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WORLD MARITIME UNIVERSITY

Shanghai, China

**THE RESEARCH OF BENCHMARKING
APPLICATION IN DEVELOPMENT OF
INTEGRATED LOGISTICS IN ZHANJIANG
PORT**

By

TIAN JING

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

(IN INTERNATIONAL TRANSPORT AND LOGISTICS)

2006

DECLARATION

I certify that all the material in this research paper that is not my own work has been identified, and that no material is included for which a degree has previously been conferred on me.

The contents of this research paper reflect my own personal views, and are not necessarily endorsed by the University.

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After great effort of over than six months, my dissertation of Research of Benchmarking Application in integrated logistics development in port of Zhanjiang has finally come to the 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'm profoundly impressed on Professor Liu. Wei's strict requirements of study, and 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 instructions and 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, especially Gao Xin and Li Yi Zhen, who are from Zhanjiang and Ningbo. With their great help, I get precious data and materials about these two ports, so they have contributed to my dissertation very much as well. Hereby, I give my 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 years.

ABSTRACT

Title of Research paper: **The Research of Benchmarking Application in Development of Integrated logistics in Zhanjiang Port.**

Degree: **MSc**

So far, coastal cities are important economic and political centers for different countries and districts, and ports, as the most direct connection with global logistics market, play more and more significant role in modern trade and transportation system. Under the background of development of logistics economic, modernized ports are not only the linking points for sea-land transportation, but significant part of freight transport chain and world trade. So this topic of port logistics is worth studying.

With the development of inter-modal transportation and global integrated logistics, modern ports, especially container terminals, which are the nodes of global transportation network, will be multi-functional, also should pay more attention to providing all-direction value-added services. So it is necessary for ports to develop integrated logistics which will encounter fierce competition, how to plan the development of a port, how to make strategies, these are extremely difficult.

This dissertation is based on this background, and cites the example of logistics development of Zhanjiang port in Guangdong province, southeast of China, in order to avoiding cavity, thus making my dissertation more practical and persuasive.

Chapter 1 is introduction of my dissertation, Chapter 2 start to analyze the status quo of logistics port Zhanjiang', first from theoretical aspect presenting integrated logistics definition and development phases, mainly focus on the relationship

between integrated logistics and ports, then do analysis on status quo of port Zhanjiang's logistics development. Chapter 3 will first introduce the methodology and application of benchmarking, then apply this methodology to Zhanjiang port from view of logistics cost, which is overall application between port Zhanjiang and other developed ports, it needs to cite a specific port as benchmark for Zhanjiang port to learn from and as goal to catch up with, so the following part of Chapter 3 is to choose benchmark in alternative ports which are three kind: first kind—the most developed ports--Rotterdam and Singapore; second kind—Hong Kong as domestic leader port; third—port of Ningbo which Zhanjiang port can probably catch up with after years of development. Then give reasons why choosing port of Ningbo as benchmark for Zhanjiang port. Chapters 4 will analysis difference between these two ports from three kinds of terminals: iron ore terminal, crude oil terminal and container terminal. Chapter 5 give SWOT analysis of Zhanjiang port then choose strategy for logistics development of Zhanjiang port based on above analysis in Chapter 4, and then present suggestions according to benchmarking application. Final part is conclusion for the whole dissertation.

KEYWORDS: Integrated logistics, Port, Benchmarking

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LIST OF ABBREVIATIONS

TQM—Total Quality Management

LNP— Liquefied Natural Petroleum

LNG—Liquefied Natural Gas

ASEAN—Association of Southeast Asian Nations

1. Introduction

1.1 Background of dissertation

With the rapid development of economic globalization and modern technology, logistics has become industry, which is the hot point in global economics. As important part in modern logistics industry, port confronts new challenges and opportunities. For port enterprises, how to improve the port functions through renew ideology, how to keep pace with the development of modern logistics, how to keep win-win state in competition, these are all their new tasks. Modern logistics stands the trend of transportation industry, and port, which is one of spots in transportation system, needs to change ideology, enhance own competitive advantage by doing research and joining the of process of the development logistics, all the above are essential for port to develop itself into modernization port in 21 century.

Zhanjiang port lies in Leizhou Peninsula—in the south end of China, where faces the Southeast Asia and lean on the Southwest of China, and also lines sailing from Zhanjiang to port in Europe, Middle East, Africa and Oceania, these lines are the shortest distance between China continental and outside. As one of ports, which were designed all by China itself, port Zhanjiang has excellent natural conditions, and was one of the most important open windows before Chinese reform and opening-up to outside and also was the primary passage to sea for southwest part of China and west of Guangdong province. After development for about half century,

Zhanjiang was one of Top 10 coastal ports of China—with convenient transportation and excellent consolidation and distribution conditions. Now Zhanjiang port is the hub center for seaway transportation for different kinds of domestic and international trade. In order to keep pace with the development of hinterland and meet the demand of construction of inland area, meanwhile to attract more cargo resource, and to fulfill the goal of becoming the largest hub center in Southeast China, focusing on development in port logistics should be the direction for Zhanjiang's future. Under this background, what kind of problems exist in Zhanjiang's development, and how is the gap between Zhanjiang port and developed ports in the world, all these can be the entrance points for a certain port to develop its own port logistics. So it's important to do research to figure out the above problems.

According to overall planning of national economic and social development, construction of five port-group will be key important, which are as follows:

1. Yangtze River Delta port-group, whose construction key point, is container transportation system including ports of Shanghai, Ningbo-Zhoushan, Suzhou and Nanjing, Lianyungang, in order to fulfill total throughput surpassing 30 million TEU.
2. Pearl River port-group will put emphasis on consolidating position of Hong Kong as international shipping center, meanwhile, making full use of resource superiority of both Guangdong province and Hong Kong, especially ports of Shenzhen and Guangzhou, correspondingly developing container transportation system for ports of Shantou, Zhuhai, Zhongshan, etc, to realize throughput surpassing 31 million TEU and developing terminals for loading&discharging import crude oil, oil product or LNP, LNG in Huizhou, Shenzhen, Zhuhai, also pay attention to construction OF crude oil and gas transshipment terminal in Guangzhou and Dongguan, including Guangzhou coal terminal development.
3. Gulf of Bo Sea port-group: construction centers are ports of Dalian, Tianjin and

Qingdao, meanwhile developing container transportation of ports of Dandong (Liaoning province), Yingkou, Jinzhou, Qing Huangdao, Tangshan, Yantai etc.

4. Southeast coastal port-group mainly focus on container transportation system of Xiamen as hub port, ports of Fuzhou, Quanzhou, Putian, Zhangzhou as feeder.

5. Southwest coastal port-group are mainly consist of container transportation system, including ports of Zhanjiang, Fangcheng, Haikou as feeder, import oil and gas transshipment system of ports Zhanjiang, Haikou, coastal ports of Guangxi province, of iron ore transshipment system of ports Zhanjiang, Fangcheng, and passenger transportation system of ports Zhanjiang, Haikou, Sanya etc.

For the above five port-group, port of Zhanjiang is adjacent to Pearl River delta, which is also the important member in Southeast coastal port-group, including container transportation system, oil gas, iron ore transship system, even the passenger transportation are port of Zhanjiang's development direction.

It's precious opportunity for port of Zhanjiang with such beneficial policy. Do study and research on topic about Zhanjiang's integrated logistics development is significant for Zhanjing to become an international shipping center.

1.2 Purpose and signification of the Dissertation

The trend of economic globalization has greatly changed the function and position of ports in the social and economic development. As one of the important link points in the integrated transportation chain, ports are becoming more and more influential in the whole processes, which also develop into the force that can determine the primary position in international competition. Therefore, keeping rapid and constantly development of port logistics should be the focus of port development and also the

most efficient way to keep competitiveness. So far, most of Chinese domestic ports have realized the importance of developing port logistics, which are now speeding up to improve the planning and construction, in order to make the traditional-functional ports which only operate loading & discharging become ones which can provide the logistics services, hence enable Chinese domestic economic development. From the current status of Chinese port logistics development, it's still in low-level state from overall view. In this initial phase, how to reduce the logistics cost and improve the customer's satisfaction by providing integrated logistics services, this topic is worth exploring and should be taken in to consideration for ports development.

During recent years, Zhanjiang port has done research in building and developing integrated logistics system for practical use, especially make great progress and gain practical experience in bulk logistics, such as iron ore. But overall speaking, the logistics in Zhanjiang port is still in initial phase, therefore, they are lack of overall planning and research of integrated logistics development including different kinds of cargoes.

Facing present fierce competition, ports nearby Zhanjiang also speed up the pace to develop, such as Fangcheng port, Beihai port (in Guangxi Province), which will make Zhanjiang probably lose its status as hub port in this area, what's more, development of Fangcheng and Beihai ports will also cause unbalance of productivity structure. So this dissertation is focusing on discussing the future strategy for Zhanjiang port to provide integrated logistics services, in order to improve the difficult situation and do research on this topic through practical cases.

1.3 Methodology applied in the dissertation

During the whole processes of writing this dissertation, I have completed the following steps:

- A. Doing theoretical research in the position of integrated logistics services in a port's development through quantitative reading and resource collecting, mainly pay attention to the complementary relation between ports and integrated logistics.
- B. Collecting statistics data of port Zhanjiang, which are preparation for doing analysis of logistics development in port Zhanjiang.
- C. Analyzing the advanced experience and success reasons of logistics development in international and domestic ports, then apply benchmarking in logistics development of Port Zhanjiang, to find the gap between Zhanjiang port and targeting benchmark.
- D. Use Methodology of SWOT analysis in port Zhanjiang, and make strategy according to result of analysis and the result of benchmarking application, then give suggestion for port Zhanjiang.

2 Status quo of integrated logistics in port Zhanjiang

In order to analyze the status quo of port Zhanjiang, this Chapter will firstly introduce the definition and development phases of integrated logistics in theoretical aspects. Second part of the chapter is mainly analyzing the relationship between port and logistics, and then come to the topic of importance of integrated logistics for modern ports. Third part of this chapter will start to analyze status quo of logistics development in port Zhanjiang, preparing for the following research.

2.1 Definition and development phases of integration logistics

2.1.1 Definition of integrated logistics

In a broad sense, integrated logistics is defined as:

¹“The process of managing all activities required to strategically move and store materials, parts, and finished inventory from suppliers, between enterprise facilities, and to customers.”

The objective of integrated logistical operations is to deliver finished inventory and material assortments, in correct quantities, and required, in usable condition, to the location where needed, and at lowest associated total cost expenditure.

¹ Definition source: Alexander M. Rodrigues (Michigan University), Theodore P.Sank (The University of Tennessee), Daniel F.Lynch (Michigan University)—Linking strategy, structure, process, and performance in integrated logistics.

Integrated logistics consists of the operational direction and coordination of facility location, transportation, inventory, communication, and handling and storage. To achieve an orderly flow of products and materials, managerial attention must be devoted to the design of the logistical system and to the direction of its operation. Thus, logistical management is defined as:

²“That managerial responsibility to design and administer a system to control the flow of materials, parts, and finished inventory to the maximum benefits the enterprise.”

The philosophy of integrated logistics involves two interrelated efforts:

(1) Logistical operations; and (2) logistical coordination.

Unlike physical movements which ideally flow toward the final sales destination, Coordination and communication represent a two-way process from and to both selling and buyer markets.

To accomplish the functions illustrated, transportation, inventory, and handling and storage must be fully coordinated between all facilities, customers, and vendors. Thus, integrated logistical management involves administration of all movement to, from, and between geographical locations that comprise the facility structure of the enterprises.

The purpose of integrated logistics is to meet the satisfaction of customers' which needs to consider production, transportation and marketing uniformly in an overall view, in order to reduce cost, improve efficiency and quality of service, hence enhance the competitiveness of the enterprise.

