving the mutual cooperation among different liner companies on the same route or sailing areas with the ways like joint loan or share container spaces to get the best balance between container throughput and vessel capacities.

Besides these, there are various sailing routes in container shipping industry like parallel sailing route, unparallel sailing route, butterfly sailing route, pendulum sailing route and globe sailing route, etc. Among them, butterfly sailing route is

suitable for short-distance trade route, especially for liner transportation with fixed dates and ports. Pendulum sailing route was origin in year 1972 applied by Israel Container Shipping Company, the first pendulum sailing route was Mediterranean—North America—Far East route. And now, after developed for more than 30 years, there are lots of container shipping companies started their pendulum sailing routes all around the world, like Europe—North America—Far East route and Europe—Far East—West Coast of North America, namely Panama Pendulum and Far East Pendulum.

In addition, some domestic experts researched out the theories like “large vessels on big routes, small vessels on small routes” to gain economic of scales for shipping companies. Some other researchers published articles to clarify that best way to save cost and avoid risk is diversity operation, which means group their own fleet into three parts: owned capacity, long-term chartering capacity and short-term chartering capacity. All these methods and thoughts once were quite helpful for shipping companies to reduce their cost and improve the operation throughput. However any theory has its own historical limitation, so we should adjust them on time to meet the rapid developing shipping world.

Mao Xia, mentioned in his book, <<*Operation of Ocean Fleet*>> in 1990, that the principles of vessel assignment on different lines should followed specifically by

ⅰ. The requirements on the technique of vessels: including the requirements on the functions of cargo carriage and seaworthiness.

ⅱ. The requirements on the economic performance of vessels: including the theories like “specific vessels on specific lines”, “big vessels on big lines” etc.

Professor Wu Chang Zhong, an expert in shipping and transportation of Shanghai

Maritime University, written in his book to give a rough idea that when considering the problems on vessels assignment, first to do is to make sure if the technique and operation ability of the vessel to be assigned meet with the tasks and conditions on this definite line. And also he brought forward the way to solve this kind of problem was using linear programming (LP).

Professor Yao Zong Ming and Lin Guo Long had another idea on the problem of vessel assignment in their cooperated book: <<*Container Transportation Management*>> in 1993, the main content we should research in vessel assignment was the relationship between the type of ships、the number of ships and the scale of the fleet with category of cargo and its amount on this definite line as well as the call ports. In their point of view, on the lines with a high level of containerization, for there are a higher property of suitable containerized cargo and the modernization of ports of call, the adoption of huge full container ships was the most economical way. On the other hand, on the lines without such high level of containerization or just in the beginning of containerization, the medium or small size of semi-container ships were preferred.

In this article, to predict the SE Asia container throughput carried by sea in 2010, first, the Linear Regression Analysis Method is introduced to get the bilateral trade situation between China and ASEAN on the basis of the records from 1995 to 2003. Then, a further prediction on container throughput between China and ASEAN in 2010 is calculated by the methods like multi-factor dynamic coefficient method, regression analysis, container throughput coefficient method and elastic coefficient method according to the relationship between container throughput and trade sum. Third, Qualitative Analysis is utilized in forecasting the container transshipment volume and container direct transport volume. After analyzing all results of different

methods and make a clear view of the developing trends on SE Asia seaborne container transportation. On this basis, the new route, E001 (Port Kelang/Surabaya), will be introduced to demonstrate its background, selection of ship form, calculation of voyage benefit, setting up of voyage plan, feasibility of the new route, which will have a directive meaning to P shipping company on her economical vessel capacity rearrangement.

CHAPTER 2

INFLUENTIAL FACTORS IN SHIP'S CAPACITY REARRANGEMENT OF SHIPPING COMPANIES

This chapter will elaborate from problem of capacity rearrangement and its influence on route management, that reveal the difficulty and the essential key point in the capacity rearrangement as well as the purpose of ship's capacity rearrangement.

2.1 INFLUENTIAL FACTORS OF CAPACITY REARRANGEMENT

The influential factors of capacity rearrangement can be divided into external factors and internal factors. External factors mainly includes the economy and trade, the harbor environment, the competitors and so on; as the internal factors are the existing fleet strength, the management service network scale and the ability, the advanced technical utilization degree and so on, all of these need to be taken into consideration in the problems on analyzing capacity rearrangement.

2.1.1 External Factors

2.1.1.1 Current situation and prospect prediction on relevant economy and trade

From macro aspects, the world's economy development and the regional trade condition, as well as its prospect prediction is the most basic driven force of shipping company to consider whether to set up a new liner route. It's easy to find out the answer by analyzing the above phenomenon with an economic viewpoint.

First, making profit is purpose of a shipping company to set up a new line route, thus, it is impossible to earn benefit without the supplement of container volumes.
Second, the profit equals to the freight income subtracts the fixed cost and the variable cost. As soon as the route was set up, there generates a great number of fixed cost (ship cost and so on), moreover, some variable costs like bunker fee, harbor fee, pilotage fee and agent expense which belongs to variable costs also turned to the fixed cost. No matter how many containers to be carried, fixed costs is fixed cost that won't be changed.

Third, freight income equals to carriage volume multiply unit freight rate. Besides, sufficient carriage volume and higher ratio of space utility will inevitably force the increase of unit freight rate; on the contrary, insufficient carriage volume and lower ratio of space utility could cause the drop of unit freight rate. This is the principle of market's supplement and providence.

The following formula indicates the route's economic benefit:

$$P = I - C$$

In the formula: P –profit of single leg

I—income of single leg

C—total cost of single leg

In actual operation, carriage volume and freight rate are different in each route from port to port or door to door, even the different freight rate with different goods qualities. Thus, income classification should be as detail as possible. The same as the cost classification. Because the tariff and the working requirement are different to each port, the cost classification is quiet complex.

In front of the decision-making on opening a new route, withdraw the route or adjusting the route, the related trade condition and the macro economy is the important factor which should attract most attention. When the prediction on economic development is optimistic, in order to seize the chance and develop it, shipping companies should decide to set up a new route although that they will suffer a temporary loss; Or, as is known that the related economic environment is not that optimistic, shipping companies will prefer to optimize the route or reduce transport capacity to easily withdraw, with the purpose of waiting for the favorable turn of the market to grow up.

From the micro aspect, analysis on local economy development and the regional trade condition is usually related with the prediction on route carriage volume. It also relates to a series of technical problems of the route like the capacity rearrangement, choice of ports of call, sailing schedule, coordination of feeder routes, etc..

In China, for example, Shanghai, Shenzhen are two important export ports of Yangtze River and the Pearl River. It is because not only the local developed economy but the highly development of their nearby areas, the import/export trade volume is quite large. Besides they are also the gathering points of goods from feeder routes from Yangtze River and the Pearl River. Therefore Ports of Shanghai and Shenzhen are generally favored by both Chinese and foreign shipping companies,

and they become the necessary ports of call with various main routes. In 2002, container throughput of Port of Shanghai over fulfilled 8 million TEUs, and the Port of Shenzhen also broke 7.5 million TEUs.

2.1.1.2 Harbor environment

Compare with the natural weather and the sea condition, the harbor environment will influence the capacity rearrangement of shipping companies more directly. Main factors that should be taken into consideration include:

- Hydrologic condition of seaway

First, according to tide port, for example Port of Shanghai, the berth and unberth of the port are limited by the tide. Thus, if time schedule is not appropriate, the sailing frequency will be affected. Second, the limitation of harbor draft, for example mouth of Yangtze river route, even if in high tide time, big size of container ships with fully loaded cannot pass through it, therefore, the order of ports of call alongside the route should be reasonably arranged. Third is route management. In some fresh harbors, because the route facilities were still imperfect, in addition, the seaway was too narrow, the obstacles (island reef, sunken ships), etc, and the local authority could restrict the berthing schedule like not arrange pilotage at night.

- Berths , load and discharge ability of the port

The more port deepwater berths, the easier to assure the berthing of the ships; the fewer the berths, the higher the risky for ship’s berthing on time, if there is delay on the front ship, the later ones will be badly affected.

The port load and discharge ability includes two aspects: one is the number and the ability of stevedores. The number of loading/discharging containers of per gang (move per hour) will directly affect the berthing time of a ship. If it takes too long time for a ship staying in a port, it will affect the sailing schedule and normal operation of the company. If there has no change to this situation, it is believed that the shipping company will say goodbye to this port and choose other ports. Another is whether the port handling equipments are suitable for the operation of big size container ships.

- Port infrastructures

Whether the port can supply sufficient infrastructures or not is very important for the shipping company to schedule the ship's movement. The ports of call alongside the main route should be selected those with swift shifting, sufficient assistant infrastructures and convenient traffic in order to keep the time of sailing schedule.

2.1.1.3. Competitors

The operation of competitors in the same route should also be considered in planning the sailing schedule, specially the date of delivery and the choice of ports of call. Usually what needs to analyze mainly include: the strength and number of competitors in the same route (ships size and ratio of capacity utility), door-to-door delivery period, choice of ports of call and the order, sailing time and so on. If the company can supply "personal service", quick delivery of goods, there will be more chance for her to meet the needs of shippers/consignees. However, remember that the absolute advantage is very rare in routing competition. Because the market is so flexible that the competitors' strategies also change unceasingly. This is also the

reason for shipping companies to optimize and adjust their routes regularly.

2.1.2 Internal Factors

2.1.2.1 Adjustable vessels

There are two ways of thought in route setting up and vessels usage:

First is to design the route and sailing schedule on the basis of taking fully advantage of current existing resources and making them to reach the optimal arrangement. The advantages are it may accurately grasp the route management under companies' control, reducing the risk; it needn't new investment, the only thing to consider is the opportunity cost of whether setting up a new route by herself or charting a ship; the preparation period on setting up new routes are relatively short and return on investment is quickly. Its shortcoming is the limitation on the ships' capacity rearrangement. It has less competitive advantage in accordance to the designed route and sailing schedule. Thus, it is normally take into effect in a new market.

Second is to meet the needs of ships shortage on transferring ships from other routes, charting or building ships on planning the routes and sailing schedule. The advantage is that the company can establish its own superiority during the planning period and has a lot of space for further improvement; very close to the market make it convenient to coordinate the way of management. The shortcoming is that it is highly risky on new investment and takes long time in preparing the new route. As to the developed and mature market, this way can help to optimize or promote the route

quality and can get a satisfactory effect.

Today, in the period of shipping cooperation is widespread, in order to make up the insufficiency of the two ways above, it is normal for two or more shipping companies to share one ship in the new route to help the companies not only reduce investment risks, but also guarantee their competitiveness of the new route. But the cooperation must under the premise that each side should unify its thinking in choosing ports of call and the order of it.

2.1.2.2 Marketing and services

Although shipping companies put much energy in analyzing the capacity rearrangement, it always occurs something that was on the contrary to what they had expected. Some routes were fully favored in forecast analysis, however, when it was put into actual usage, it occurred a lot of problems. Other problems like lack of supply on carriage goods make companies suffer loss and hard to remain the route; the delay on delivery goods for the incorporation of port authority; the increase of customers' complain for the poor services provided by the local agency which will affect the reputation of shipping companies. Besides some objective factors, the happening of this problems are mainly because the lower marketing ability of the shipping companies or the low service level that cannot satisfy the need of the route management or the capacity rearrangement.

The containerized transportation is a systematic engineering; it is the same in the new route setting up and capacity rearrangement. Especially when entering into a new market, on one hand the company should consider its own marketing and service

levels in this market; on the other hand, the shipping company should adjust the relevant policies and human resources in market exploration and marketing to meet the needs of capacity rearrangement.