² Adopted from: Linking strategy, structure, process, and performance in integrated logistics(JOURNAL OF BUSINESS LOGISTICS, Vol, 25, NO 2, 2004.)

The characteristics of integrated logistics can be described in three aspects:

(1) professional, (2) integrated, (3) international

(1) Professional mainly including two parts: professional technology and professional port logistics management.

Professional technology means the application of high-tech in port logistics processes, such as bar-code technology, electronic data interchange (EDI), automatic technology, information and net system, intellectual and soft technology, professional and standard physical equipment of transportation, loading&discharging and warehousing. Prevailingly applying high-tech in logistics field will make logistics management more and more professional and efficient.

Professional management, which refer to find professional logistics company or setting up special department to operate logistics management for a certain enterprise, while the manufacturing department can get rid of operation of managing logistics processes to focus on production.

Professional logistics companies are independent entities, such as Third-party logistics company or distribution center.

Goal of professional management is to make logistics processes rationalized, which means least spots, shortest time, shortest distances, minimum cost in the whole processes from production to consumers.

(2) Integrated. The essence of integrated logistics is to organized organically to make all processes coordinate with each other, thus remove the subject factors which will block the logistics to be smoothly operated, and create the most suitable logistics structure in the whole processes from origin of raw material to customer market.

With more and more obvious trend of segmentation of socialization and specialization, enterprises are willing to centralize business on core competence and superiority field of themselves, while outsourcing other business they are not good at or familiar. Upstream and downstream manufacturers, distributors, retailers are not only confrontational but cooperated relationship. Multi-national logistics companies focus on enhancing competence of whole supply chain through improving or optimizing supply chain, for example, choosing more suitable shipping lines, destination port, shipping companies, forwarders, to reduce the cost of the chain. This kind of competition is not the competition among individual enterprises, but among supply chains.

(3) International. So far, more and more enterprises take step of globalization, which need to purchase raw material, raw parts from all over the world, and prefer to use distribution center of global network and also choose the warehouse with consolidation and distribution functions for key products, then through the local global logistics network to obtain raw materials and distribute products, transporting them through ports.

2.1.2 Development phase of integrated logistics

Logistics management experienced great development from 1960s, and for different environment of each country, there are different development process of logistics management.

Generally, the whole processes can be divided into three phases:

A. Physical Distribution

In 1960s and 1970s, traditional enterprises usually focused on physical distribution, aiming at efficiently distributing products to customer at lowest cost with managing transportation, stocking and distribution.

Main reason for traditional enterprises put focus on physical distribution:

1. Enlarging manufacture scale in order to enlarge market share and satisfy demand of customers at different level.
2. Diversification production which resulted from adding different brands on basic products, and diversification on products' size, shape, color, would lead to higher stocking cost, higher orders dealing cost and high transportation cost.
3. Enterprises preferred to produce high-value products, which were not labor-intense production, because high inventory cost, package cost and transportation cost would increase logistics cost.

During this phase, the characteristics of logistics management was focusing on logistics processes from production to customers and manufacture enterprises had to pay more attention to sales because it was buyer's market then.

B. Integrated Logistics Management

During 1970s to 1980s, enterprises realized that they should do integrated management of material management and product logistics management, which can greatly improve efficiency. American first realized free-transportation which means carriers and cargo owners could settle rate freely, and this also enlarged service range greatly. Because of more closed long-term cooperated relationship between carriers and cargo owners, it was probably for enterprises to analyze logistics systematically, reduce logistics cost and improve service quality. Meanwhile, more and more fierce global competition pushed enterprises to adopt new logistics management technology and improve logistics system, such as JIT(just in time),

TQM(total quality management).

C Supply Chain Management

During 1980s and 1990s, because the change of series of outer factors, enterprises began to pay attention to whole logistics processes, including supplier of raw materials and distributors of finished-products. The concept of Supply chain management was based on trend of partnership and alliance between manufacturers and suppliers, between distributors and logistics service providers. SCM refers to different stakeholders and it would provide optimal solution to overall supply chain. This solution maybe not optimal for individual member in a certain supply chain, but from view of cost reduction and improving service quality, it was potential.

Modern logistics have developed into integrated logistics, which need multi-transportation modes to cooperate with each other, hence reducing logistics costs, improving logistics service efficiency and quality.

Since 1980s, logistics have become new industry, which is considered to be third-profit source after raw materials, processing. Modern logistics have get rid of traditional production and circulation processes, and become new economic activity and new segmentation field, which is operated by specialized and independent economic organization.

2.2 Relationship between ports and integrated logistics

2.2.1 Development of port logistics

Port can be seen as “station” for seaway transportation cargo ‘s flow since it’s a spot

for cargo to move from a carrier to another kind of carrier, such as from vessel to truck. So port is spot for cargo's consolidation and transportation carriers to change modes. To some extent, its economic development request that port should provide better logistics services since active material flow, cash flow and information flow will make port busier material flow in limited space.

According to estimate of World Bank, in 1997, the percentage of logistics cost in GDP of China was 16.7%.

Therefore, do research on development of port logistics is positively good for reducing logistics cost, enhancing efficiency, and better cooperation with other departments in the ports.

Development of logistics has complementary relationship with that of economic. On one hand, logistics development is pillar of economic development; on the other hand, development of economic will cause increase of total volume of logistics demand. With rapid development of economic, demand for logistics is becoming more and more. In 2003, total amount of import&export trade reach 851.2 billion dollars in China, growing 37.1% compare to year 2002.

Port's position in logistics processes as follow:

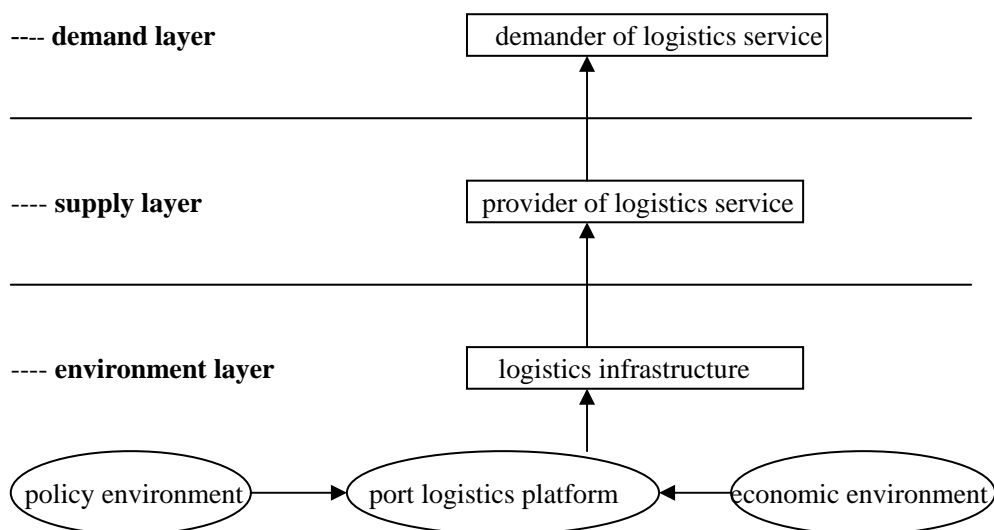


Figure-2 1 Port's position in logistics processes

In the above figure, entire port logistics service structure is composed of environment layer, supply layer and demand layer. Service environment layer is including economic organization of local port and hinterland, policy and regulations made by government functional department (Port authority and Customs etc), and logistics infrastructure of port (terminals, warehouses, road and machinery equipment).

Supply layer refers to logistics service providers, mainly including terminal, stevedore, transportation, forwarding, warehousing and managerial type of logistics companies, (the companies which provide logistics consultancy and management suggestion through purchasing operation service of other companies, while without any own logistics equipment).

Demand layer mainly includes trade enterprises, multi-national companies, manufacture and processing enterprises, etc. Custom declaration&clearance, inspection, packaging and related information services are determined by special position of ports in international transportation and cannot be replaced.

Position and service target of port should be platform and carrier of logistics activities, which can supply corresponding infrastructure (such as warehouse, yard, distribution center, etc), software environment (related policies, custom declaration&clearance and inspection services, internet and intranet application etc), and these activities operated by professional logistics companies form a regional logistics center with centralized functions.

Above all, port logistics should be important part in whole logistics processes, which can be reliable for all logistics activities in this service platform.

Traditional port competition

Although it's greatly substitute for ports in same area, different geographic location and natural conditions make differences of each port. Competition among them is permanent, while rejection to cooperate with each other should not appear, but cooperation is also conditional and temporarily.

So far, competition of ports in China is competition of prices, and vicious competition caused great difficulties for lots of ports. Main reason for port to charge lower and lower is that price has closed relationship with marginal cost due to the limited designed-capacity of port throughput. While fixed cost of port industry take large proportion of total cost, lower percentage of marginal cost. Therefore, even lower charge cannot make port enterprises to get back high fixed cost. So ports have to operate under this kind situation of low rates.

Competition is essential drive for every industry. But vicious competition usually do harm to both competitors, if the situation of low rate operation of ports goes on, it will cause great negative influence in the development of Chinese ports. Some large ports enterprises have appeal to setting up limitation of lowest rate for whole port industry to get normal investment return.

If the appeal works, ports cooperate with each other to set up limitation of lowest rate and to maintain it, some individual ports will secretly lower the rate to attract

customers from its own side to optimize the profit, so the rate will finally get back to lower rate, then imitation of lowest rate disappear.

While if adopting strategy of merging two ports enterprises to be an alliance, and set up high rate strategy inside enterprises by administrative measure, it's probably to get higher profit, but this kind of monopoly will be restricted by government.

Competition after developing modern logistics

After bring in logistics services, the situation of vicious competition will be to some extent changed. The main goal of shipping logistics system is better services, and the form of value-added, distribution and DOOR-TO-DOOR stands for services. Modern shipping logistics seek development through proper strategy focus on cargo owners, and the management principle is to optimize service quality under lowest total cost or using least system resources.

Service quality of modern port has greatly improved compare to traditional ports. The factors influents consumer demand is no longer just enterprise price or related enterprise price, and it need to consider another variable—service quality.

Service quality including lots of factors, such as punctuality, high efficiency for loading &discharging, cargo tracing, cargo damage level, and whether capable to provide service to do processing and distributing, etc. under market competition, enterprises can choose price and logistics service quality strategies.

Theoretically speaking, there is always a peak of total throughput in certain time certain area, each port get corresponding part of it. But the amount is not only related

to port own competition strategy, but also relates to other port's strategies.

It's impossible to shorten the time of ports service needed unlimitedly, for different ports enterprises, time limitation are different. Under the same price condition, consumers will definitely choose better service quality provider, in fact, better service means higher price, so price and logistics service quality is correlated.

For bring in logistics service, traditional ports competition has changed, which means price is no longer the only competition way. Ports enterprises who provide logistics service can not only charge higher, but also make greater market share, thus to get superiority in competition, which can enable other ports to develop logistics service gradually, hence doing good to healthy development of Chinese port industry.

2.2.2 The development of Chinese port logistics.

Port logistics is a relatively new concept for Chinese ports, which means that central port cities should take advantage of superiority of itself, rely on advanced software and hardware environment, and pay attention to radiation capacity, enhancing the strength of ports consolidation, stowage and distribution, based on adjacent industries, relying on information technology, aiming at optimizing ports resource, thus to develop port integrated service system including activities of logistics industry chain.

Port logistics is special integrated logistics system, which is important and unable to replace. Ports provide basic logistics service and derived value-added logistics in whole supply chain system.

With deeper and more mature realizing in integrated logistics theory, people in academic field, logistics industry and government pay higher attention to development of logistics. According to statistics, there are 2500 international trade ports all over the world, which spreads in key point of five oceans, among which there are more than 100 ports with throughput surpassing 10 million tons, more than 20 ports with throughput surpassing 50 million tons. So far, ports of throughput surpassing 10 million tons are mostly in developed countries, which are also industry centers. Ports in developing countries are just export port for raw materials and their industry is in developing level.

Compare to development of port logistics in developed countries, though some of our domestic ports have set strategic goal for integrating port resources, and developing new economic growth point. Port cities also determine to develop logistics into pillar industry; in order to make economic of the city more active, logistics in China is still in initial phase from overall view.

(1) Uneven port infrastructure and equipment level. Recent years, port of Beilun, Yantian, Dalian, Zhanjiang, Qingdao, Shanghai have greatly enhanced their containerized extent, which is the level of 1980s of developed countries. Other ports are just equipped as level of 1960s—1970s in developed countries. The break bulk transportation is prevailing in China while it's rare seen in developed countries and low efficiency.

(2) Lower level of standardization of logistics infrastructure and equipment. There is no uniform equipment among different transportation modes; such as standard of containers for seaway transportation and railway are not uniform, which greatly impact on efficiency in multi-model transportation.

(3) Disorder competition of port logistics. Loading&discharging in quay of terminal and warehousing or stock in yard cannot coordinate smoothly, especially the

warehousing or stockyard are operated extensively, undeveloped information management and technology.

(4) Functions of enterprises and government are not clarified, which means that operation of ports and administration are conducted together. It's not good for port's healthy development.

Economic globalization, integration of production and trade lead competition to new stage. With the rapid integration of cash flow, information flow, material flow in global market, every country or district is seeking how to link the globalization with localization in this trend. China takes part in global economic stage more and more actively, which results in more frequent product flow in and abroad, the total volume of cargo flow is getting bigger and bigger. So it's more important to keep pace with the development of international logistics and related services. Without sound logistics system, especially without port logistics system, it's hard for China to develop its potential economy.

In initial phase, starting logistics service requests construction of essential infrastructure, port needs to invest certain amount of capital, and how much the capital is will greatly influenced by the profit of the enterprises expects. So in order to enhance activity of Chinese port to start logistics services, government should adopt special beneficial measures to help ports enterprises to control the initial capital. The wider the range of logistics services, the more the kinds of the services, the more superiority the enterprises will have in the competition.

Most of ports in China operates businesses independently, which means little cooperation and communication with other ports, what left is competition. With the age of integrated logistics approving, functions of ports will be changed, and the

mechanism of modern port's operation need to be creative, which also request ports to enhance cooperation. Purpose of linking ports is to unify port's policy and optimally use limited resources. New kind of transportation will break traditional independent operation of ports. As central spot in integrated logistics chain, each port cannot survive independently without influence from other ports. Only cooperation can fulfill the goal of win-win.

The dissertation is under above background to do research of importance of integrated logistics in port, and specify this topic in port of Zhanjiang to put emphasis influence of integrated logistics in practical case.

2.3 Analysis of status quo of port Zhanjiang

2.3.1 Location and traffic of port Zhanjiang

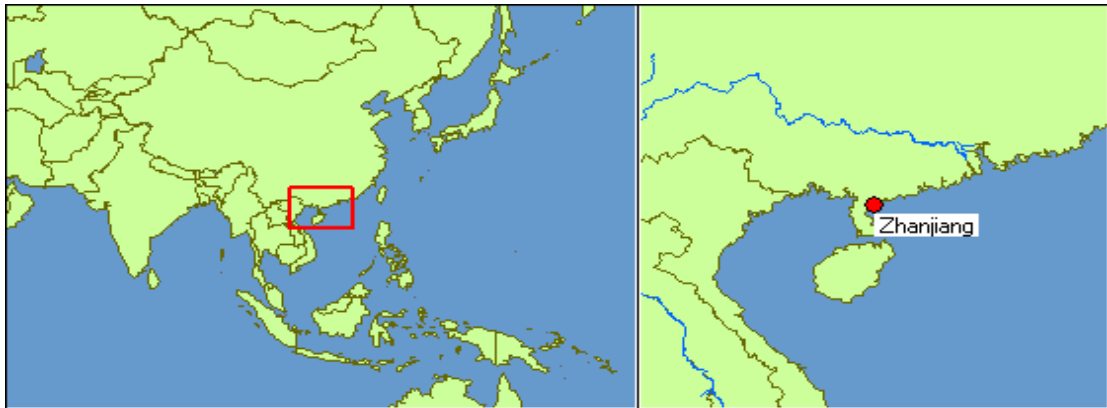


Figure-2 2 Location of port Zhanjiang

Source: <http://www.chineseports.com>

Zhanjiang lies on the south end of Mainland of China, the southwest of Guangdong province. It is on the verging area of Guangdong, Guangxi and Hainan provinces, to the west of the South Sea, to the east of the Gulf of Tonkin. Hainan province is just across the Qiongzhou Strait.

Zhanjiang lies on the verging area of Guangdong, Guangxi, and Hainan province, far away from the developed area, such as Hong Kong, Macau, Taiwan, and the delta of Pearl River. It is not as developed as other areas in Guangdong, for the Guangxi and Hainan province nearby both have low industrial and urbanization level, residences there have low income and purchasing power, and it is less-developed in market economic. With the "Great Western Exploitation" policy and the construction of the southwest seaway route, Guangdong, Guangxi and Hainan develop greatly in economy, providing motility for the development of Zhanjiang Port.

Traffic network

Zhanjiang has a great number of terminals, including 22 transportation terminals, 174 berths of big and small size, the designed annual capability is over 60 million tons, forming port-group centralized in Zhanjiang Port and supported by the medium and small ports around the Leizhou Peninsula. Zhanjiang port is famous for its natural deep-water quay. The coast length inside the port is 241 km, and the area of the port is 2400 square km, there is another 97 km coastline for deep-water port. Zhanjiang is the biggest port in western Guangdong and the Gulf of Tonkin, which has the first crude oil terminal with capability of 300 thousand-ton, and the modern iron ore terminal of 200 thousand-ton, what's more, the deepest sea-route in southern China. Ships over DWT150 thousand-ton can come into the port on the tide. Zhanjiang faces the ocean from 3 directions, with more than 30 islands, and it has coast of 1556 km long, which is 46% of coastline length of the Guangdong province.

It has been 20 more years since the charring out of "Reform and opening-up policy", the economy and the society of Guangdong province have gain advances ahead of

other provinces, but at present, the industrial structure in Zhanjiang is basically on the stage between the agricultural society to the industry society period. The industrialization and the urbanized level are low. As a result of lacking of a clear developing policy and program and low investment, the condition of the city's industry is "less diversified", and the raw and semi-finished materials industries develop slower than the manufacturing and processing industry, the industrial product structure in some areas is simple and the industrial foundation is weak. From inside industrial structure, the manufacture has too low percentage; the industry is still in the initial phase.

Comparing the proportion of industry in GDP, 60% of Shanghai, 50% of Guangzhou, only 33% of Zhanjiang, for those counties that governed by Zhanjiang, this number is even below 20%. There are too few high-tech and high attachment value industries but too much labor-intensive industry, too much sale in domestic market but too little exports volume. Extroversive economy grows slowly, more than 50% industry outcome centers in the urban area. Without the attraction of foreign capital, the economy is not so good.

Multi-purpose port berth

There are 32 berths in Zhanjiang Port, including 25 berths that are over 10 thousand-ton. It has the deepest route in Southern China and the biggest oil port, with gross volume of the oil tanks 292 thousand cubic meters, at the same time, it has over 700 set of loading machines, more than 20 production ships, and a 41.5km-long pipeline. It can be charged with the responsibility of loading&discharging, stocking, transportation of containers, grocery, bulk cargo, heavy items, dangerous material, petroleum, and liquefied chemical industry. Also, it is capable for transportation of

passengers and cars, and it has the business of cargo proxy, ships proxy, ships repairing, ships transportation, exportation supervising and managing, too.

2.3.2 Development phase of port Zhanjiang

Overall speaking, development of port has experienced three generations.

First generation: port should be defined as purely center of transportation, which mainly provides services for ships calling, loading &discharging, transshipment and stocking etc.

Second generation: port can be view as center of transportation and service, besides providing loading &discharging, stocking, port also starts industrial and commercial activities, which make port have the function to provide value-add services.

Third generation: port should become international logistics center, and maintaining consolidation and distribution for tangible products in international trade and focusing on improving efficiency, port has the function to consolidate and distribute intangible products (technology, capital and information) with tangible products.

Third-generation ports are specialized container port, the customers of which are liner company alliance, and this kind of ports are important hubs and spots, also regional even international commercial and information centers.

Now developing second-generation port is the trend, but with economic and market globalization, some of large ports start to develop into third-generation ports.

Port of Zhanjiang are now in phase of second-generation, who is still traditional loading&discharging, stocking center, but Zhanjiang is start to develop itself into

international container hub and integrated logistics center from pure sea-land transfer linking spot. Port of Zhanjiang is important hub in domestic coastal integrated transportation system, and also key point which has great impact on city of Zhanjiang to speed up process to realize industrialization and developed open-up economy. Development of port Zhanjiang is important condition to make sure realizing modernization of Guangdong province.

With structure adjustment and integrated transportation system improvement of port Zhanjiang, it will become multi-functional, modern and integrated port whose main cargos are energy, raw material and container, with highly developed adjacent industry.

The market targeting of Zhanjiang Port

According to the Chinese Ministration of Communication's layout of the ports, Zhanjiang Port is the key port on Chinese coastal system, which is also the biggest consolidation and distribution center of bulk cargo and oil on the southern coast of China.

The economy developing level, the industrial structure and the growth pattern of port area have decided the localization level of the port in the market. Among the Southern China ports, Guangzhou and Shenzhen area lies on the delta of Pearl River, where the market economy and manufacture industry are highly developed, so the priority of development should be traffic infrastructures with high attachment value. Zhanjiang is in the west part of Guangdong province where the economy is less developed, and it mainly serves the Southwest China. So goal of Zhajiang is to attracting more and more raw material transportation such as bulk cargo or oil. According to Industry layout and business analysis, Zhanjiang port should be planed

to become a large logistics center, which is both international and regional. The related business in Zhanjiang would be motivated by the logistics progress.

2.3.3 Analysis of throughput of port Zhanjiang

For a port that determines to develop port logistics, throughput volume is an important attribute and reference for port construction planning. Port of Zhanjiang developed rapidly in recent years, especially after entering 21 century: in 2004, throughput volume has a breakthrough of 30 million tons for the first time in port of Zhanjiang, growth rate reaching 32.2%, which is 10% higher than average rate of coastal ports in China. In the past, it took 22 years for port of Zhanjiang to realize throughput volume increase 10 million tons; now it only took 2 years for Zhanjiang to increase 10 million tons throughput volume. so it's potential for Zhanjiang to develop integrated logistics. Domestic economic of China keep constantly development, which will increase demand for transportation. What's more, planning and development of port logistics need to consider about the cargo throughput volume in recent years.