2.1.2.3 The application of advanced technology

With the arrival of Internet time, information technology has already permeated into each link of container transportation. The global navigation intelligence supervisory system has realized the monitoring on the worldwide weather effective, providing powerful support for ships' adoption protection measurement ahead of time. The fulfillment of ship and port data interchange system and onboard computer network could not only make a smooth communication between ships and shipping companies, reducing the communication cost; but make it possible for on-shore shipping company to realize the long-distance monitoring of the onboard equipments, effectively decrease the breakdown of onboard equipments. With the widely application of EDI, it accelerate the transference of related documents within shippers, forwarders, carriers, port authorities and the customs, raise the accurate rate of the transference, providing opportunity in increasing ship's turnover. With the development of electronic business in the containerized transportation, the electronic booking space, electronic clearance, electronic bill of lading, etc, have already realized.

2.2 INFLUENCE OF CAPACITY REARRANGEMENT ON ROUTE MANAGEMENT

Capacity rearrangement, as a key influential factor in route management, will affect

the benefit of the route in the aspects of fixed cost and variable cost of route management as well as the operation risks under accidental situation.

2.2.1 Influence of Capacity Rearrangement on Operation Cost

Scientific designed capacity rearrangement can not only strengthen the route competitiveness but also can effectively control and reduce route operation cost. As to one route, the operation cost are mainly include ship's fixed cost, container fixed cost, bunkering fee, port disbursement, cargo cost and container management cost.

2.2.1.1 Ship's fixed cost

No matter charter or build new ships, the expenses can be converted to single ship daily fixed cost. Obviously, the ship's fixed cost is different along with the different input of ship's size and ship amount. The bigger of the input ships' sizes and more of ships' number, the higher the ship's fixed cost is, thus, burden the pressure on route management. Therefore, controlling and reducing the ships' input become one of duties in optimizing the route management. For example, if there is surplus capacity operation in the current route, the company should consider raise the service speed of the ship and reduce the number of ports of call to decrease the ship's fixed cost in the condition of no proper new added ports of call or the fierce competition in delivery time.

2.2.1.2 Bunkering fee

Bunkering fee equals to the consumption amount multiply the unit price. There is

nothing to do with the controlling of unit bunker price and capacity rearrangement, but there is relationship between consumption amount and bunkering fee. One effective way of save bunker consumption is keep the ship sailing at the economic speed in the precondition of meet the requirement of sailing schedule. Thus, it can be seen that when arranging the capacity to meet the sailing schedule during the management, shipping companies should reduce the berthing time as far as possible to provide the opportunity for ship's sailing at the economic speed.

2.2.1.3 Port disbursement

The port disbursement is the sum of expenses of ship's come in and out the port to commerce loading or discharging. Its content includes pilotage fee, tugboat fee, berthing fee, loading and discharging fee, agency fee and so on. In the port of developed country, the pilotage fee, tugboat fee, loading and discharging fee as well as some other expenses will double when occur at night or in holiday. Therefore, when arrange the capacity compare with the sailing schedule that shipping companies should take advantage more daytime for handling operation as far as possible, meanwhile, reduce night handling operation. But it is worth mention that the port disbursement is agreed between shipping company and port authority with the reference of port tariff, so as the designers and the researchers, they should well understand of the favorable rules in agreement, and take advantage of them to reduce the total operation cost and make more profit.

2.2.1.4 Cargo cost

Cargo cost is generate at both ends of shipment related to the transportation of

cargoes, like package fee, warehousing expense, inland transfer expense and so on. To port to port cargos, shipping company is not response for the cargo cost generate outside the terminals. However, to door to door cargoes, cargo cost is included in the freight rate, and the shipping company should choose appropriate ports of call in accordance with inland cargoes supplement and demand, to reduce the cargo cost.

2.2.1.5 Container fixed cost and container management cost

Similar with the ship fixed cost, the container fixed cost can also be converted to single container daily fixed cost. Container management cost includes container storage cost, repair cost, empty container transfer cost. Shipping companies have a large number of container storage cost every year, moreover this cost is closely related to the route, the capacity rearrangement even the service network establishment. If the company can fully consider containers turnover during the designing of sailing schedule and capacity rearrangement, it can effectively control the total number of container, thus reduces the container fixed cost. In some main line, the unbalance cargo flows will result the heap up of empty containers in some ports. If containers cannot be transferred from over-container ports to short-container ports, it will cause the increase of container management cost in the over-container ports on one side; on the other side, shipping companies have to rent more containers in short-container ports to meet the transportation of carriage cargoes. Therefore, the research on ship capacity rearrangement should not only to satisfy the needs of laden container transportation, but also to create the chance of balance transference between laden/empty containers.

2.2.2 Unexpected Operation Risks under Accidental Situation

Proposing the unexpected operation risks under accidental situation is to reveal the importance in scientific researching the ship capacity arrangement.

When there happens the inaccurate capacity arrangement of ships serve in the route which cannot meet the need of shippers/consignees, shipping companies will suffer the following loss:

First is the loss of reputation. The announced definite ship capacity is the promise of shipping company towards her customers. No matter what reason of this error of miss-loading the containers, to most shipping companies, their faith to customers is the most important thing in today's fierce market competition. If such behavior happens too frequent, it will affect the status of the shipping company among her customer groups; thus, it will generate negative effects on the operation of that company. The reason why those top-class shipping companies can quota a higher freight rate than the average market level is that they can provide better services on the basis of their good faith. So that the indirect loss from companies' reputation is higher than the direct loss from companies' daily operation occurred from the inaccurate capacity arrangement.

Second is the loss of compensation. If the behavior of miss-loading happened, shipping companies should compensate to the shippers/consignees, besides that, if there is any space-sharing with other shipping companies, the relevant companies should make up for the loss of the counterparty. Nowadays, with the increase of route cooperation among each shipping company, their influence aspects will be expanded, that means the increase of risks during their daily operation.

The accidents happening during the process of transportation are keep changing all the time, none of shipping companies can guarantee to provide 100% accurate services. What they can do is the scientific research, the effective management, and make fully preparation to the accidents that may happen.

In summary, it's not difficult to find out that the capacity rearrangement should reach the following basic goals:

First, provide proper capacity arrangement to realize economic feasibility. Too much in capacity providence will result the waste of ship space and suffer losses; too less in capacity providence will lead to the miss-loading and increase the operation risks.

Second, adapt to the market, satisfying the needs of competition.

Third, improve the structure to meet the request of network management.

Fourth, integrate the current resources; satisfy the maximum request of resources utility.

CHAPTER 3

BACKGROUND ANALYSIS ON CAPACITY REARRANGEMENT OF P SHIPPING COMPANY IN SE ASIA FEEDER ROUTE

3.1 TRADE RELATIONSHIP BETWEEN CHINA AND ASEAN

China and ASEAN have been trade companies for long time. As early as 1995, from bilateral trade statistic, ASEAN was the fifth trade company to China; meanwhile, China was the sixth trade company to ASEAN. Whit the signature of *Agreement between China and ASEAN on a Framework of Economic Corporation*, the economy and trade cooperation between each other has stepped into a brand new historical period. The total population of China and ASEAN has reached 1.7 billion and total GDP was nearly 2 trillion USD. Trade volume among 10 members of ASEAN as well as China was more than 1.2 trillion USD. The trade between China and ASEAN has a great influence on worldwide economy.

3.1.1 Introduction of Bilateral Trades between China and ASEAN

From 1990’s, the trades between China and ASEAN have increased stably, that

means their interdependence on each others trades (FTD) is getting increased. With the high-speed development and the industrial structure's promotion, the trade volume between China and ASEAN raised with 21% annually. The ratio of export (import) cargo from China to ASEAN occupied the total volume of Chinese export (import) cargo has increased from 6.07% (7.12%), 1995 to 7.02% (11.47%), 2003. In year 2003, the total bilateral-trade volume between China and ASEAN has reached to a new historical level—0.7824 trillion USD—42.9% higher than the year before, which was also a historical year they had the most trade balance.

Table 3 1 - Status of Bilateral Trade between China and ASEAN

Year	Export from China to ASEAN		Import from ASEAN TO China		TRADE BALANCE	Foreign Trade Dependence	
	Sum (USD)	Share of Total Chinese Export Volume (%)	Sum (USD)	Share of Total Chinese Import Volume (%)		Import	Export
1995	9035658	6.07	9402518	7.12	-366860	1.31	1.37
1996	9707853	6.43	10717678	7.72	-1009825	1.21	1.33
1997	12030853	6.58	12332097	8.66	-301244	1.36	1.40
1998	28147902	15.32	20715318	14.77	7432584	3.03	2.23
1999	12170455	6.24	14871210	8.97	-2700755	1.25	1.53
2000	17341321	6.96	22180949	9.85	-4839628	1.63	2.08
2001	18385412	6.91	23229312	9.54	-4843900	1.59	2.01
2002	23568453	7.24	31197456	10.57	-7629003	1.88	2.48
2003	30925467	7.06	47326892	11.47	-16401425	2.20	3.36

Source: Structural Analysis on Trade Relationship between China and ASEAN. Yuan Xu

The figures in Table 3.1 indicate that in the bilateral trade between China and ASEAN, China imported more cargo from ASEAN than exported cargo to ASEAN, furthermore, the trade deficit of China to ASEAN was getting larger these years, the gap was 2.701 billion USD in 1999 to 16.401 billion USD in 2003. This reflected that China was the major import nation to ASEAN. Along with the slow down of

Japanese, Europe's and America's economy growth, ASEAN has already more and more relied on Chinese market.

3.1.2 Structure of Main Trade Products between China and ASEAN

According to SITC, all products may divide into the primary product, the industry product and the classified miscellaneous product. Food, the agricultural raw material, the fuel and the minerals are the primary product; the chemical product, the machinery and the transportation equipment are the property and the technical crowded product; other finished goods are the labor-intensive products.