Table 2.1 Throughput volume of port of Zhanjiang (2001-2005)

Year	Throughput (thousand tons)	Annual growth
2001	17890	
2002	26270	14.7%
2003	28660	9.0%
2004	37830	13.2%
2005	46470	12.3%

Data source: NO1 Office of Port Authority of Zhanjiang

Table 2.2 GDP of Zhanjiang from 2001-2005

YEAR	GDP (Billion RMB)	Annual growth
2001	43.5	
2002	50.2	11.5%
2003	55.3	11%
2004	60.8	9.9%
2005	65.2	7.2%

Data collection: by writer from website of Port Authority of Zhanjiang

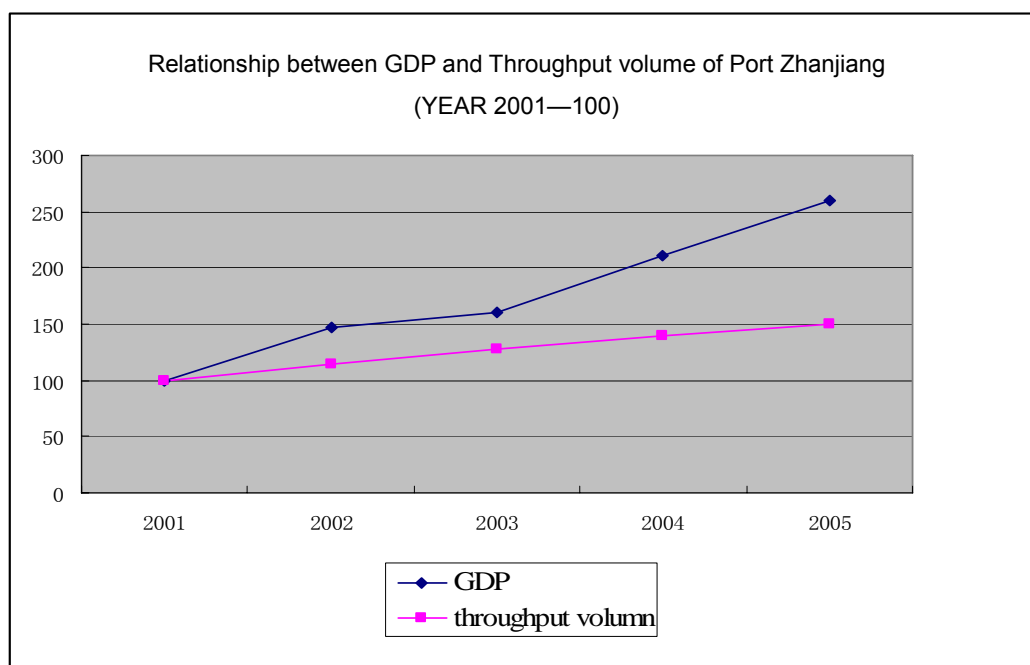


Figure-2 3 Relationship between GDP and Throughput volume of Port Zhanjiang

For the above two tables, we can find that development of port Zhanjiang is rapid. Annual growth rate are almost surpassing 10%, and also the GDP. From the graph, we can see growth of city of Zhanjiang is keeping same trend of port Zhanjiang, which means port Zhanjiang make great contribution to the whole city development and also reflect that Zhanjiang's policy "motivating City economic with the port's development".

2.3.4 Characteristics of integrated logistics in port Zhanjiang

Chinese Ministration of Communication clarifies that port of Zhanjiang is one of domestic coastal hubs, and targets it be the largest oil and chemical, break bulk cargo center for consolidation and distribution in Southwest of China.

Port's target is should be determined by economic of hinterland, industry structure and economic growth mode. Port of Guangzhou, Shenzhen are located in Zhujiang Delta where have relatively developed economic, so their key point are certainly high value-added container transportation. Port of Shenzhen rank No.2 in container throughput in domestic ports system.

Port of Zhanjiang is located in west of Guangdong province, where economic is relatively un-developed, meanwhile. Customers are mostly from western part of China, such as Yunnan. Guizhou, Sichuan provinces, where economic are slowly developing, while there are large quantity of import and export of oil, metal ore, fertilizer, etc can provide cargo sources of port Zhanjiang. According to analysis of industry structure and status quo of western Guangdong, southwestern, and Southwest of China: port of Zhanjiang should throw the traditional thought of economic hinterland, and should view places where need and demand transportation

as its hinterland. In addition, according to area superiority and cargo structure features, port of Zhanjiang should target itself to be international and regional logistics center.

International logistics center means opening-up to outside world. Port of Zhanjiang has connection with more than 100 countries and districts, and attracts lots of famous foreign enterprises directing invest in Zhanjiang, building factories and doing businesses, thus make the foreign trade volume taking up more than 70% in total GDP.

To build port Zhanjiang into regional logistics center due to port of Zhanjiang lies in central Gulf of Tonkin, besides, it is also key passage for southwestern part to export outside. This special geographic superiority should enable port of Zhanjiang to motivate economic development of central Gulf of Tonkin and southwestern part of China.

In fact, range of hinterland of port of Zhanjiang is not so large. Cargoes are mostly from western China. Confronting the fierce competition, port of Zhanjiang needs to enlarge its hinterland. Direct hinterland is places of Leizhou Peninsula, west of Guangdong province, and areas along railway Li-Zhan. Indirect hinterland is including Guizhou province, Guangxi, Sichuan, Chongqing, Yunnan, Hainan and west of Hunan province which are along railway Qian-Gui and Xiang-Gui. Though facing fierce competition of ports of Qinzhou, Fangcheng, Beihai, the hinterland of Zhanjiang is stil larger compare to the above ports. As window of places in east of southwestern part, it's hard to enlarge land-range hinterland since ports of Guangxi provinces are also key passage for west of southwestern. So Zhanjiang has to actively enlarge sea-range hinterland, devoting itself to adjacent industry and

modern logistics.

Finding the key problem, municipal government of Zhanjiang determines to put breakthrough point on “motivate economy with development of industry and port”, focusing on adjacent industry, attracting capital in large projects. So far, Sinopec, China shipping have invested in Zhanjiang, besides, there is power plant project of total investment 4 million RMB, etc. All these projects form the framework of adjacent industry of port of Zhanjiang

For operation model, port of Zhanjiang adopts adjacent industry, which means conducting processing, transshipment, transportation, warehousing and trade in ports yard, to optimize the port industry development

Table 2.3 Statistics of economic attributes of Zhanjiang port in 2003

Statistics of economic attributes of Zhanjiang port in 2003

Attributes	Unit	2003	2002	Growth (%)
Total Throughput		28662137	26273821	109.1
Throughput of container	TEU	111883	88749	126.1
Average time of ships at port	Day	1.4	1.4	100.0
Average time of loading&discharging 1000 tons	Day	0.14	0.15	93.3
Efficiency of loading&discharging	Tons/hour	19.6	19.8	99.0
Good condition of loading&discharge equipment	%	87.3	87	100.3
Usage of loading&discharging equipment	%	21.7	21.5	100.9
Average time of stocking	Day	37.9	42.7	88.8
Total asset	Million RMB	2194.35	2289.47	95.8
Operating income	Million RMB	380.	336.34	113.1
Total profit	Million RMB	3.06	3.51	87.1

Data source: No 1 Office of Authority of port of Zhanjiang

3. Benchmarking analysis and targeting benchmark choosing

Chapter III of the dissertation will be divided into four parts: first part will focus on introduction of benchmarking methodology, then giving the principle for choosing benchmark. Second part is the analysis for benchmark, which are alternative for the following application. Third part is benchmarking application from logistics cost for port Zhanjiang and other developed ports. Fourth is the reason why choosing port Ningbo as benchmark for port Zhanjiang

3.1 Introduction and principles of Benchmarking

3.1.1 Introduction of Benchmarking

Benchmark originally refers to the marks made on rocks, wall or buildings. Function of benchmark was to set up point for observer to get location or height in geographic prospecting and observing tidal. In broad sense, benchmark means reference point for measuring.

While meaning of “benchmark” has been beyond the reference point, coming into commercial dictionary, and become method of performance comparison for commercial companies.

In the article of “the importance of benchmarking studies for logistics field”, which is public by **Logistics Association in Turkey**, define Benchmarking as follow:

“Benchmarking is a process which continuously measures the products, services and operational practices of a given organization to compare the organization’s performance and operational practices with a selected sample group.”

It is a good tool to do research for development, in addition to creating a basis for comparison, and it enforces a self-critical approach, indicating the points of operation the company must improve.

Benchmarking focuses on what best practices are available and ensure an understanding of how they are performed. Overall effectiveness of the business will only be achieved by changing current practices of performing business processes and adapting them to best practices.

Basically, there are three kinds of benchmarking application in port enterprises:

1. Service benchmarking. Targeting on service quality of leader of the industry, and then absorb their successful experiences after analysis of comparison in order to catch up even exceed in the leader. This kind of benchmarking is prevailingly used for enterprises. It’s good to choose targeting competitor after comparing in speed of service, economic and safety.
2. Organization benchmarking. Do comparison on organization systems and organization structure and performance in developed ports, and then find the key factors that lead the organization to success, considering practice of port itself, then carrying out organization systems improvement.
3. Strategy benchmarking. Do comparison in forwarding, loading &discharging, stowage, and financing with developed ports, then find efficiency operation process and model, which can be absorbed to be more creative.

Benchmarking including but not only benchmark data statistics, it should be applied in different layers and different environment. Benchmarking as advanced commercial concept can be applied in higher level, such as the management function field, like strategy planning restructuring and financial management in logistics enterprises.

In this dissertation, applying benchmarking methodology to analyze logistics development of port of Zhanjiang, in order to find the gap between Zhanjiang port and other developed ports, then according to the analysis, get conclusion and give suggestions.

3.1.2 Principles of Benchmarking Application

Applying benchmarking should comply with some principles, which are requested when choosing attributes or benchmarks to do comparison. In port logistics field, the benchmark chosen should obey the following principles:

First principle: international. Each port should focus its vision on international market. When considering the development of port Zhanjiang that has apparent geographic superiority and excellent natural conditions, it should target on international market. In the dissertation, choosing the largest and most developed ports—port of Rotterdam and Singapore to be considerable benchmarks.

Second principle: modernized. To be modernized is not only the request of development of logistics, but also the basic goal of port logistics development.

Third principle: comparable. Attributes and benchmarks should be comparable, which means the port chosen as benchmark for port of Zhanjiang should be the same kind of Zhanjiang port, besides, it should have excellent performance in port industry. Request for comparability of benchmark is because that the process to

choose benchmark is process to learn from advanced ports.

Following content will be analysis of operation mode and state quo of three kinds of ports, and then choose one kind of these ports to be benchmark port of Zhanjiang considering the above principles, in order to do detailed analysis between these two ports.

3.2 Analysis of targeting benchmarks

3.2.1 Developed international ports—Rotterdam and Singapore

3.2.1.1 Port of Rotterdam

Port of Rotterdam , which is located in 51°55'N、4°24'E , the entry of the sea which is the cross point of River Meuse-the distributary's of River Rhine and the original River Meuse, adjoins the booming maritime traffic location-the straits of Dover. It is the biggest port in Holland, and one of the big ports of world fame. It is also the logistics center for bulk goods, oil and container transportation in west Europe, the traffic of which has always been the top level compare to other ports in the world since 1970's.

It keeps a record that it has annual throughput volume over 500 million tons, which absolutely makes the port “The port of the world”.

The port of Rotterdam is booming. Container transportation in 2004 grew by 16 percent, reaches to 8.3 million TEU, each unit corresponding to a 20-foot long shipping container.

The characteristics of the Port of Rotterdam:

First, the container transportation mode is multiple. The port is the largest container port in Europe, where computers conduct all the operations and the volume of loading&discharging container has already over 3.2 million.

Second, as an integrated city for port and downtown, an important world trade center and industrial base, Rotterdam has a strategy named: “more free than a free port”.

Third, it has a modernized construction of port. There is a good traffic system connecting railway, highroad, pipeline with the downtown traffic and the airline.

Fourth, it's equipped with functional distribution center. Port of Rotterdam provides integrated logistics services and plans to construct logistics part nearby terminal and inter-modal infrastructure.

Fifth, the management mechanism is always keeping improvement: the port area is extending, the offshore traffic, barge and rail way are attempting, the education and training of logistics expert are enhanced, port high-tech and increment logistics concepts are put into use.