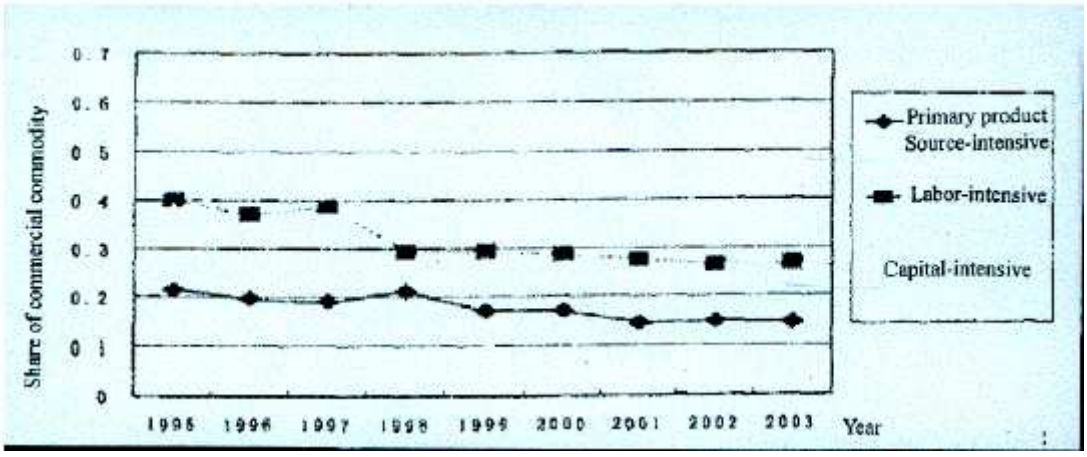

Figure 3 1 - Export Volume from China to ASEAN

Source: Structural Analysis on Trade Relationship between China and ASEAN. Yuan Xu

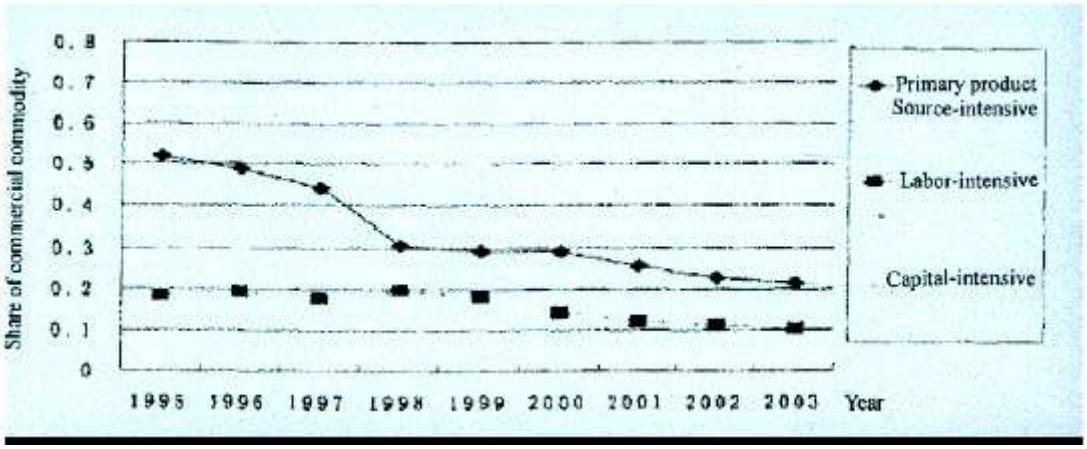

Figure 3 2 - Import Volume from ASEAN to China

Source: Structural Analysis on Trade Relationship between China and ASEAN. Yuan Xu

Figure 3.1 and figure 3.2 give ratios of different types of trade products between China and ASEAN from 1995 to 2003 based on time order. The charts show that the share of primary product in the bilateral trade drops year by year, especially the import of resource-intensive primary product from China to ASEAN dropped from 51% in 1995 to 21% in 2003. Meanwhile, because both China and ASEAN have competitive advantage in labor resource, the share of labor-intensive industrial product presented a drop tendency in bilateral trade, but not as remarkable as the primary product. On the other hand, the share of capital-intensive and technology-intensive product in the bilateral trade increased obviously: the import of capital-intensive product from China to ASEAN increased from 37% in 1995 to 58% in 2003 while the export figure was 29% in 1995 to 68% in 2003. During recent 10 years, the main products traded between China and ASEAN have transferred from resource-intensive primary product and labor-intensive industrial product to capital-intensive and technology-intensive product, which realize the promotion of trade product's structure. But for the feature of China and ASEAN, in the bilateral exportation high-tech product, the very great proportion of product is the relatively simple labor-intensive processing (most of which are import spare parts processing

and assembling), the application of local resource and technology in complex processing and research is very rare.

The trade between China and ASEAN basically reflects the “Comparative Advantage Theory” decided by each other’s national resource endowment from their product structure in bilateral trade. Situated in tropics, ASEAN has abundant forest resource, marine resource, agricultural and mineral resource, etc. which become the main import product into China. Like the rice, the lumber, the rubber, the industrial chemicals, etc from Thailand to China; the palm oil, the fruit, the fertilizer imported from Malaysia. Meanwhile, the grain, cotton and zinc, lead, coal are the main product export from China to ASEAN. For example, China exports the crude oil, the traditional Chinese medicine to Thailand; exports the corn, the soybean, the feed and food to Malaysia as well as exports the crude oil, food, the chemical product to Philippines and so on. Thus it can be seen that the differentiation in resource endowment between China and ASEAN supply a huge economical complementarity for both sides.

3.1.3 The Design of ASEAN Economic Community

In Nov 2002, in the 8th ASEAN Leader Conference, held in Phnom Penh, Cambodia, Singapore Premier Goh Chok Tong officially proposed the conception of establishing “AEC” (ASEAN Economic Community) in 2020. With the establishment of this economic community, ASEAN will become a single market with a population over 500 million.

In Oct 2003, in the 9th ASEAN Leader Conference, held in Bali Island, Indonesia, the

representatives of the nations got an agreement on the 2nd *ASEAN Coordination Manifesto* , that all the members of ASEAN agreed the design of establishing "AEC" in 2020, which would accelerate improve their own regional economic integration. According to plans, ASEAN will comprehensively advance and realize the construction of free trade zone, the service trade agreement area and the investment district. The goal of this economic community is not only to build a single market, but also to become a competitive produce base, which will promote the brand of "made in ASEAN" to the whole world.

Driven by such develop tendency, once the whole ASEAN become an economic community, the GDP of this region will increase by 10%, while the cost of business operation will lower by 20%, that means the GDP of the whole ASEAN will be 50 billion USD higher than the level nowadays. However, for the restrictions on the differentiation in development level, the political system, the form of society and the legal framework within each member of ASEAN, the growth and development of this economic community still has a long way to go.

Table 3 2 - GDP of China and Part Members of ASEAN in 2005 & Their Estimate GDP in 2006

Unit %

Year / Country	2005	2006	Year / Country	2005	2006
China	9.9	9.0	Thailand	4.6	5.0
Hong Kong	7.0	5.4	Malaysia	5.0	5.4
Tai Wan Province	3.6	4.1	Philippines	4.8	5.0
Singapore	5.4	5.7	Vietnam	8.3	8.0
Indonesia	5.5	5.4			

Source: Hong Kong Trade Development Council.

It is can be seen from Table 3.2, the economic developing trends of China as well as part members of ASEAN are located at a comparatively stable level. And this steady situation of foreign trade has quietly led to a raise of freight volume carried with containers; furthermore, this trend has kept for a very long time.

From the trends by constructing the economic community, seeking for common economic development opportunity between China and ASEAN or within the members of ASEAN, it can easily get that the maritime market of entire China-ASEAN area will certainly rely on the tendency of the economic development, stepping into a higher level. In next chapter, I will emphatically introduce the transport situation of container market on SE Asia Feeder Route.

3.2 REVIEW ON THE DEVELOPMENT OF SHIP FORM SERVE IN SE ASIA FEEDER ROUTE

The first container ship was invented in 1956 reequipped from a tanker by American Trans-Atlantic Ocean Company. Later on, semi-container ship which can load both container and general cargoes was invented. The ship invented especially for loading containers didn’t appear until 1960s. From the time the cellular container ship invented 40 years ago, the most obvious characteristic of container ship development is it is become larger in size. In 70's the container ship can load 2,000TEUs, while, at the beginning of the 80's 3,000TEU container ship was invented. In 1988, there appeared 4,800 TEU container ships whose breadth was over 40 meters-the maximum wide of Panama Canal. Step into 90's, there appeared 5000TEU, 6,000TEU even 8,000TEU, namely Super-Panamax container ships. The relevant research indicated that, compared with two 4,000TEU container ship, the operation

cost of one 8,000 TEU container ship is about 18% lower. Therefore, those powerful shipping companies make order of building bigger size container ships that rises a new wave of shipping competition.

Table 3 3 - Developing Situation of Chinese and World Container Fleet (2001-2005)

	Chinese container fleet		World container fleet	
Year	2001	2005	2001	2005
Current Fleet Capacity				
Vessel Amount	180	235	2554	3208
Tonnage (million DWT)	3.65	5.37	6.87	9.92
Average Tonnage (DWT)	20,294	28,851	26,899	30,914
Average Age of Vessels	10.7	12.5	10.3	10.7
Order Capacity				
Vessel Amount	40	267	517	1156
Tonnage (million DWT)	1.93	7.75	20.12	53.44
Average Tonnage (DWT)	48,216	29,022	38,921	46,224

Source: *Maritime Information* 2006.3

Table 3.3 shows that, from 2001 to 2005, the world container fleet average tonnage has an increase trend, but as to the current fleet capacity, the expansion of Chinese container fleet was higher than the global average standard, this contributed to Chinese order capacity in 2001, which accounted for about 10% of the world's order capacities. However, this percentage reached to 14.5% in 2005, it can be foreseen that in the near future, the average tonnage of Chinese container fleet will go beyond the world level on the basis of 2005 and located at a leader position. On the other side, this situation indicates that a new wave of fierce competition among shipping industry will occur in the near future.

As to SE Asia Feeder Route, influenced by transportation distance, carriage cargo volumes, ports and seaway conditions, 1,000 TEU ships are more favorable by shipping companies, especially the local shipping companies. In order to compete for

market, they will unceasingly expand the route coverage; reduce the ports of call to meet the sailing frequency, these companies generally input 300TEU ships. From table 3.4, we can find that the trends of ship form development has become bigger, but the form of ships serve in SE Asia Feeder Route only changed slightly, the main power serve in this region were almost small ships.

Table 3 4 - Average Container Capacity of Ships Serve in SE Asia Feeder Route

Unit: TEU

	Year	China			SE Asia	Third countries	Total
		Total	P Shipping Company	Local companies			
Average Container Capacity per vessel	1995.7-1996.7	425	618	334	261	628	420
	1996.7-1997.7	450	630	352	288	668	446
	1997.7-1998.7	454	654	401	295	795	468

Source: *Containerization* 2004.12

3.3 INTRODUCTION ON CONTAINER TRANSPORTATION IN SE ASIA FEEDER ROUTE

3.3.1 Container Transportation in SE Asia Feeder Route in 2005

On November 4, 2004, the *Agreement between China and ASEAN on a Framework of Economic Corporation* was officially agreed by both Chinese and ASEAN government leaders, which symbolized the relationship between China and ASEAN has stepped into a new developing time. Inspired by such good news, shipping companies managing in this region began to take measurement like adjusting route, increasing transports capacity and so on to make benefits. Some companies

substituted newer and higher-speed ships with capacity of 800-1,000TEU for the old ones with capacity only 300-400TEU in this route. Some other companies, through chartering, adjusted the sailing frequency of their fleet by one voyage a week to two in a week. But influenced by the unbalanced trade volume (import/export) and the different structure of carriage cargoes, the ratio of space utility was only 80% to 85% of the vessels exporting cargoes from China to ASEAN, even it appeared the situation that the space utility ratio from China to Thailand was as lower as 50% to 55%. Therefore, in SE Asia Feeder Route, the same situation as capacity surplus and low ratio of space utility occurred. The trend of freight rate in SE Asia Feeder Route was lower at both ends of the year and higher in the middle of the year, in summary, the trends of freight rate was stable in this year. During busy season, each shipping company increase the freight rate, although this raise extend did not meet what carriers had expected. In second half year of 2005, influenced by the slow down of the American economy growth rate; and the revaluation of Chinese Currency-RMB, as well as shock merge case that the shipping giant Merask Sealand successfully purchasing P&O. All these events were the direct influential factors that led the drop of global seaborne container freight rate worldwide, SE Asia Feeder Route included.