The port of Rotterdam promotes the economic of the area, and the port has been the basis for Rotterdam to develop modern service industry and impulse the integrated function of the city, and even the economics center. In the year of 2000, the direct and indirect employees of the port come 300 thousand, the contribution for the GDP of city from the port and the related industries is 34%, making contribution to give employee positions, which is take up 21% of employment. In 2003, economic

contribution of the Port of Rotterdam and related industries make up 31% of the GDP of the whole country. In plan of 2020: "Rotterdam-High Quality Port", Rotterdam Port suggests 6 goals for the function and development of the port and supportive area: Multi-functional port, developed port, intellectual port, fast and safe port, charming port and clean port. With these goals, facilities will be arranged in larger area, and the city port will be changed into an urban energetic area.

3.2.1.2 PORT OF SINGAPORE

The economic of the Port of Singapore is mainly in the following domains: commercial business, manufacturing, architecture, finance, traffic and communication. Oil refining, petroleum, shipbuilding constitute the industry, which makes Singapore Port the third center of oil refining. In 2004, GDP of Singapore grows 8.4% comparing last year's

Singapore has a excellent deep water port, moreover, it builds 4 container docks which can load and unload more than 15 million containers, so the Port of Singapore becomes the second container hinge port.

The characteristics of the port: The government supports coordinated process to develop logistics. The logistics-proposing committee set down the development program, successfully made the traffic, warehousing, supply et , to a coordinated process ; The combination of logistics and high-tech , makes the automation of the process come true ; The government initialed "Trade Network" system , the logistics companies establish compute technique platform , which bring about the info-exchange online between government and company ; The logistics companies there are professional , socialized , they can serve some particular company with all-dimension , or serve every domain with some special logistics operations .

The port of Singapore finished the international container traffic with a number of 21.33 million TEU, which is a little lower than Hong Kong did, but the international transfer therein is over 80%, a little higher than Hong Kong did. Like Hong Kong Port, the Port of Singapore is apparent in its location advantage. It locates in the hinge of main line of ocean, can radiate to east and south Asia; The berth and navigation channel are suitable for the trunk line liner to moor, management and operation are efficient enough; The related service are perfect, advanced and cheap ; The free port policy is executed , the container port locates in the free trade zone , where transfer operation is not limited by the custom , another strategy is to compete with cheap price , the fee of load and unload container is 20% cut off ; The facilities are expanded in time so as to keep the advantage of ability and cost , actively draw ships to touch at the port . As a result, the port operates about 60 international ships per day, becoming the largest international container port.

One of Singapore's successful experiences is actively enlarge its business range, not just be limited in trade, which is base of its business. In addition, the strategy "The world is our hinterland, but Singapore is our homeland", and the psychology of opening and spaciousness of Singapore government are both valuable for us.

Government is a leading role in the Singapore Port development. Although the condition for developing port and transshipment trade in Singapore is very good, without the government's effort to actively expand import substitution industry and IT industry while promoting transshipment trade, Singapore may still only be a port, or a good "specialty port", but not be the leader economy in Asia that has advantages in IT, finance service et, GDP stands ninth in the world.

3.2.2 Developed domestic ports—Hong Kong

PORT OF Hong Kong

Hong Kong is already a world-class logistics hub. For many years, Hong Kong has maintained the position of being the busiest container port and international air cargo-handling centre in the world.

Logistics services span over sea, air and land transport, and involve various policy areas and services areas, including distribution, supply chain management and information technology. The objective for "Logistics Hong Kong" is to build on the solid foundation provided by Hong Kong's infrastructure to create an even more conducive environment for Hong Kong to be developed as the preferred international and regional logistics hub and a supply-chain base.

Hong Kong is one of the world's top three maritime centers. It has an enormous port – Asia's number one cargo and container hub. It lies at the centre of the busiest maritime region in the world. There is, in the surrounding region, intense activity in ship-owning, ship-building, ship-repair, naval architecture, port operations, tugs, ferries, commercial fishing, naval, police, coast guard, tourism, work boats, pollution control and much more.

There are 9 container terminals, which include 24 berths capable to let 24 third-generation (or above generation) ships call at the same time. In 2004, there are 22,870 container ships calling at Hong Kong, reaching container throughput volume 21.98 million TEU, ranking NO 1 in global ports, and the average annual growth rate is 11% compared to 5.1 million TEU in 1990, in which percentage of international transshipment is high to 75%.

High efficiency is one the success factors of port Hong Kong. Taking loading&discharging an 8,000 TEU-container ship for example, it only takes 16 hours to load&discharge for 5,200 TEU, which means 325 TEU per hours. In Yantian port of Shenzhen, it can load &discharge 2001 TEU in 16 hours—that is 111 TEU per hour, and in port of Long Beach, it takes 5 day to load&discharge 14,000 TEU—117 TEU per hour.

Many internationally renowned ship owners operate their ships from Hong Kong, which currently controls or manages about eight per cent of the world's total tonnage. Plus, many Chinese and Japanese ship owners are moving their headquarters to Hong Kong because they enjoy a more favorable corporate environment there.

Hong Kong is Asia's leading business centre and the premier source of expertise and experience on the China market. Low taxes, the rule of law, free flows of information, goods and capital and its free port status make it the best place to manage business in China, Asia and worldwide. It is the "freest" commercial centre in the world.

Hong Kong based firms have been instrumental in supporting Asia's major growth areas with capital, logistics services, management expertise, marketing and design skills and quality assurance. It allows businesses to operate in China from Hong Kong, a world-class business city, while decentralizing other activities into the Pearl River Delta, the mainland's leading cost-competitive export processing base.

3.2.3 Highly developing domestic port—port of Ningbo

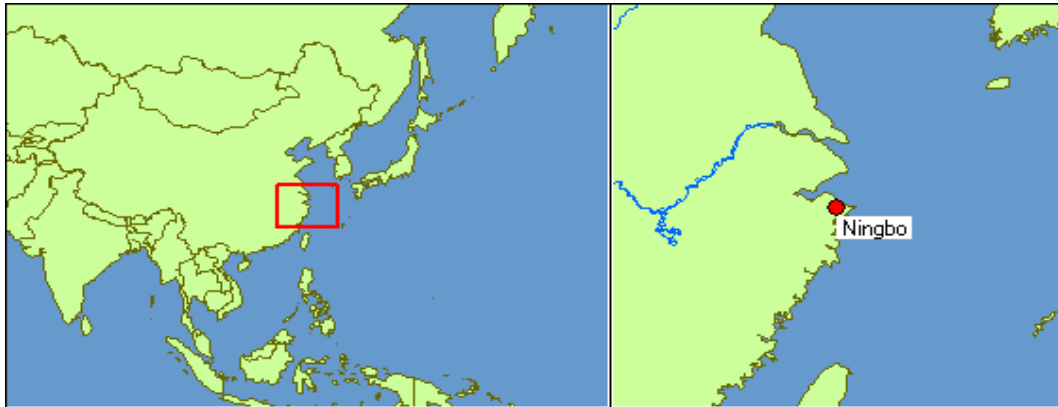


Figure 3 1 Location port of Ningbo

Source: <http://www.chineseports.com>

Ningbo Port is well situated in the middle of China's coastline, at the T-shaped joining point of China's coastline and the Yangtze River. It's a famous deep-water port of Mainland China. It enjoys unique natural conditions with convenient traffic reaching in all directions. Outwardly the port links East Asia and the whole round-the-Pacific region. It's within 1000 sea miles to Hong Kong, Gaoxiong of Taiwan, Pusan, Osaka and Kobe. It connects inwardly China's coastal ports and covers directly the whole East China and the economically developed Yangtze River Valley by river-sea through transport via the Yangtze River and the Grand Canal. It's therefore an ideal place for developing ocean-going transport to the ports of America, Europe, the Middle East and Oceania. With deep water and smooth current, the port area of Ningbo is free from strong winds and waves. The entry channel is normally over 18.2 meters deep. Large ships of 250,000 up to 300,000 tonnages can come and leave at tide. With an exploitable deep-water coastline of over 120 km, Ningbo Port owns broad developing and construction prospects. On the north of Beilun Port Area,

Zhoushan Islands serve as its natural defense, so there is no need to build breakwaters when constructing berths at Beilun Port Area. Less investment can produce better benefits. Besides, there is a wide and plain dockland behind the deep-water coastline, which is extremely good for developing port storage, warehousing and littoral industry.

From geographic location, hinterland of Port of Ningbo should include provinces of Jiangxi, Hunan, Hubei, Sichuan, Chongqing, Zhejiang, Jiangsu, Anhui, while in fact; practical range of Ningbo's hinterland is much smaller than above. One reason is constraint for traffic infrastructure, second is for inadequate competence, but with the construction of backside consolidation and distribution progressing, the range of hinterland of Ningbo will enlarge.

There are 132 berths of 0.5 thousand-ton, 17 of 50 thousand-ton, 1 berth of 250 thousand-ton in Suanshan terminal, and another berth of 250 thousand-ton transshipment terminal constructing in Daxie terminal, 2 terminals for 50 thousand-ton oil product ships which is special designed for Zhenhai refineries plant. Above all, Ningbo has the largest berth for 50 thousand-ton LNP and LGP berth in China.

In addition, there are also some cargo owner's terminals, such as the 250 thousand-ton oil terminal for Zhenhai Refineries plants, 350 thousand-ton coal terminals for Beilun power plants.

Since China's reform and opening-up to outside world, port of Ningbo as an excellent harbor with natural deep water condition, it successfully to realize the goal expanding port area from inside of Yongjiang River to outside sea of Beilun port, which make port of Ningbo a truly multi-functional port with capability to transportation between

river and coast sea. What's more, the throughput volume and capability are both surpassing 100 million tons from the original 2 million tons in 1980s, with average annual growth rate of 20%, and now, Ningbo port has become second largest port in China mainland, just following Shanghai port.

³**Table 3.1 Statistics of GDP and Throughput Volume of Port Ningbo in year 2001-2005**

Year	GDP (billion RMB)	Throughput volume (million tons)
2001	132.23	128.52
2002	154.97	153.98
2003	178.68	185.43
2004	210.94	226.89
2005	237.25	270.00

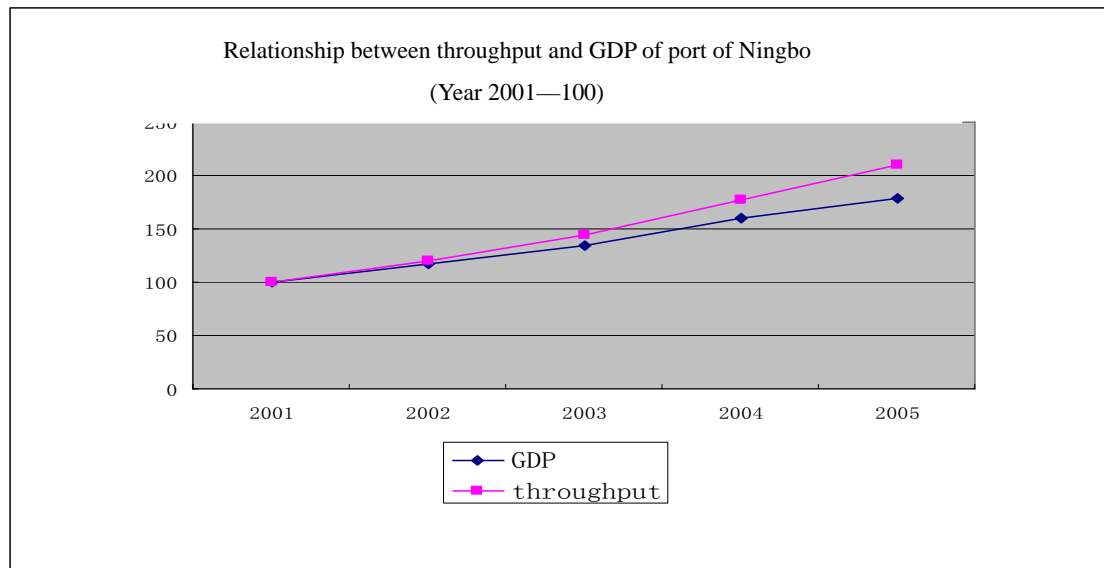


Figure 3 2 Relationship between throughput and GDP of port of Ningbo

³ Data source: Basic thought and planning of program for port Ningbo to start second venture.(April, 2004)

⁴Table 3.2 Prediction of throughput of Crude oil, iron ore and steel for Port of Ningbo (Unit: thousand tons)

	2003	2010	2020	2003-2010 Annual growth	2011-2020 Annual growth
Crude oil	54005	69200	71000	3.6%	0.3%
Iron ore	48102	50000	40000	0.6%	-2.2%
Steel	1836	2500	3000	15.3%	0.0%

From the stratus quo and logistics development experience of above four ports, port logistics should be developed to the direction of international, integrated and systematical. Modern ports need to take step to enlarge their business range of logistics service, such as increasing value-added service, and should pay attention to improvement of information system and high-tech application in practical operation, which can make great contribution to realize high efficiency. Building “intellectual port” and “control center of logistics chain” is now becoming the trend and main features of modern ports.

3.3 Benchmarking application in port of Zhanjiang from view of logistics cost

Port of Zhanjiang is now in phase of second-generation, which is still traditional loading&discharging, stocking center, but Zhanjiang is start to develop itself into international container hub and integrated logistics center from pure sea-land transfer linking spot. Port of Zhanjiang is important hub in domestic coastal integrated transportation system, and also key impact on city of Zhanjiang to speed up process to realize industrialization and developed open-up economy. Development of port Zhanjiang is important condition to make sure realizing

⁴ Data source: Overall layout planning of port Ningbo—Authority of port Ningbo (October, 2002)

modernization of Guangdong province.

With structure adjustment and integrated transportation system improvement of port Zhanjiang, it will become multi-function, modern and integrated port whose main cargoes are energy, raw material and container, with highly developed adjacent industry.

In order to realize the gap between port of Zhanjiang and most developed ports in the world, here apply benchmarking methodology to do comparison from view of logistics cost.

Here will give logistics cost reduction situation of developed ports, which are goal of port of Zhanjiang, after comparison, give result according to the gap between these ports and Zhanjiang port.

There are four attributes for comparison:

- (1) Percentage of value increased by logistics industry in GDP of the city
- (2) Percentage of logistics cost in GDP of the city
- ⁵(3) Cargo value factor of port logistics
- ⁶(4) Service quality factor of port logistics

⁵ Cargo value factor stands for individual port's cargo value VS average cargo value of Chinese ports

⁶ Service quality factor stands for level of customer satisfaction.

Table 3.3 Attributes and goal for port logistics in Zhanjiang port

Attributes	Level in 2002	Goal level	Benchmark level
1. Percentage of value increased by logistics industry in GDP of the city	10.2%	$\geq 20\%$	Hong Kong: year 2001--25% Shanghai Pudong: year 2002--(16.8%)
2. Percentage of logistics cost in GDP of the city	21.3%	$\leq 12\%$	Japan: year 1997- 9.5% America: year 1997--10.5% Shenzhen: year 1997--13.725%
3. Cargo value factor of port logistics	0.53	≥ 1	Shenzhen: year 2002—2.08 Shanghai: year 2002--0.89 Guangzhou: year 2002--1.71
4. Service quality factor of port logistics	0.28	≥ 0.7	Shanghai: year 2002--0.96

Data source: No 1 Office of Authority of port of Zhanjiang

(*Goal level means goal in year 2012)

After comparison, it can identify the gap between port of Zhanjiang and developed

ports through four attributes. So in the following years, the direction of development of port Zhanjiang should be included:

1. Focusing on how to reducing total cost of logistics industry.
2. Speeding up the centralization of logistics enterprises and increase logistics demand.
3. Paying attention to keep amount of logistics demand and improving quality of logistics service developing together, then to maintain coordinate logistics development.
4. Improving port logistics infrastructure.

3.4 Choosing port of Ningbo as targeting benchmark

After analysis for the above three kinds of ports, I'm willing to choose port of Ningbo as benchmark of Zhanjiang port.

Reasons as follows:

From view of port type:

Both of ports of Zhanjiang and Ningbo have excellent natural conditions and apparent geographic superiority. Though these two ports are in the construction of second-generation ports, Port of Ningbo develops much more rapidly than port Zhanjiang.

Port Ningbo is becoming top 3 ports in China, while Zhanjiang port is now in initial stage of development, now it's just rank 12 in coastal ports of China. So choosing port of Ningbo as benchmark, it's comparable and feasible.

From view of Cargo structure:

Port of Ningbo is multi-functional port, which is the same kind of port Zhanjiang. Both of them have abundant cargo structure, including: coal, oil (crude and product), metal iron, non-metallic ores, fertilizer, grain, nonferrous, raw materials for chemical production, steel and medicine products, etc. there are container terminals, iron ore and crude oil terminals in both ports. In addition, the bulk terminals are both new project with high designed annual capacity and now in trial phase.

Table3.4 Cargo structure in Port of Zhanjiang and Ningbo

Zhanjiang	2003	2010	Ningbo	2010
Coal	12.2%	8.9%	Coal	6.3%
Crude oil	29.1%	23.1%	Crude oil	20.3%
Iron ore	25.9%	16.7%	Iron ore	11.4%
Steel	1.0%	0.8%	Steel	0.9%
Other	31.7%	48.5%	Other	58.1%

Data source: Research report of port Ningbo to build international container hub, (October, 2005)

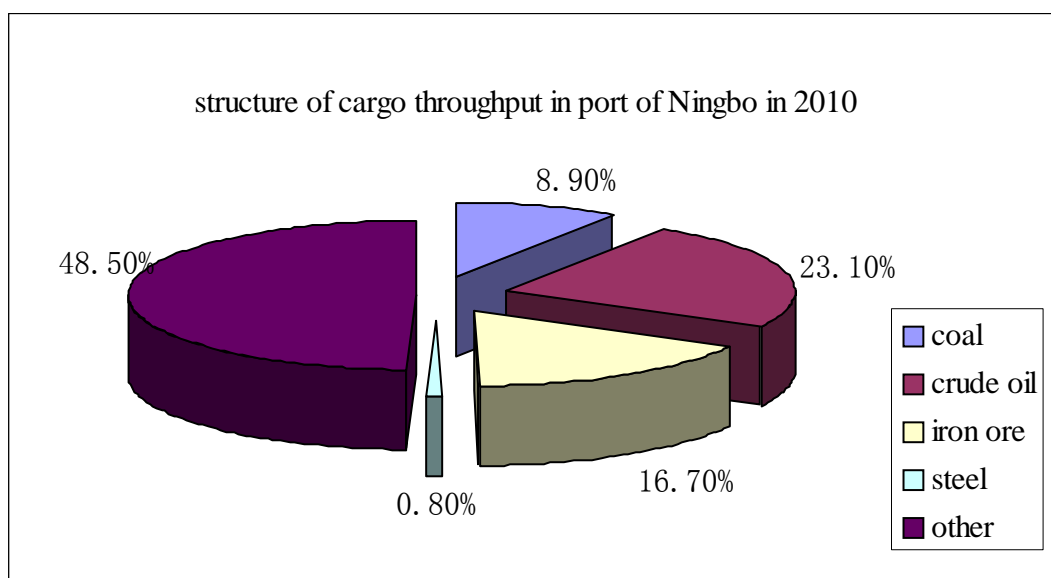


Figure 3.3 Structure of Cargo Throughput in Port of Ningbo in 2010

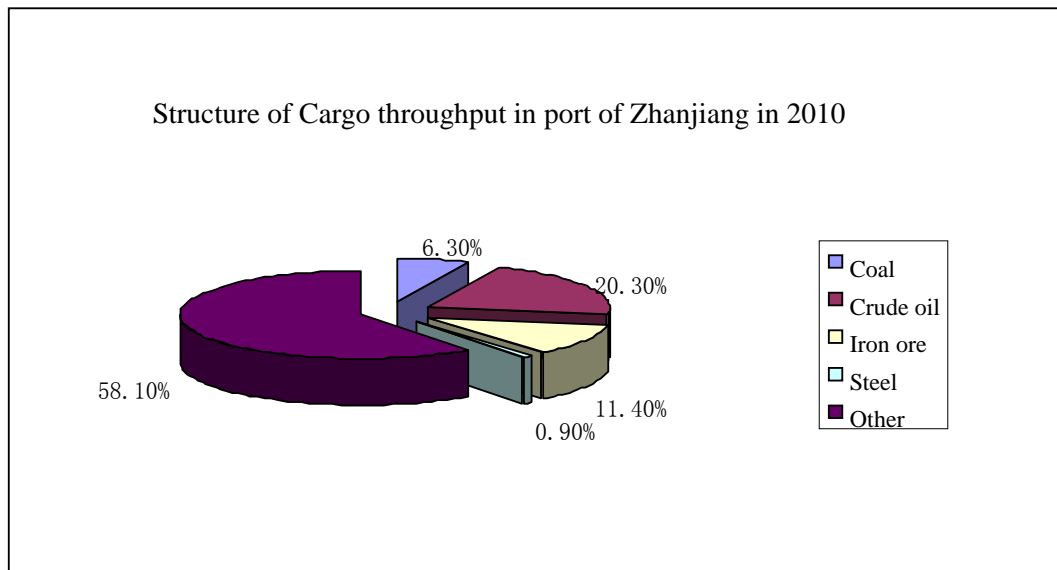


Figure 3 4 Structure of Cargo Throughput in Port of Zhanjiang in 2010

From view of port's performance:

With Large professional berth completed and put into production, scale of port of Ning is becoming larger and larger, especially the development of bulk transshipment and the improvement of transportation network including road and railway system greatly enlarge the hinterland of port of Ningbo, which makes Ningbo to develop into a integrated port providing service to the whole China from original port just designed for Bao Steel. Port of Ningbo has become the transshipment base for oil transportation in Yangtze River Delta and area alongside, coal transshipment base of Zhejiang province, LNP and LNG transshipment and stocking base for Far East area, and form initial shape of container link hub in Yangtze River Delta.

⁷Table 3.5 Throughput volume of Ningbo port from 2000-2005

Year	Total Throughput (Unit: thousand tons)	Container throughput (Unit: thousand tons)
2000	115471	902
2001	185230	1213
2002	153980	1859
2003	185426	2772
2004	142328	40073
2005	269000	52095

Until 2003, port of Ningbo has equipped 198 production berths, among which there are 37 deep-water berths, and 250 thousand-ton oil terminal, 200 thousand-ton iron ore terminal, the sixth specialized container terminal and 50 thousand-ton LNP and LNG terminal, having shipping lines with more than 560 ports.

⁷ Data source: Overall layout planning of port Ningbo—Authority of port Ningbo (October, 2002)

4. Benchmarking application in port of Zhanjiang

In this chapter, three kinds of terminal logistics will be discussed: iron ore terminal, container terminal and crude oil terminal. Separately apply benchmarking in the above kinds of terminal logistics, do comparison between port Zhanjiang and Port Ningbo from different aspects, then give result of the above comparison, preparing for the following SWOT analysis, in order to make strategy and give suggestions

4.1 Benchmarking application in iron ore logistics in port Zhanjiang

4.1.1 Characteristics of iron ore logistics

Recently, operation of domestic ports had been in full-load or over-load situation. With emerged problem of inadequate off-dock capacity of the terminal. According to statistics, until May of 2003, ports of Zhanjiang, Ningbo and Qingdao appear different extent of congestion when receiving iron ore. There were 7-8 million tons of iron ore which can not loaded&discharged.