3.3.2 Container Transportation in SE Asia Feeder Route in 2006

Unexpected by the experts, just at the beginning of year 2006, the phenomenon of overspace appeared in SE Asia Feeder Route. Because there was a stable raise in trade volume within ASEAN which resulted to the market freight rate staying at a relative stable level, for instance, the freight rate of Port Kelang/Jakarta was $350, while this amount was only $220 at the end of year 2005. If keeping the developing

trends like this, there will be a new peak on freight rate in this route. Some experts predicted that it will reappear the same overspace situation that happened in 2004.

3.3.3 Characteristic of SE Asia Feeder Route

First is short in sailing distance and low sailing frequency, shipping companies can maintain their daily operation by input a single vessel. Compare to other shipping companies whose service fields are the main routes, the requirement on companies operating in SE Asia Feeder Route are relatively low. There are nearly about 20 shipping companies serving in SE Asia Feeder Route, some of them only have one single vessel. The business strategies of these companies are quite flexible. Second is the unbalance of trade volume. The ratio of import volume to export volume is 3 to 5 in some places of SE Asia, the transference of empty containers becomes a big problem that troubles the most shipping companies serve for that region and affects their profit. Third is the low level of freight rate. Because of the surplus capacity input in this region and the limitation of carriage cargoes supplement, the freight rate is easily influenced by the fierce market competition.

3.4 CURRENT SITUATION AND THE DEVELOPMENT OF P SHIPPING COMPANY IN SE ASIA FEEDER ROUTE

3.4.1 The development of P Shipping Company

P Shipping Company has the top-class container fleet in the world. From the beginning of her establishment, she organized her fleet upon the world’s standard. P

Shipping Company set up her first domestic coastal container route in March, 1997, and having developed for 9 years, now P shipping Company has domestic coastal container ships more than 30 with the capacity over 30 thousand TEUs. P Shipping Company has been one of the most powerful carriers with most domestic coastal container ships, great container transport ability, high service level and broad service network in Chinese shipping market.

At the beginning of P Shipping Company's establishment, her container fleet was made up by 8 container ships reequipped from bulk ships. Her container scale could not account into the list of world's carriers. However, P Shipping Company coordinates her developing strategy to group the world scale container fleet at that moment.

During the next several years, the management level of P Shipping Company held the periodic characteristic of international shipping industry and operated the company with count-periodic strategy to realize the former goals and became the global carrier in only 4 years. Year 1998 is the time when the whole shipping market was in depression and the hire of ships was relatively low. P Shipping Company seized this opportunity and put investment into charting market with a low hire. In 1999, P Shipping Company set up 3 new international routes and made profit more than 100 million USD in 2000.

Now, after having developed for 9 years, the container fleet of P Shipping Company is made up by 68 modern vessels with the average capacity more than 4,000 TEUs per ship. 10 of which are the biggest and most modern ones with the average capacity more than 8,500 TEUs. Besides, another 8 container ships are under construction, each has capacity about 9,600 TEUs and will put into market in 2006.

The current classification on container fleet of P Shipping Company divided by capacity is listed in table 3.5

Table 3 5 - Container Fleet Profile of P Shipping Company

Ship Form	Vessels Chartered	Vessels Owned
＜1000TEU	10	9
1000-1999 TEU	5	23
2000-2999 TEU	12	14
3000-4999TEU	13	14
5000-8999TEU	11	19
＞8000TEU	0	5
Total	**51**	**84**

Source: Internal reference material of P Shipping Company. 2003

3.4.2 Introduction on SE Asia Feeder Route operated by P Shipping Company

At present, P Shipping Company is managing totally 6 routes in SE Asia area, all their sailing frequency are weekly, and totally 9 ships serve in this area. Now her feeder service has already expanded to Singapore, Malaysia (Port Kelang, Pasir Gudong, Penang), Indonesia (Belawan, Surabaya, Jakarta, Semarang), Bangladesh (Chittagong), Burma (Rangoon), Vietnam (Ho Chi Minh), Cambodia (Phnom Penh).

Because the severed ships have perfect performance, broad coverage service area, P Shipping Company has strong competitive advantage against her rivals and her current market share has reached as high as 25%. To all shipping companies, on-time service is the lifeline in their management, thus, P Shipping Company followed the

principles of providing on-time and high quality services to enlarge her reputation in this market when they first entered into it. Based on this, P Shipping Company built up good relationship with local shipping companies as well as other main route shipping companies.

Table 3 6 - List of Liner Routes by P Shipping Company in SE Asia Area

Voyage No	Sailing Frequency	Vessel Amount	Ports of Call
E001	weekly	1（LI PENG）	Port Kelang, Laem Chabang
SE001	weekly	2（XIANG FEN、XIANG FA）	Port Kelang, Jakarta、Semarang
N001	weekly	2（XIANG ZHONG、XIANG QIANG）	Port Kelang, Rangoon
WN001	weekly	2（HAI TANG，XIANG RONG）	Port Kelang, Belawan, Penang
WE001	weekly	1（XIANG LIN）	Port Kelang, Pasir Gudong, Tanjung Priok
PH001	weekly	1（MEKONG RIVER EXPRESS）	Phnom Penh, Ho Chi Minh

Source: Internal reference material of P Shipping Company. 2005

3.4.3 Technique Parameters of Ships Serve in SE Asia Feeder Route by P Shipping Company

Currently, P Shipping Company has 9 self-owned ships serve in SE Asia Feeder Route; each DWT is under 10,000 tonnage and container capacity of 150 TEUs to 500 TEUs, actual sailing speed range from 12 to 18 nautical miles per hour. From the technique point of view, these kinds of ships are quite suitable serving in SE Asia Feeder Route.

Table 3 7 - Technique Parameters of Ships Serve in SE Asia Feeder Route by P Shipping Company

VESSEL NAME	DWT (MT)	GRT (MT)	NRT (MT)	CAPACITY (TEU)	LOA (M)	BREADTH (M)	DRAFT (M)	DESIGNED SPEED (KN)	HORSE POWER (KW)
LI PENG	8449	4400	2460	413	118.00	16.00	5.8	12-15	4648
HAI TANG	3545.7	2752	1541	170	84.57	15.00	5.5	8-10	2140
XIANG RONG	3545.7	2752	1541	170	84.57	15.00	5.5	8-10	2140
XIANG FA	4612	4181	1971.25	210	105.32	16.00	6.5	10-12	2750
XIANG FENG	4718	4119	1769	210	105.32	16.00	6.5	10-12	2750
XIANG ZHONG	4666	4119	2306	210	105.32	16.00	6.5	10-12	2750
XIANG QIANG	4718	4119	1769	210	105.32	16.00	6.5	10-12	2750
XIANG LIN	5276	4119	2306	210	105.27	16.00	6.48	12-14	2750
MEKONG EXPRESS	2200	975	546	124	70.00	13.20	5.5	5-7	1268

Source: Internal reference material of P Shipping Company. 2005

3.4.4 Analysis on Operation by P Shipping Company in SE Asia Feeder Route

According to the finance data of P Shipping Company, in 2005 only three routes, namely Port Kelang/Laem Chabang, Port Kelang/Belawan/Pasir Gudong and Phnom Penh/Ho Chi Minh could make slightly profits among the 6 routes, others were all suffered a loss. Among them, Port Kelang/Yangon Route loss the highest amount to 7 million RMB. The main reason was that the served ships in this route was newly built in 1998, their service speed is over 15 KT. Although, from technique point of view, their competitive advantage was obvious in on-time service, the ship’s fixed

cost and operation cost are relative high that will reduce their advantage in this route. Besides that, the competition in this route is quite fierce; the average container utility ratio was only 42%, therefore it suffered great loss in this route. The same situation happened in Port Kelang/Jakarta/Semarang Route and Port Kelang/Belawan/Penang Route. “HAI TANG” and “XIANG RONG” served in Port Kelang/Belawan/Penang Route with each container capacity of 170 TEUs. The average container utility ratio was only 60%, however, these two ships were built in 1990. Thus, the ship’s fixed cost is relatively lower. Besides that the ship’s efficiency and power ratio of DWT are much higher so that the loss in this route was not that bad. As to Port Kelang/Laem Chabang Route, the served vessel was one single ship with container capacity of 413 TEUs. P Shipping Company could keep high ratio of container utility in this route and this ship’s efficiency was well enough to make profit. It was the same to Port Kelang/Belawan/Pasir Gudong Route. Although the operation cost of “XIANG LIN” is relatively high, the high ratio of container utility in this route assured the benefit to P Shipping Company. The competition in Phnom Penh/Ho Chi Minh Route was not that intense, and a high ratio of container utility could be realized in this route, so that it could also make profit despite the severed vessel’s container capacity is only 124 TEUs.

Table 3 8 – Operation Situation of P Shipping Company in SE Asia Feeder Route

Unit: million RMB

Voyage NO	Vessel	Balance
E001	1（LI PENG）	3
SE001	2（XIANG FEN、XIANG FA）	-5
N001	2（XIANG ZHONG、XIANG QIANG）	-7
WN001	2（HAI TANG，XIANG RONG）	-3
WE001	1（XIANG LIN）	2
PH001	1（MEKONG RIVER EXPRESS）	0.5

Source: Internal reference material of P Shipping Company. 2005

CHAPTER 4

THE PREDICTION ON SEABORNE CONTAINER VOLUME IN SE ASIA AREA

4.1 THE ANALYSIS ON TRADE DEVELOPMENT BETWEEN CHINA AND ASEAN

The bilateral trade between China and ASEAN has a stable increasing since 1990s. With the highly-speed develop of Chinese economy and the upgrade of Chinese industry framework, the trade volume between China and ASEAN increased annually by 21%. Figure 4.1 indicates the trend of import/export sum between China and ASEAN from 1995 to 2003.

The author has to mention here, because of the extremely rapid developing trends started from 1990s' between China and all the other foreign countries and regions, (Chinese Reformation and Development Policy began at year 1990.) the collect data and linear relationship list in figure 4.1 is strong enough to support the bilateral trade developing trend between China and ASEAN as well as enough for using in regression analysis. On which, the author thinks it is representative and can get much accurate prediction value based on regression analysis method.

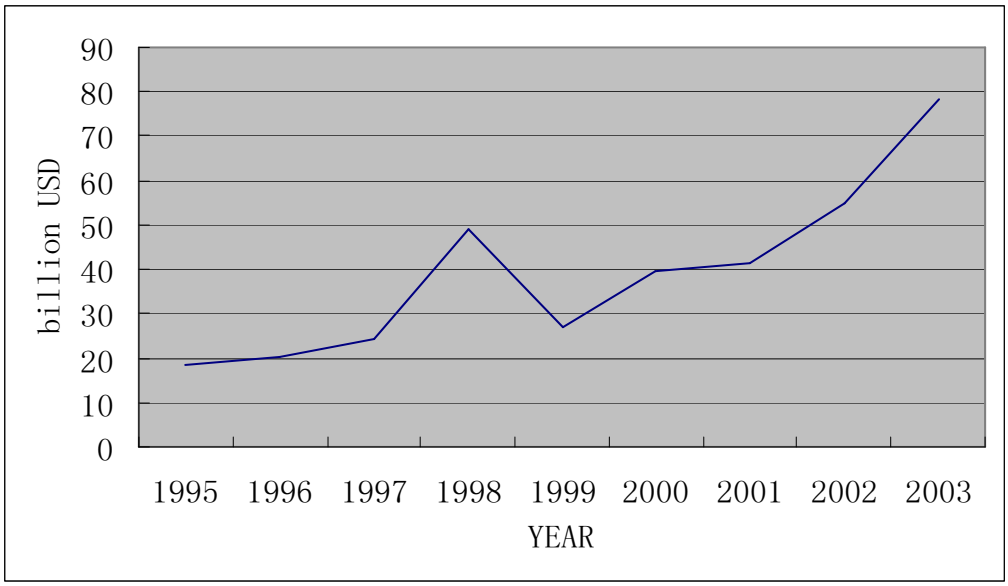

Figure 4 1 - Total Import/Export Sum between China and ASEAN (1995-2003)

Figure 4.1 shows the China's total trade volume is in an increasing trend, while it is also periodic. In the year 1995-1996 and 2000-2001, the bilateral trade increased more slowly. However, in 1997, under the impact of the Southeast Asian financial crisis, it was a deadly strike to the bilateral trade that the total foreign trade volume decreased over 20 billion USD. But since 2001, it was a sudden soar of the bilateral trade and the total foreign trade volume increased almost 40 billion USD in only two years. It is convinced that with the dream of ASEAN Economic Community to realize, there are more development spaces in bilateral trade besides their collaboration in other fields like HR communication, technology communication, etc.