Beside port of Beilun, port of Ma Jishan for Baosteel and port of Qindao, large proportion of iron ore is loaded&discharged at bulk terminals. These bulk terminals just can operates on small DWT ships, low efficiency and high cost, to some extent, this kind of bulk terminals have negative influence on steel industry development. Areas of Yangtze River Delta, north of Yangtze River, and south of Yangtze River are three main parts for import iron ore. The proportions of import iron ore of above area

are”: 35.4%, 47.3%, and 17.3%. In order to meet the demand of steel industry, volume of import iron ore will increase rapidly and it's predicted to reach 250 million tons in 2010.

From analysis of profit of seaway transportation iron ore, the transportation cost of 200 thousand-ton specialized bulk ships is the lowest. With rising of oil price and salary of sailors, the cost gap between large DWT ships and small ones will larger. But in China, there are only four specialized iron ore terminals, which can load&discharge DWT 200 thousand-ton ship. So for Chinese iron ore logistics, inadequate infrastructure is key problem.

4.1.2 Benchmarking application in iron ore of port Zhanjiang

4.1.2.1 Analysis of comparison hinterland

Port of Zhanjiang:

According to port of Zhanjiang location, it's the door of south of China, east extent to Zhu Jiang River delta, west side adjacent to Gulf Tonkin, leaning on southwestern part of China, facing to Southeast Asia. Zhanjiang lies on the verging area of Guangdong, Guangxi, and Hainan province, far away from the developed area, such as Hong Kong, Macau, Taiwan, and the delta of Pearl River. It is not as developed as other areas in Guangdong, for the Guangxi and Hainan province nearby both have a low industrial and urbanization level, residences there have low income and purchasing power, it is less-developed in market. Direct hinterlands are places of Leizhou Peninsula, west of Guangdong province, and along railway Li-Zhan. Indirect hinterland is including Guizhou province, Guangxi, Sichuan, Chongqing, Yunnan,

Hainan and west of Hunan province which are along railway Qian-Gui and Xiang-Gui. Though facing fierce competition of ports of Qinzhou, Fangcheng, Beihai, the hinterland of Zhanjiang is still larger compare to the above ports

Port of Ningbo:

Also from geographic location, hinterland of Port of Ningbo should include provinces of Jiangxi, Hunan, Hubei, Sichuan, Chongqing, Zhejiang, Jiangsu, Anhui, while in fact, practical range of Ningbo's hinterland is much smaller than above. One reason is constraint for traffic infrastructure, second is for inadequate competence, but with the construction of back-side consolidation and distribution progressing, the range of hinterland of Ningbo will enlarge..

Though there is small business of international transshipment in port of Ningbo, the market share of it will be greatly enlarged with the process of Ningbo's globalization, and this will make its hinterland extend to whole East Asia and Asia-Pacific area.

Compare to Ningbo's, hinterland of Zhanjiang port are much smaller. Though, there are about 3 million -square meter hinterlands, which should be Zhanjiang's, restrains of traffic become bottom-neck. Un-developed traffic infrastructure in provinces like Guizhou, Guangxi, especially slow progress along Lizhan railway result to lower efficiency in both communication and transportation. From overall view, hinterlands of Zhanjiang are mostly slow-development provinces in China, whose construction of infrastructure cannot meet the demand of economic development. So improvement of Zhanjiang's constraints needs hinterland's cooperation to speed up step in processes of railway, road construction.



Area of port Zhanjiang's hinterland
(Shadow part)

Figure 4 1 Range of hinterland of Zhanjiang

Source: Theses of "Optimization of iron ore logistics in port Zhanjiang"

4.1.2.2 Analysis of comparison for throughput of Iron ore

Port of Zhanjiang

Port of Zhanjiang is the coastal hub in domestic port system, also is one of main port for import and export iron ore in southeast part of China. In 2003, ports of Zhanjiang complete loading&discharging import iron ore 5.26 million tons, 5.23 million tons of which is transported by DWT 50 thousand-ton ships. But there were only 3 iron ore berths of 10-15 thousand-ton in 2003, they were only capable to load&discharge 2.5

million tons iron ore. According to statistics, in 2004, cargo volume of Zhanjiang was 37.8 million tons, including iron ore 8.4 million tons, growth rate reached to 50%. Facing this inadequate berth to receive large volume of iron ore, port of Zhanjiang starts to construct 200 thousand-ton specialized iron ore terminal.

Port of Ningbo:

Port of Ningbo has become the largest transshipment base of Iron ore in domestic China, which take the task to transship import iron ore from Australia and Brazil to steel enterprises in Shanghai or alongside of Yangtze River, and partially to north China and steel factories of Fujian and Jiangxi province. In 2000, throughput volume of iron ore reached 43.3 million tons, transshipment and export 19.55 millions tons, including import 23.75 million tons, in which 18.46 are import to alongside Yangtze River.

According to demand prediction of steel enterprises alongside Yangtze River, in 2010, there will be demand for iron ore import&export via Yangtze River 49.4 million tons for Pot of Ningbo, and to 2020, this figure will be 54.7 million tons. Prediction of throughput volume for metal iron in 2010 and 2020 will be separately 48 million tons and 48.5 million tons, including import volume 26.3 million tons and 27.3 million tons.

4.1.2.3 Analysis of comparison logistics system

Port of Zhanjiang:

Port of Zhanjiang is now equipped five-operation iron ore area, with 32 production berths; annual capability is 28.18 million tons.

Table 4.1 Berth of iron ore terminal in port of Zhanjiang

Type of Berth	No of Berths
Total	32
For DWT above 50 thousand-ton ships	2
For DWT 35 thousand-ton ships	2
For DWT 20-25 thousand-ton ships	4
For DWT 10-15 thousand-ton ships	17
For DWT below 5 thousand-ton ships	7

Data source: No 1 Office of Port Authority of Zhanjiang

Zhanjiang port: Recent years, there are more and more DWT above 50 thousand-ton ship via port of Zhjiang, and the NO of the ship has surpassing 100 2003, berths of DWT 10-15 thousand-ton are totally meet the demand of those large bulk ship. So port of Zhanjiang is constructing iron ore terminal, which can call DWT 200 thousan-ton ships, which make great contribution to Zhanjiang iron ore development.

Table 4.2 Vessel type call port of Zhanjing & Ningbo from (2001-2003)
(DWT unit: thousand tons)

YEAR		NO. Of vessel of dwt 50 thousand tons (Including 50)	Average DWT
2001	Zhanjing	48	6.74
2002	Zhanjing	78	8.42
2003	Zhanjiang	100	7.95

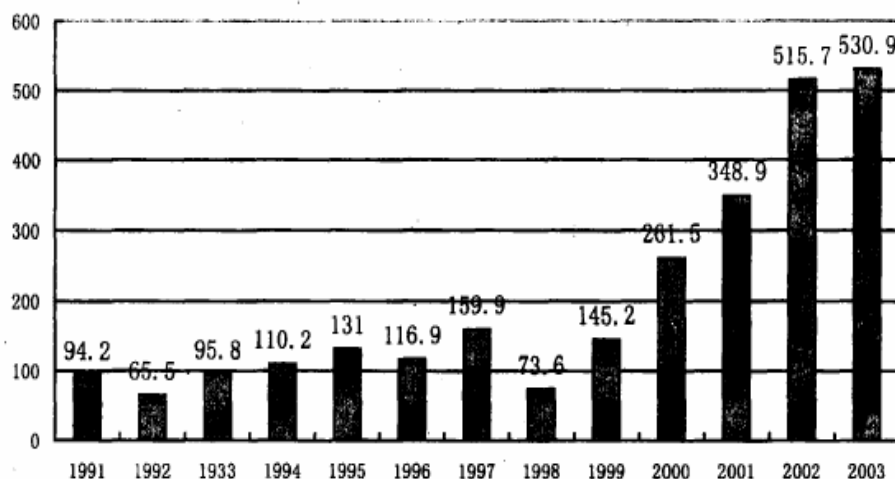
Port of Ningbo:

With the trend of berths specialization and large scale, port of Ningbo determines to make full use of superior natural condition to develop its berths and terminal. There are two specialized terminal for iron ore, which are capable to load&discharge DWT

200 thousand-ton ships since 1995, and also reconstructed the 100 thousand-ton terminals into 150 thousand-ton, which is specially designed for iron ore import of Baosteel. Above-mentioned berths make port of Ningbo become the largest transshipment base of iron ore in China.

In addition, there are cargo owner's terminal in Beilun port area, such as the 250 thousand-ton oil terminal of Zhenhai Refineries plants, 35 thousand-ton coal terminal of Beilun power plant, all those terminal are in leading position in and abroad,

According to planning for Ningbo port, import ships from South Africa and Brazil are mostly DWT 200 thousand-ton, from Australia are mainly DWT 25 thousand-ton ships, including DWT 16-35 thousand-ton bulk-carriers, transship to north China via Ningbo are mostly DWT 35 thousand-ton ships, among which there are also DWT 50-60 thousand-ton ships.



Trend of import iron ore of port of Zhanjing (1991-2003)
(Unit: thousand tons)

⁸Figure 4 2_Trend of import iron ore of port of Zhanjiang (1991-2003)
(Unit: thousand tons)

Source: Theses “Optimization of iron ore logistics in port Zhanjiang”

Zhanjiang port confronted this problem and planed to build 200 thousand -tons iron ore terminal. In 2005, this project have been tried to put into use and get success. With 200 thousand-tons terminal building, situation restrained of capability to discharge large bulk ship in port of Zhanjiang will be greatly improved. But capability for consolidation and distribution only by railway from hinterland can't meet the demand of iron ore terminal.

In port of Ningbo, they solve this problem better.

First, port of Ningbo will cooperate with Ma Jishan(iron ore and mine terminal special designed for Baosteel) to share the transshipment task for steel enterprises in Yangtze River Delta and alongside.

Second, Ningbo starts the project to improve the fairway to reach -12.5m, which will greatly help bulk ship directly transport to steel enterprises.

4.1.3 Analysis result of benchmarking application

According to benchmarking application, present berths capability cannot meet the demand of large-scale ships

(1) Capability of berths of Zhanjiang is mostly 15 thousand-ton level, while recent trend for ships is larger and larger scale, more and more DWT above 50 thousand-ton ships are taken into use to meet the rapidly increase demand for iron ore. So berths capability cannot catch up with the large-scale ship trend.

⁸ Graph from theses: Zheng Riqiang—Optimization of iron ore logistics in port Zhanjiang.

(2) Capability cannot meet throughput volume increasing of iron ore

As mentioned before, throughput volume of port of Zhanjiang in 1999 was about 1.9 million tons, in 2000 about 3 million tons, in 2003 about 5.7 thousand tons, far beyond the designed capability. With China entering WTO, volume of import and export iron ore will keep high growth, which will make problem of inadequate capability more serious.

(3) Slow economic development impact on cargo resource of port of Zhanjiang

Most of Zhanjiang's hinterland lies in west part of China, where economic develop relatively slow and the infrastructure for transportation is also not good as east part of China, un-developed network of railway, road. All these are greatly impact on transportation between hinterland and port of Zhanjiang, especially for that main cargo of Zhanjiang is large-scale break bulk, which largely extent rely on railway transportation.