4.2 THE PREDICTION ON FOREIGN TRADE VOLUME BETWEEN CHINA AND ASEAN IN 2010

The method of regress analysis can be used to get the mathematic formula based on

the quantitative relationship within different phenomenon. And this method can also judge whether the formula is reliable; what effects the independent variables will make on dependent variables; etc. The extent of a single independent variable cause on another dependent variable we call this Unitary Regression. In this article, the author starts with the development trend of foreign trade volume between China and ASEAN from 1995 to 2003, take annual trade volume increase rate as independent variable(X), to predict the total foreign trade volume in 2010(Y) by application of Unitary Regression as well as EXCEL. There are two ways to balance the coefficient extent based on the linear relationship between independent variable and dependent variable calculated with Unitary Regression: on the one hand, according to “Multiple R” or “R Square”, the bigger the “Multiple R” or “R Square”, the more accurate their relationship will be; on the other hand, according to “estimate standard error”, the smaller the “estimate standard error”, the linear relationship is more representative.

Table 4 1 - Export/Import Volume between China and ASEAN (1995-2003)

Unit: billion USD

Year	Export	Import	Total	Growth Rate%
1995	9.036	9.403	18.438	
1996	9.708	10.718	20.426	19.87
1997	12.031	12.332	24.363	39.37
1998	28.148	20.715	48.863	245.00
1999	12.170	14.871	27.042	-218.22
2000	17.341	22.181	39.522	124.81
2001	18.385	23.229	41.615	20.93
2002	23.568	31.197	54.766	131.51
2003	30.925	47.327	78.252	234.86

Source: Structural Analysis on Trade Relationship between China and ASEAN .Yuan Xu

Through the calculation, the formula between annual trade volume increase rate and total foreign trade volume is:

Y=351.35+0.9X

After analyzing the conclusion get from the data, it can easily find out that the Southeast Asia Financial Crisis occurred in 1997 had very deep negative influence on the bilateral trade between China and ASEAN, so that the result calculated from the collected data was departure from the actual situation and not that representatives. In this circumstance, the author decided to delete the data of year 1998/1999 and process the rest data.

Table 4 2 - Export/Import Volume between China and ASEAN

(1995-1997/2000-2003)

Unit: billion USD

Year	Export	Import	Total	Growth Rate
1995	9.036	9.403	18.438	
1996	9.708	10.718	20.426	1.987
1997	12.031	12.332	24.363	3.937
2000	17.341	22.181	39.522	12.481
2001	18.385	23.229	41.615	2.093
2002	23.568	31.197	54.766	13.151
2003	30.925	47.327	78.252	23.486

Source: Structural Analysis on Trade Relationship between China and ASEAN .Yuan Xu

Again, the formula between annual trade volume increase rate and total foreign trade volume is:

Y=217.6+2.25X

Compare with the two groups of data, obviously, the result get from Table 4.2 is more accurate and representative, on this basis, the prediction on foreign trade volume between China and ASEAN in 2010 can be shown in Table 4.3.

Table 4 3 - Prediction on Foreign Trade Volume between China and ASEAN in 2010

Unit: billion USD

Year	1996	1998	2000	2002	2004	2006	2008	2010
Volume	20.43	48.86	39.52	54.77	81.17	128.70	214.25	368.24

4.3 THE PREDICTION ON CONTAINER THROUGHPUT BETWEEN CHINA AND ASEAN IN 2010

4.3.1 The Method of Research

General cargoes are the main traditional contents carried in containers. According to the characteristic of transport demand raised by the bargain of manufactured goods between China and ASEAN, the container throughput has a close relationship with the foreign trade volume as well as the framework of import/export goods.

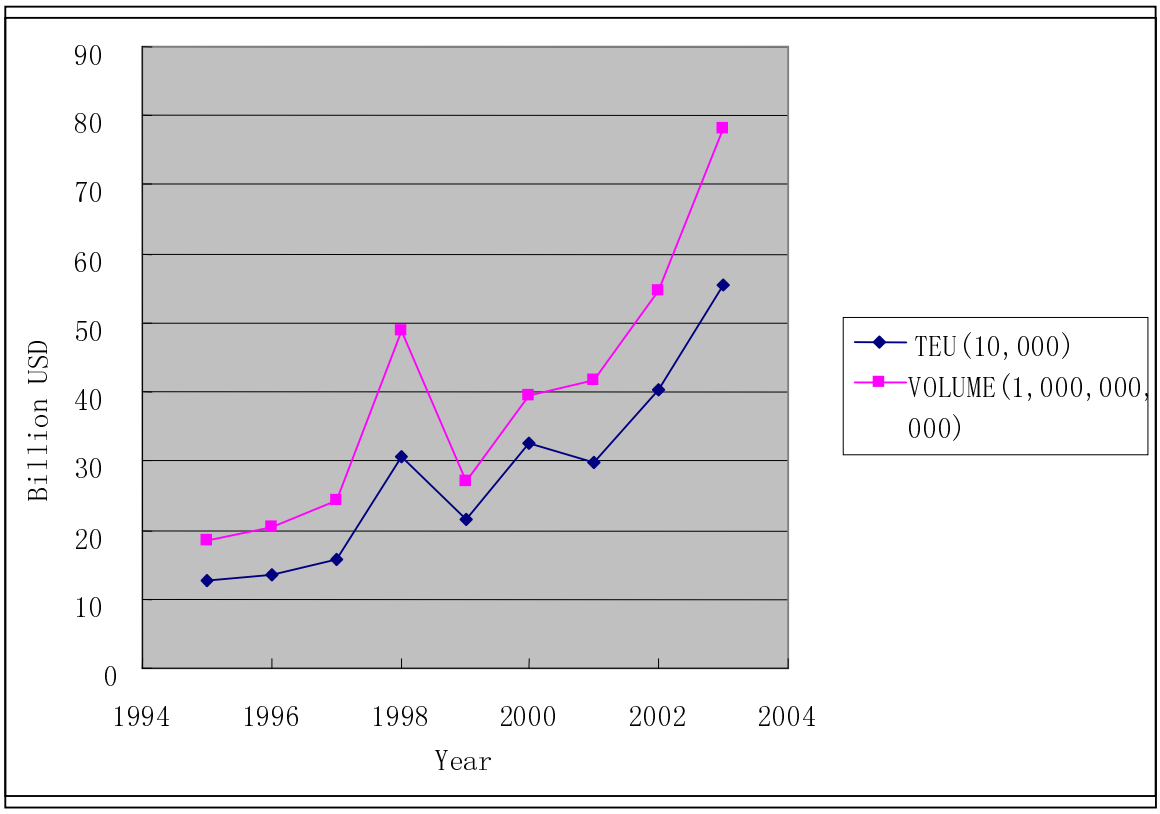

Figure 4 2 - Relationship of Bilateral Trade Volume and Container Throughput between China and ASEAN (1994-2003)

Source: Strategy analysis on Southeast Asia. Xu Min

It is concluded, from figure 4.2, that from 1995 to 2003, with the increase of trade volume, the relative container throughput was also went up. This completely indicated that the bigger the trade volume, the more cargo can be carried in containers, therefore the higher the container throughput.

Factors like GDP (Gross Domestic Product), structure of different industries, total foreign trade volume, the framework of foreign trade products, container transport management level, etc will have a direct effect on the container throughput after analyzing the container generation elements between China and ASEAN.

4.3.2 Methods of Prediction on Container Throughput

4.3.2.1 Multi-factor Dynamic Coefficient Method

The basic way of predicting the container throughput between China and ASEAN by multi-factor dynamic coefficient method is that: considering the factors as the developing level of bilateral trade volume, the trade industry structure, category and framework of products, etc which will have a direct or indirect influence on the generating of container goods. The ratio of laden containers is affected by the proportion of container goods and carriage volume in laden containers; the ratio of empty containers is affected by the imbalance of import/export volume. The total container throughput is made by laden containers plus empty containers.

The formula is:

Q=V*K1*K2*K3/K4/K5

Q: Total Container Throughput (10,000 TEUs)

V: Import/Export Total Volume (billion USD)

K1: Volume Ratio of Container Goods (%)

K2: Generate Coefficient of Container Goods (ton/10,000 USD)

K3: Containerization Ratio of Container Goods (%)

K4: Average Carriage Weight per Laden Container

K5: Ratio of Laden Container

- Volume Ratio of Container Goods K1

The container goods from the trade between China and ASEAN are mainly mechanical instruments, electronic applications, apparatus, organic chemistries,

plastic and plastic products, etc. In recent years, even some bulk cargoes like coals and ores are transported in containers. With the economic development and optimal adjustment of trade structure between China and ASEAN, the lists of container goods will further enlarged and the volume ratio of container goods will continue increasing. It is predict that this ratio will change from 70% the current data to 90% in 2010.

- Generate Coefficient of Container Goods K2

During the prediction period, with the trends of importing/exporting more high-tech products step by step, the commercial goods will be higher in value, smaller in volume, lighter in weight and the increase of the proportion of mechanical instruments and electronic applications, the generate coefficient of container goods will lower to 6.5 ton/0,000 USD in 2010.

- Containerization Ratio of Container Goods K3

Because of some limitations on the containerization ratio, it increases very slowly, and the prediction on this ratio will be 80% in 2010 compare to the current ratio of 75%.

- Average Carriage Weight per Laden Container K4

The level of average carriage weight per laden container has a very close relationship with the loaded products framework within the trade area. For the further lower on custom duty, and the different competitive advantages between China and ASEAN, China will import more container goods with high-tech, the average carriage weight per laden container could be lightly decrease. As to the export goods from China to ASEAN, with the advance of technology, the proportion on exporting mechanical instruments will be further increase. So the prediction value of average carriage weight per laden container would be 9.6 ton/TEU compare to the current value: 8.4

ton/TEU.

- **Ratio of Laden Container K5**

With the revolution of port management system and improvement of port services will lead to the perfection on container transportation system as well as the distribution on ports among Chinese and the members of ASEAN. So that the movement of empty containers could be less than before, and the proportion between laden containers and empty containers will become more reasonable. On this basis, the prediction on ratio of laden containers will reach to 78% while the current ratio is only 66%.

Table 4 4 - Parameters of Container Generation between China and ASEAN in 2010

Parameter	Unit	2010		
		Export	Import	Total
K1		84%	93%	90%
K2	Ton/10,000USD	6.8	6.1	6.5
K3		84%	75%	80%
K4	Ton/TEU	8.3	8.8	8.5
K5		72%	83%	78%

Source: Ministry of Commercial Marine, 2002.

According to the total trade volume that predicted of year 2010 as the amount 368.244 billion USD, by application of the formula and we can calculate the generation of containers in 2010 will be 2.6 million TEUs.

4.3.2.2 Regression Analysis

The application of regression analysis is based on the internal relationship between trade volume of bilateral trade within China and ASEAN (X) and container

throughput (Y). As the same way of setting the mathematic modal like the prediction on bilateral trade volume between China and ASEAN, we can get the regression formula:

$$\mathbf{Y=1.34+0.71X}$$

The total bilateral trade volume between China and ASEAN is expected to be 368.244 billion USD in 2010; therefore, according to the formula we get from regression analysis, the container throughput will be 26.16 million TEUs at that moment.

4.3.2.3 Container Throughput Coefficient Method

In this method, the relationship between the total expected bilateral trade volume and the coefficient on per container throughput from each 1,000 USD will help the author to calculate the final container throughput in bilateral trade.

As just mentioned before, with the revolution of port management system and improvement of port services will lead to the perfection on container transportation system as well as the distribution on ports among Chinese and the members of ASEAN, the movement of empty containers could be less than before. According to the container throughput record from 1995 to 2003 between China and ASEAN, the average per container throughput from each thousand USD in last 9 years is 7.1 (7,100 USD/TEU), so the expected container throughput between China and ASEAN in 2010 is 26.21 million TEUs.

4.3.2.4 Elastic Coefficient Method

The elastic coefficient is the ratio of the increase rate of container throughput between China and ASEAN and the increase rate of total bilateral trade volume in the past years. And then multiples the average increase rate of total trade volume between China and ASEAN with the elastic coefficient to get the increase rate of container throughput in bilateral trade in 2010. At last, the container throughput in 2010 is calculated based on the collected data of container throughput in 2003.

According to the collected data of bilateral trade volume and the container throughput between China and ASEAN from 1995 to 2003, we can get the increase rates of them are 20.4% and 21.5% respectively. Therefore the elastic coefficient is 1.05 (21.5%/20.4%). The total bilateral trade volume in 2003 is 78.252 billion USD and the predicted value in 2010 is 368.244 billion USD, so the average increase rate of total trade volume in 6 years (2004-2010) is 24.8%. And the average increase rate of container throughput in 2010 is 26% (24.8%*1.05). As far as we known, the container throughput between China and ASEAN in 2003 was 5.55 million TEUs, and the amount will reach to 26.17 million TEUs in 2010 after calculation.

Above all, the prediction values of the four different methods are relatively close. But with the improvement and development of China and ASEAN in economic area, their cooperation will be easily influenced by the fluctuation of world economy as well as the friction of world trade, the trend of economy increase in the bilateral trade could by slightly weaken; on the other hand, for there are a lot of factors, which are highly related to the bilateral trade development and will directly affect on the prediction on the container throughput and had taken into consideration in the multi-factor dynamic coefficient method, and the trends of each different influential

factor has been analyzed more in detail, so that this method is quite reasonable and acceptable. Therefore the author prefers this method on predicting the container throughput in 2010, and the predict value-26 million TEUs-is the final answer after our research.

Table 4 5 - Container Throughput between China and ASEAN

Unit: million TEUs

Year	2003	2010
Container Throughput	555	2600

4.4 THE PREDICTION ON SEABORNE CONTAINER THROUGHPUT IN SE ASIA AREA

4.4.1 The Method of Research

First, according to the ratio of total trade volume between China and ASEAN to the whole trade volume of ASEAN Free Trade Area, we can calculate the container throughput of ASEAN in its foreign trade. On this basis, through the analysis on the container transshipment ratio in SE Asia area and the whole internal transportation distribution (railway, road, sea), we can get the container throughput within SE Asia area.

4.4.2. The Prediction on Container Throughput in SE Asia Area

The data on total foreign trade volume of ASEAN is in the top-side of table 4.7 and

the data below is the amount of trade volume on China-ASEAN bilateral trade.

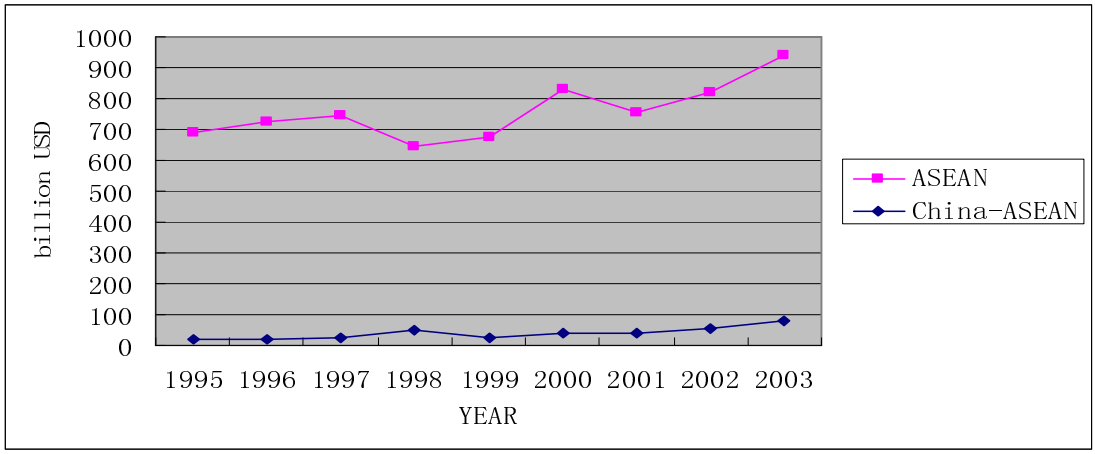

Figure 4 3 - Trade Volume of ASEAN

(Foreign Trade Volume and Trade Volume with China)

According to the developing situation of bilateral trade volume between China and ASEAN from 1995 to 2003, it occupied 7.48% of total foreign trade volume of ASEAN Free Trade Area. Considered that China and ASEAN will have a more intimate cooperation in economic field, so the prediction on the ratio of total trade volume of China-ASEAN to total foreign trade volume of ASEAN Free Trade Area in 2010 could be 9.6% and that will reach to 3835.875 billion USD of total ASEAN foreign trade volume.

Because of the limitation on the data, the author will apply the container throughput coefficient method in predicting the target value. For the coefficient of average per container throughput from each thousand USD is 0.73 (7,300 USD/TEU) based on the collected data, so we can get the container throughput of ASEAN in 2010 is 522.5 million TEUs.

This container throughput is made up by two parts: the internal container throughput within SE Asia and external container throughput from foreign trade.

Table 4 6 - Container Throughput of ASEAN from 2002 to 2004

Unit: million TEUs

Year		2002	2003	2004
Container Throughput	Internal	7.5	8.3	8.9
	External	352	387	426

Source: An analysis of marine container transportation in the Asian region, 2005.

The linear relationship between external container throughput (Y) and internal container throughput (X) that get on regression analysis is listed below:

Y=52.4X-42.8

And the final internal container throughput within SE Asia area in 2010 is 10.85 million TEUs according to this formula.

The territory of whole ASEAN accounts for 4.476 million square kilometers and the coastline is over 10 thousand kilometers. All the members of ASEAN are costal countries or island countries except for Laos. Considered the economy status and the infrastructure of each member, seaborne trade is the most suitable way within SE Asia area. According to the authority data, container transportation by sea accounts for about 93% among all different traffic ways (railway, road, sea) within the area of SE Asia. Therefore the container throughput by sea will be 10 million TEUs at least, and still, it will keep in a brilliant developing trend in the future yeas.

CHAPTER 5

THE ANALYSIS ON CAPACITY REARRANGEMENT IN SE ASIA FEEDER ROUTE

5.1 BASIC WAYS AND METHODS ON CAPACITY REARRANGEMENT

As one of the top-class local carriers with swift developing trend in China, P Shipping Company puts more attention on her market share. Meanwhile, also to be a main carrier in SE Asia area, her position meets much more challenges. Based on the prediction value: the container throughput by sea will be 10 million TEUs in year 2010 in ASEAN, the improvement on the relationship between China and each member of ASEAN, it is necessary to analyze the capacity rearrangement in SE Asia Feeder Route of P shipping Company. to enhance her current market share of 25% in that area; avoid further loss and try to make money; improve the transport efficiency of vessels; keep away the management risks; etc. Therefore, to meet the economic developing trend of SE Asia, keep the current competitiveness of P shipping Company., the company decided to set up new routes, although she has already got 6 routes in this market with the consideration of her management level and the current shipping capacity, as well as the demand and supply of this market.

5.1.1 Necessities of Decision on Setting Up New Routes

The necessities in capacity rearrangement of liner companies, sooner after her setting up a series of strategic decisions on the new routes, are listed in figure 5.1:

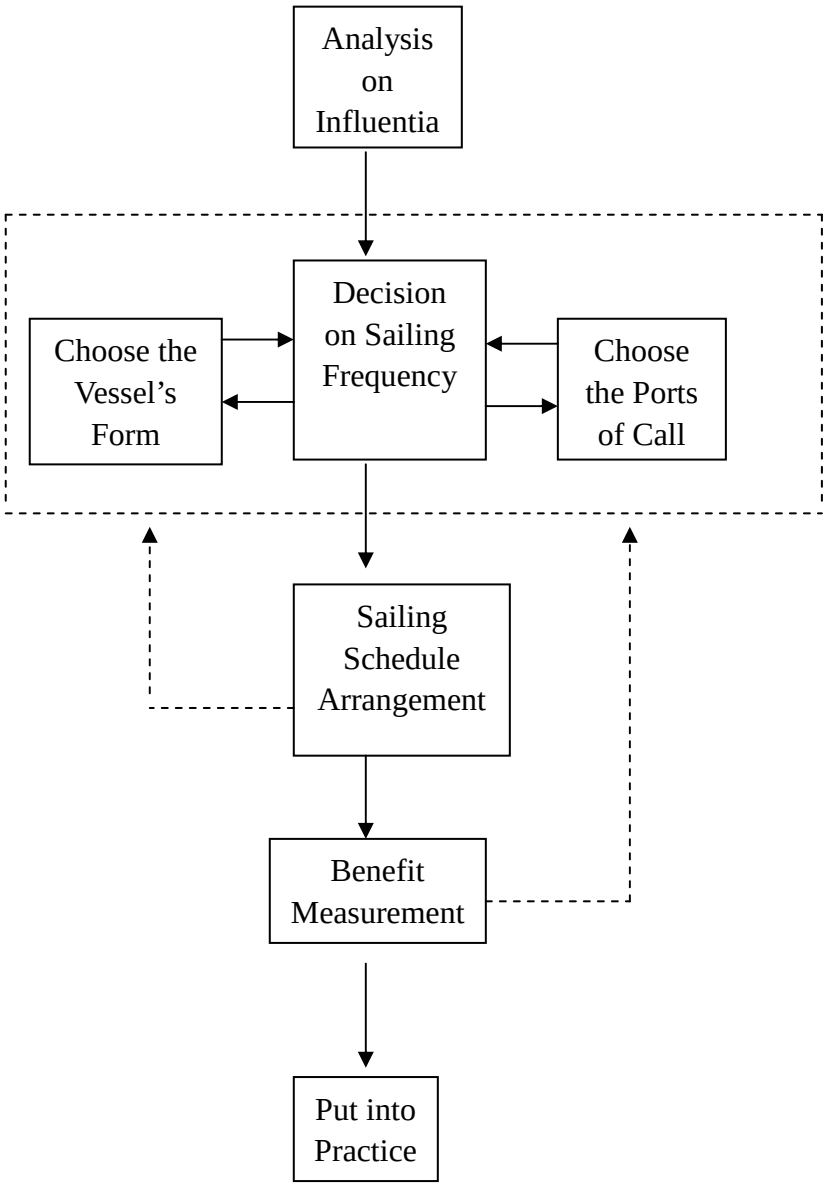

Figure 5 1 - Strategy Flow of Capacity Rearrangement in New Routes

Explanation:

1. Based on the precondition that the macro-economic development will be brilliant as well as the strategic decisions have been made, the analysis on influential factors put much more emphasis on gathering information of vessel's form, sailing frequency, ports of call for further research.
2. Considered the choices of vessel's form, sailing frequency, ports of call should be co-related to each other to improve the competitive advantage and the efficiency of new routes.
3. Sailing schedule rearrangement and benefit analyzing are not only feasible analysis but also optimal measurement on capacity rearrangement, therefore, once the results are not that reasonable, the former choices should be modified in order to make the final benefit much suitable.
4. Thoughtful arrangement in practicing the final decisions is very important in reducing risks and guarantees the benefit.

5.2 THE CHOICE ON PORTS OF CALL OF P SHIPPING COMPANY IN NEW ROUTES

The choice on ports of call not only has close relationship to the time on sailing frequency, but the influential factor to decide the cargoes volume or the income level. Although each liner company has her own choice on ports of call, for the origin places of cargo, market competitive advantages and the market networks of them are various to each other, there must be some common points in choosing ports of call that can be comply with.

In practice, the choice on ports of call should following the basic principles:

5.2.1 Sufficient Container Cargoes

The goal of capacity rearrangement is to improve the management level and make more profit for company. Thus, those selected ports of call should have enough container cargoes as well as the trade center among that area. For example: ports like Shanghai, Shenzhen, etc. They are not only the economic centers among their region, but also the main import/export points of Yangtze Delta Area or Pearl Delta Area. Therefore, these kinds of ports are the first choices of liner companies in their selections. Besides, the unnecessary repeating choice on the same ports of call in different routes among the same region should be avoid to improve the efficient of management level.

5.2.2 The Coherence of Sailing Schedule

The number of ports of call must satisfy the requirement of sailing schedule; as to the sequence on ports of call, liner companies should fully consider the competitive advantage in market competition among those important load/discharge ports during delivery period. To those ports have large cargo volume and unique competitive geographic location, in order to show their advantages in cargo delivery and transportation, liner companies should implement “double-berthing” strategy as far as can satisfy the sailing schedule. For example, Port of Singapore is not only the first import choice from Europe to Far-East but also the last export port from Far-East to Europe.

5.2.3 Convenience of Transshipment

Container transportation needs network management, thus, the choice of ports of call should match with the optimal transport network as well as the strategy on developing pivot ports. For instance: ports like Singapore, HongKong, and Japanese ports play different roles in transshipping cargoes among South-North Routes, East-West Routes, regional or worldwide routes, etc.

5.2.4 Good Condition in Ports of Call

The trend of bigger in ship's size requires the ports to have enough draft and infrastructures to meet the need of operation on big ships in loading/discharging. Besides, whether the condition in ports of call is good or not is a key influential factor to on-time of sailing frequency. Therefore, liner companies should be much more careful when choosing the ports not having good infrastructures or management level, with low product efficiency or unstable political environment, etc in their choice on ports of call.

5.2.5 The Balance of Laden/Empty Container Throughput

The balance of laden/empty container throughput is very important in reducing management cost and increasing the benefit of a shipping company in her daily operation. However ports that can accomplish the balance of laden/empty container throughput are quite rare that leads to the phenomenon of "over-container ports" or "short-container ports" alongside the regular route. Thus, in choosing ports of call and planning for the order of them, shipping companies should consider the problem

transporting empty container from “over-container ports” to “short-container ports”.

In SE Asia area, Singapore, Indonesia, Malaysia and Thailand are the main countries contribute to the seaborne container throughput, besides that the ports infrastructures, logistic supplements, employees’ level, legal and political system, government support of the mentioned the countries are locate in a leader status compare to other members of ASEAN. Because the transshipment center of P shipping company is located in Port of Kelang, Malaysia, it is regarded as one of the basic port of call in capacity rearrangement of P shipping company in setting up new routes.

In practice, after analyzing the mentioned influential factors, P shipping company explored the route of Port Kelang/Surabaya, namely Route E001, as a new market exploration in SE Asia area to help her make more profit. The contents below will give a further description in capacity rearrangement of P shipping company in accordance with Route E001.

5.3 REASONING ON SHIP’S FORM OF P SHIPPING COMPANY IN SE ASIA FEEDER ROUTE

Consider the situations of cargo volumes, waterway drafts, harbor conditions, etc the container ships sailing within SE Asia Feeder Route are normally with the capacity under 1,000 TEUs. Now P shipping company has total 24 vessels of 13 different ship’s forms with the capacity under 1,000 TEUs. Their technique parameters are listed in table 5.3.

Table 5 1 - Technique Parameters of Ship's Capacity under 1,000 TEUs

CAPACITY (TEU)	VESSEL NAME	DWT (MT)	GRT (MT)	NRT (MT)	LOA (M)	BREADTH (M)	DRAFT (M)	DESIGNED SPEED (KN)	HORSE POWER (KW)
112	**JIANG PENG**	2400	1595	893	73.40	13.10	4.10	10-13	1340
	WAN YONG ZHENG	2312	1589	889	75.00	13.20	3.65	7-9	1340
124	**MEKONG EXPRESS**	2200	975	546	70.00	13.20	5.5	5-7	1268
128	**ZHHOU HANG JI**	1980	1596	893	71.60	13.20	3.65	7-9	1222
170	**HAI TANG**	3545.7	2752	1541	84.57	15.00	5.5	8-10	2140
	XIANG RONG	3545.7	2752	1541	84.57	15.00	5.5	8-10	2140
210	**XIANG FA**	4612	4181	1971.25	105.32	16.00	6.5	10-12	2750
	XIANG FENG	4718	4119	1769	105.32	16.00	6.5	10-12	2750
	XIANG ZHONG	4666	4119	2306	105.32	16.00	6.5	10-12	2750
	XIANG QIANG	4718	4119	1769	105.32	16.00	6.5	10-12	2750
	XIANG LIN	5276	4119	2306	105.27	16.00	6.48	12-14	2750
413	**LI PENG**	8449	4400	246	118.0	16.00	5.8	12-14	4648
420	**LI TAO**	7020	4914	2306	112.50	18.20	6.68	14	3360
	LI LIAN	7020	4914	2306	112.50	18.20	6.68	14	3360
450	**HAN SHUI HE**	9465	8282	3586	126.00	21.40	7.66	13.50	4928
	HAN TAO HE	9485	8282	3586	126.00	21.40	7.66	13.50	4928
494	**XIANG LONG**	9636	9129	3556	138.50	21.50	8.02	12-14	8824
	XIANG FENG	9636	9129	3556	138.50	21.50	8.02	12-14	8824
564	**SONG ZI**	9509	8957	4132	138.03	22.40	7.82	13-15	7208
	ZU ZI	9509	8957	4132	138.03	22.40	7.82	13-15	7208
810	**JIN MAO FU**	17170	15189	8505	170.89	24.56	9.89	14-16	6250
	JIN MAO FU 1	17170	15189	8505	170.89	24.56	9.89	14-16	6250
950	**XIANG AN**	18070	13769	7550	165.50	23.05	10.7	14-16	6455
956	**XIANG PING**	18274	13396	5744	164.00	22.00	9.60	14-16	6336

Source: Internal reference material of P Shipping Company

5.3.1 Reasoning on Ship's Form in Port Kelang/Surabaya Route

When reasoning on ship's form in Port Kelang/Surabaya Route, consider that the export container throughput is weekly 300-400 TEUs and the import container throughput is 200-300 TEUs every week, so only those ships with capacity more than 400 TEU can be in the list. On the other hand, for that the distance between Port Kelang and Surabaya is only 963 nautical miles, it is not suitable to choose those ships with capacity more than 1,000 TEU at the angle of the transportation cost. Meanwhile, because the actual rate of container capacity utility should no less than 70%, only 5 kinds of ships, namely 413TEU, 420TEU, 450TEU, 494TEU, 564TEU can meet the needs of the mentioned new route.

During the process of reasoning, consider that the fierce competition in SE Asia Feeder Route, the shippers' requirement on delivery time becomes much stricter, thus, the ships sailing in this area are mainly high-speed ships. Admiralty coefficient is a key competitive index in researching the ship's speed because, if the ship's speed is the same, the bigger the admiralty coefficient is, the better the ship's performance will be: less main engine power and bunker consumption. Ship's efficiency is another important parameter in ship's form selection with the increase of bunker price. Ship's efficiency is a comprehensive index that reflects the relationship among ship's DWT, ship's speed, bunker consumption of main engine. The higher the ship's efficiency, the better the ship's economic benefit will be. Among the choice of competitive indexes, freight rate is absolutely necessarily to be chosen for the fierce price competition among shipping companies, even some local shipping company participate into the transportation by charting an old and small ship. This index means to achieve the intended investment yield, the value of the lowest income level per transport volume. To show the scientificity in reasoning, we choose another two

indexes, namely unit capacity output and power ratio of DWT for reference.

The freight rate (RFR), unit capacity output (UCO), power ratio of DWT (R_P), ship's efficiency (E_{SH}) and admiralty coefficient (AC)of five selected ships' form on Port Kelang/Surabaya Route are listed in table 5.2.

Table 5 2 - Competitive Indexes on Five Selected Ships

Ship Form / Index	A （413TEU）	B (420TEU)	C （450TEU）	D （494TEU）	E (564TEU)
RFR （USD/TEU）	317.8	306.3	285	318.6	320.7
UCO	75.84	76.83	80.16	67.48	65.62
R_P	1.82	1.77	1.64	1.59	1.47
E_{SH}	162458	136742	121047	113089	145228
AC	447	424	204	266	486

Source: Internal reference material of P Shipping Company. 2005

Among the five selected ships, none of them can make all their five indexes to reach to the optimal at the same time. Therefore, the integration on these indexes is necessary to get the optimal plan. So first of all, we should deal the data as listed in table 5.3.

Table 5 3 - Competitive Indexes of Five Selected Ships after Adjustment

Ship Form / Index	**A** （413TEU）	**B** （422TEU）	**C** （450TEU）	**D** （494TEU）	**E** （564TEU）
RFR （100USD/TEU）	3.178	3.063	2.85	3.186	3.207
UCO*10	7.584	7.683	8.016	6.748	6.562
R_P	1.82	1.77	1.64	1.59	1.47
$E_{SH}*10^5$	1.62458	1.36742	1.21047	1.13089	1.45228
$AC*10^2$	4.47	4.24	2.04	2.66	4.86

Source: Internal reference material of P Shipping Company.2005

In the process of reasoning, we apply the weight-sum method to research and optimize. After analyzing and requiring experts' advises, the weight-sum coefficient of each index is 0.22, 0.21, 0.18, 0.18, 0.21, respectively. (Reasoning process see APPENDIX C.)

Table 5 4 - Comprehensive Assessment on Five Selected Ships

Ship Form	A (413TEU)	B （420TEU）	C (450TEU)	D （494TEU）	E (564TEU)
Comprehensive Assessment	0.22	0.21	0.18	0.18	0.21

From table 5.4, A ship (413TEU) gets the highest mark in comprehensive assessment, so this plan is the best solution in ship's form reasoning.

5.4 THE MEASUREMENT ON ROUTE BENEFIT

In capacity rearrangement research, another necessary work is to measure the route benefit, both single leg and double legs.

The task of this step is to calculate the investment effective index and test on the feasibility of each plan.

The most normal used investment effective index is net present value (NPV). NPV means during the relevant economic testing period, the cash flow occurred at different time against one particular investment plan, discounting the present value of the first year on one fixed discount rate of the investment plan as soon as it going to make profit, and finally sum the total amount to get the result. The principle of

estimating the result is that: if NPV is more than or equal to zero, the plan is feasible; on the contrary, if NPV is negative, the result is unfeasible. However, among the final results of each different plan, bigger the NPV, better the plan will be.

Here, the author uses NPV Method against Route E001 to measure the route benefit and assure whether the plan of setting up this new route is feasible or not.

Table 5 5 - Raw Data of Benefit Measurement on “A” Vessel under Different Speeds

Unit: million USD

SPEED（kn） / ITEMS	12	13	14	15	16
Investment	17.64	18.32	19.07	19.88	20.76
Scrap Value	0.87	0.92	0.95	0.99	1.04
Mend & Insurance	0.76	0.79	0.82	0.85	0.89
Bunkering	1.46	1.67	1.89	2.14	2.39
Port Disbursement	3.52	3.68	3.83	3.98	4.12
Waterway Fee	0.57	0.60	0.62	0.65	0.67
Agency Fee	0.17	0.18	0.19	0.20	0.21
Container Apportionment	2.89	2.89	2.89	2.89	2.89
Salary	0.40	0.40	0.40	0.40	0.40
Annual Operation Cost	9.77	10.20	10.64	11.10	11.56
Annual Income	11.77	12.30	12.80	13.30	13.78
Annual Profit	1.63	1.71	1.75	1.78	1.77
NPV	5.46	5.81	5.75	5.28	4.41

Source：Internal reference material of P Shipping Company.2005.

Based on the discount rate of 3.75% and payment period of 20 years in the NPV method, which was calculated by the experts and scholars, from table 5.5, we can get the maximum NPV when ship’s speed is 13 knots, and this NPV is more than zero. Thus, we regard this plan is feasible and the economic speed is 13 knots.

As to the sailing frequency, we can calculate it based on that the distance between Port Kelang/Surabaya is 963 nautical miles with economic speed of 13 knots, so that the sailing time is 2.6 days, single leg, besides that taking the load/discharge time into consideration, it needs 1 day each end. Therefore, we study out the sailing schedule lists in table 5.6.

Table 5 6 - Sailing Schedule

SE Asia Feeder Route		
PORT KELANG/SURABAYA		
Vessel Name	Voyage NO	Loading Port
LI PENG	E001	PORT KELANG
Discharging Port: SURABAYA	23.3N/42W	10/23

CHAPTER 6

SUMMARY AND CONCLUSIONS

The intense competition of container transportation in SE Asia Feeder Route was resulted for the short distance of the routes, the low requirement on vessels' capacity, although the container volume is increasing year by year. Therefore, the first choice in deciding the vessel's form is those can be operated in low costs besides their completion the shipping tasks. As long as selecting those low-costs vessels can P shipping company lower her freight rate and make sure her winning the competitive advantage in competing with other shipping companies. Secondly, the fast-speed vessels are necessary in serving for the SE Asia Feeder Route when researching the vessels capacity rearrangement. The shipper/consignee are more and more strict on delivery time, sometimes, even the freight rate are 10 USD higher than the market level, they preferred to shipping companies with top reputation as well as those who can provide on-time services. To P shipping company, one of her emergencies is to build up her service reputation, so in researching the vessels capacity rearrangement in SE Asia Feeder Route, P shipping company should combine the factors like operation cost, vessels' technique requirement, etc. Then select those can make benefits for her in daily management. Moreover, a key step in her daily management is how to cohere the sailing frequency within P shipping company and her branches in transshipment ports. In SE Asia area, the services provide by branches cover

almost all ports in that area, supply the shippers with high-quality, thoughtful services. Thus, the key point for P shipping company in her further strategic plan is how to keep tight connect with branch shipping companies at the same time when her finishing tasks of main routes.

REFERENCES

Asaf Ashar. (2002). Revolution now, *Containerization ,International*, January.

Bernd Eulitz, How to boost your profits, Containerization International,June,2002

Chen De Ming. (2001,Apr). Development trend's Analysis on Worldwide Top 3 Container Lines. *Containerization.*

E.Sambracos, J.A.Paravantis, C.D.Tarantilis, C.T.Kiranoudis. (2004) Dispatching of small containers via coastal freight liners: The case of the Aegean Sea, European Journal of Operational Research 152. pp 365-381

Eurad M. (1987, Jan). Optimization procedures in maritime fleet management. Maritime Policy & Management.: pp 27-48

Fogerholt, K. (1999). Optimal fleet design in a ship routing problem. International Transactions in Operations Research 6, pp 453-464.

Huang Jin. (2002). Ports of Malaysia, a challenge to the world's load center ports. *China Ports*. pp 35

Huang Jun Lin. (2005, 10). Ship's form reasoning on LNG transportation. Shanghai Maritime University. pp 21-35

Internal reference material of P Shipping Company. (2000-2005). Unpublished.

Liu Cai Yong. (2003, March) Current situation and prospects of south-east Asia container ports. Modern Asia & Pacific.

M.C.Mourao M.V.Pato A.C.Paixao, (2001). Ship assignment with hub and spoke constraints, *Maritime Policy & Management, Vol.2*.

Ministry of Commercial Marine, (2002, Jan). Personal communication.

Tanjung Perak Port Development at Lamong Bay. Directorate general of sea communication ministry of communications. January 2005.

Tarantilis C.D. Kiranoudis C.T (2002). Using a spatial decision support system for solving the vehicle routing problem. Information & Management 39 (5). pp 359-375.

Terence D. Smyth. (2004). Forecasting Trade for Port Projects in the Developing World.

Unpubished. (2005). *An analysis of marine container transportation in the Asian region.* Eastern Asia Society for Transportation Studies. Vol. 5,pp 617-630.

Wang Hong Yan. (2001). Statistic analysis and decision making by EXCEL. Education Publication.

Wang Yi. (1992). Quantitative analysis on marine economy. Personal Communication.

Wu Bing. (2002, Jul). Why Malaysia beats Singapore. *Transportation World*.

Wu Chang Zhong. (1992). Shipping management. Dalian Marine College.

Xia Bo. (2004, Jun). A probe into China's peaceful emergence and the development of its future relations with ASEAN. Around Southeast Asia.

Xu Tian Fang. (1994) A research for shipping modern management. *Journal of Dalian Marine College*. pp 20.

Yao Zong Ming, Lin Guo Long. (1990). Container transport management. Dalian Marine College.

Yuan Xu. (2003). Structural analysis on trade relationship between China and ASEAN. Education Publication.

Zhao Gang. (1997, Dec). Analysis and improvement on the vessel allocation model of liner service. *Journal of Science Engineering*.

Zhao Gang. (1997). International shipping management. Shanghai Maritime University.

Zhou Hu. (2004, Nov). Cooperation improves development. *Containerization*.

APPENDICES

APPENDIX A.

Regression Analysis on Prediction Trade Volume between China and ASEAN

Table 1 Result of regression analysis (1995-2003)

Regression Statistics	
Multiple R	0.699752
R Square	0.489652
Adjusted R Square	0.404594
Standard Error	146.7162
Observation Value	8

Table 2 Result of regression analysis (1995-1997/2000-2003)

Regression Statistics	
Multiple R	0.898556
R Square	0.807404
Adjusted R Square	0.759254
Standard Error	104.1301
Observation Value	6

APPENDIX B.

A Brief Introduction to Port of Tanjung Perak, Surabaya, Indonesia

Port of Tanjung Perak located at the east of city Surabaya, which is the second biggest city in Indonesia only second to the capital city-Jakarta, and is famous by its commercial environment. As to the function of a port, Surabaya is also a natural perfect harbour with a historical fame. Developed for centuries, Port of Tanjun Perak, already equipped itself both in hardware (harbour facilities, berths, infrastructure, etc) and software (the skill of employees, services, local policies, etc), can now provide worldwide carriers with top-class maritime transport services.

Table 3 - Basic Descriptions of Port of Tanjung Perak, Surabaya

Port hinterland	East Java Province. Much of eastern Indonesia for feeder trade.
Port role	Deep-sea regional and feeder trades. Domestic container trade.
Container shipping	
Now	Mix of deep-sea feeder and regional trade vessels, plus interisland container vessels (small feeders).
Future	Same but larger vessels.

Source: Forecasting Trade for Port Projects in the Developing World. Terence D. Smyth

Table 4 - SWOT Analysis on Port of Tanjung Perak, Surabaya

Strengths	New development area with clean sheet for port design. Good road links to hinterland. Good location regarding ports in eastern Indonesia.
Weaknesses	Channel depth (9.5 m maximum draft with 2.2 m tidal assist), which will become an issue even in the feeder and regional trades.
Opportunities	To create a new, efficient port with help of international port operator.
Threats	Possibility of new deep water ports in area, but only in the very long term. Dependence on future industrial development in a relatively small hinterland with unsophisticated industries.

Source: Forecasting Trade for Port Projects in the Developing World .Terence D. Smyth

According to the record, container flow of Tanjung Perak Port in 2004 amount of 1.37 million box equivalent with 1.69 TEUs.[1] And in the predict year of 2010, the container flow will reach 4.5 million TEUs.[2] The current international container market share of Port of Tanjung Perak, Surabaya is nearly 3%,[3] and the annual growth rate as high as 12%. Besides the sufficient source of cargo from its hinterland, convenient transshipment service, good condition of the port, etc. All these precondition make P shipping company select Port of Tanjung Perak, Surabaya as the port of call of the new route E001.

[1] TANJUNG PERAK PORT DEVELOPMENT AT LAMONG BAY p 35
[2] TANJUNG PERAK PORT DEVELOPMENT AT LAMONG BAY p.36
[3] Forecasting Trade for Port Projects in the Developing World p 46

APPENDIX C

Reasoning Process on Weight-Sum Method

Table 5 7 - Competitive Indexes of Five Selected Ships after Adjustment

Ship Form / Index	A （413TEU）	B （422TEU）	C （450TEU）	D （494TEU）	E （564TEU）
RFR （100USD/TEU）	3.178	3.063	2.85	3.186	3.207
UCO*10	7.584	7.683	8.016	6.748	6.562
R_P	1.82	1.77	1.64	1.59	1.47
$E_{SH}*10^5$	1.62458	1.36742	1.21047	1.13089	1.45228
$AC*10^2$	4.47	4.24	2.04	2.66	4.86

Source: Internal reference material of P Shipping Company.2005

From Table 5.3, each vessel has 20% of total weight in measuring the best suitable one. Meanwhile, assume each selected factor (RFR, UCO, RP, ESH, AC) has the same weight, in this table, we got each column represents 4% of total weight.

On that basis, we can get the index of each vessel:

	A （413TEU）	B （422TEU）	C （450TEU）	D （494TEU）	E （564TEU）
SUM	18.68	18.12	15.76	15.31	17.55
WEIGHT	0.22	0.21	0.18	0.18	0.21