(4) Cargo draining for limitation of berths

It's essential to equip large deep-water berths for loading & discharging large-scale iron ore ships. For that before the construction of 200 thousand-ton specialized iron ore, the largest berth in port Zhanjing are 50 thousand-ton, which means Panamax and Cape-size bulk ship should firstly call large terminal to reduce DWT, then can call port of Zhanjiang. This process highly increase the cost of cargo owner, thus make cargo sources draining, which do great harm to Zhanjiang port of its competition with others.

4.2 Benchmarking application of logistics in container terminal of port Zhanjiang

4.2.1. Characteristics of container terminal logistics

The need for an optimal management of logistics activities at modern container terminals is well recognized. This is a crucial problem, when guaranteeing that the terminal system can react in a cost-effective way to the continuous growth of the transshipment flow. Logistics activities are costly and particularly complex since they require the combined use of several expensive resources (berth, cranes, specialized manpower, and so on). On the other hand, the competitiveness of a terminal site is especially measured in terms of an adequate service level offered to visiting shipping companies.

In initial phase of domestic container terminals of different ports, their developments are uneven, which is mainly showed by percentage of throughput volume of top 8 ports of China: ports of Shanghai, Tianjin, Qingdao, Ningbo, Xiamen, Guangzhou, Shenzhen, Dalian are lower and lower. So in initial phase, it's essential for China to start container terminal integrated logistics services in some ports, which have excellent natural conditions and large cargo sources.

From the aspect of cargo constitution, the bulk cargoes such as ore, food supplier, cane sugar, oil and fertilizer etc. are the main cargoes for Zhanjiang port. However, there are little containers, which are widely used in the modern port logistics.

Port of Zhanjiang has natural superiority and large range of hinterland area, which will make great contribution to container business of port Zhanjiang.

4.2.2 Benchmarking application of logistics in container terminal of port Zhanjiang

4.2.1.1 Analysis of comparison of outside environment

Port of Zhanjiang:

1. The further development of China's western area.

With the further development of China's west region, Zhanjiang Port become presenting its geography advantages in southwest and west region. Zhanjiang Port is the only large-scale port, which is shared by east, middle and west in China. It is also a very important channel for the trade of southeast in China. Furthermore, it is the port, which has the shortest distance from china's mainland to Southeast Asia, Middle East, Europe, Africa and Oceania. Zhanjiang Port has a very close contact with railway, highway and air of southeast economy hinterland. Tong Dalin who is a famous economist calls it is the "gold key" of China's southeast development. With the economy development of middle and west region as well as the economics improvement of west region, the gold key has a more and more important impact on the continuous transportation of the ore resources to the west region.

2. The build of China-East Union free trade area

In 2000, China signed "Agreement of Economy Cooperation with ASEAN Countries at ASEAN annual meeting. It is decided that the China-East Union free trade area will be build in 2010. it means an economy circle which has 1.7 billion consumers and USD 1200 billion trade gross will be formed. It is a great challenge for Zhanjiang port, which is in the economy circle. After the start of China- East Union free trade

area, Zhanjiang port will show its advantages of geography. Zhanjiang port will take an active part in the competition and become the leader of China-East union free trade area.

3. Enhancement of transport capacity

The Bay Bridge, which is invested by RMB 1.24 billion, started from Nov 2003. Guangzhan highway and Yuzhan highway have been built in the end of 2004. Zhanhai ferry port of Yuehai railway has been built and put into operation. These all make a good base for the fast development. The problems of congestion in port will be solved soon.

Port of Ningbo

1. During "Ninth-Five Planning of China", the dramatic development of container turnover is achieved in the background of industry restructure of Yangtze delta, increase of economy, development of open economy and international trade. According to the development trend of open economy in Yangtze Delta and alongside regions, we can predict that the turnover of containers in this region can achieve 15 million TEU in 2010 and 25 million TEU in 2020.

2. Ningbo Port plays a very important role in Shanghai international shipping center. Under the great support of Zhejiang province and Ningbo government, and the cooperation with custom, the EDI system of Ningbo Port has been put into operation. Moreover, the build of integrated logistics center in Ningbo and Ningbo information port has started. The environment of port has been great improved, too. This acceleration the increase of container turnover in Ningbo. The beginning of 21 century is the key period of Ningbo port development. If Ningbo port can not only

hold this opportunity of Shanghai international shipping center and the advantages of deep water but also improve the traffic conditions and have a good relationship with the nearby ports and ship companies it will have a greater development potential in container turnovers.

Ningbo Port is an important part of Shanghai international shipping center. It has competitive advantages of calling big-size container vessels and has a great market share.

3. Nowadays, 48% of container turnovers are from Ningbo port. This proportion will be raised to 65 percent in the near future. Furthermore, the cargoes, which are shipped by the large container vessels to Jiangsu and Shanghai, will be discharged in Ningbo Port. This also attracts the container cargoes, which belong to the downriver of Yangtze River port to be transferred in Ningbo Port.

4.2.2.2 Analysis of comparison of throughput

Port of Zhanjiang:

Zhanjiang Port is one of the ports to early develop the container loading businesses. It is started from 1982, and the turnover of containers lists the eighth in China. At the beginning, because of the restrictions of incomplete equipments, the containers can only be loaded and discharged by traditional equipments on the port. So the efficiency is very low and it cannot meet the needs of quick loading and unloading. There is a long time that the container lines are not able to open and the density of the liner to Hong Kong is also very low, which cannot meet the shippers' requirements. Thus, the turnover of containers of Zhanjing Port has several years' stagnation.

The container turnover in 2002 is 105 thousand TEU. During "Ninth-Five Planning in

China”, the increase of the container turnover is 27.7%. The first two years of “Tenth -Five Planning” is 26.6%. As lack of economy development of hinterland, the productivity of container is very low. The economy in Zhanjiang drops behind that of Pearl River Delta a lot. Especially the increase of extroversive economy is very slow which leads to the international trade of container did little progress. The increase of containers basically didn’t catch the great increase of international trade in China.

Zhanjing Port develops from a multiple functional port to a professional one, and at last to a multiple operational phase. After its 20 years development, it has been in a dramatic development period. The 5th and 6th generation container port are being built in Zhanjiang port. It has the potential of building the over 100millin ton international port in the Yuexi and North Gulf region in China.

Port of Ningbo:

In 2000, area of Yangtze River Delta completes operating throughput of container 7.4 million TEU—5.61 million TEU is operated by port of Shanghai, 0.9 million TEU is of port of Ningbo;s.

Province of Zhejiang is the main container cargo resource, where can provide about 1.3 million TEU demand each year. Ningbo takes 70% of the total amount of Zhejiang province. According to statistics of Authority of Ningbo port, there is about 5 million TEU demand in 2010, 8 million TEU in 2020. For prediction of foreign trade container throughput of Ningbo port, there will be 3.9 million in 2010, 6.5 million in 2020. The percentage of ocean line in foreign trade will be gradually increased, which is about 65% in 2010, 70% in 2020.

4.2.2.3 Analysis of comparison of infrastructure

Port of Zhanjiang:

Containerization is the symbol of port modernization. Though port of Zhanjiang is traditional port for break bulk, container business has greatly developed recent years. Until now, port of Zhanjiang equips 2 berths for 15 thousand-ton container ship, designed annual capability 100 thousand TEU. Project of 300 thousand-ton fairway have been put into use in 2005. there are about 444,974 square kilometers warehouse, 329,418 square kilometers container yards, which can not meet the demand of container business development.

It's predicted that the container throughput of Zhanjiang will be 368 thousand TEU, so it's urgent to solve the inadequate capability problem of port Zhanjiang. Government of Zhanjiang start the project of phase I of Baoman container terminal, which will be included 2 container terminals of 50 thousand-ton, designed annual capability reaches 800 thousand TEU, and this project can be put into force in 2008. Meanwhile, during 2005-2008, Port of Zhanjiang will enlarge the container yard and infrastructure, to make the capability to 350 thousand TEU in order to meet the demand of recent years.

Port of Ningbo:

Container terminals, which are under construction in port of Ningbo:

1. Phase IV international container terminal project, whose designed annual throughput is 2 million TEU, with capital from MSC and EVENGREE. Now two berth windows of the project are put into use, and another two are still in rapidly

construction.

2. Ningbo Daxie Merchant international container terminal, whose draft of quay can reach -17m and designed annual-throughput, is 2 million TEU, jointly operated by China Merchants, Daxie development company/

3. Yongzhou international container terminal, whose draft of quay is -18.5m and designed annual-throughput is 2.5 million TEU, constructed together with Zhoushan Goldpool development company and Hong Kong Ningxing Co., Ltd.

4.2.3 Analysis result of benchmarking application

Port of Zhanjiang has great potential to develop, equipped with 40m fairways, 23-28 meters of terminal quay, 300 thousand-ton and 500 thousand-ton oil ships. But from the comparison of port of Ningbo, there are still problems of port Zhanjiang:

(1) Undeveloped economic of hinterland cannot supply large quantity of containerized cargoes, which do harm to port's throughput of containers.

In 2002, Zhanjiang's GDP is 46.13 million RMB and GNP of agriculture and industry are 63.5 million RMB, average annual growth is 15%, the percentage of agriculture, industry and service industry is: 25.5:37.3:37.2, which means Zhanjiang is still in initial phase of industrialization, thus lower industry percentage leads to small volume of container cargo.

(2) Fewer liners and shipping lines

Throughput volume of port of Ningbo has surpassing 4 million TEU, with 115 container shipping lines, in which there are 53 ocean lines, 33 coastal lines, 16 extension coastal lines, frequency of liner surpasses 500 in a month. Port of Ningbo has become top 5 container ports in the world. Port of Zhanjiang targets itself to be a

feeder port, so there are few liner s and shipping lines, which results to that part of container need to transport by land mode, so make slow development of container volume.

Table 4.3 Main shipping line of Zhangjiang port

	Distance (unit: kilo meter)	Days	Speed (knot)
Zhanjiang—Dampier (Australia)	2698	8.65	13
Zhanjiang — Port Hedland (Australia)	2687	8.61	13
Zhanjiang—Kandla(India)	4097	13.13	13
Zhanjiang—Dahej(India)	3904	12.51	13

Data source: No 1 Office of Port Authority of Zhanjiang

(3) Inadequate infrastructure construction

Infrastructure construction of Zhanjiang port is in initial phase, some significant projects cannot be put in to practical use until now, such as the project of 300 thousand-ton fairway project. Repeat-construction of port infrastructure with competitors, ports of Beihai, Fangcheng, Qinzhou, this problem is not only waste of capital, but also result vicious competition with ports around. While port of Ningbo adopts to attract lots of capital and investment to construct port infrastructure, which also bring in advanced management and technology, abundant experience of operation port, making ports operation more international.

4.3 Benchmarking application of logistics in oil terminal of port Zhanjian

4.3.1 Status quo of oil industry

So far, total volume of export oil is 2.29 billion tons, in which Middle East takes up 0.95 billion tons, Russia makes contribution of 0.3 billion tons, percentages are 41.5% and 13.1% of total export volume. Prediction for year 2020, export volume of Middle East will make up above 50%. West Africa is second largest export area which is just behind Middle East, according to statistics, there are 25% of crude oil coming from West Africa to China. America, Europe and Asia-Pacific region are the main consuming area in the world, which takes up 75% of total consuming volume, net import volume takes up 84% of world's total import volume, while production of oil only make 30% of total amount of oil production of the world. So it's obvious that extent of unbalance of demand and supply for different regions is serious. Sea-way transportation is the mainly mode for crude oil and oil products, I, with this high extent of unbalance among different region and districts, means large quantity of transportation demand for oil, which need to develop logistics in oil terminal urgent, so under this kind of background of oil industry, it's great opportunity for ports to start logistics in terminal.

Table 4.4 Trade Volume of Oil transported by sea and World Economic Growth
(Unit: million tons)

Year	Crude oil	Product oil	Total volume	Economic growth(%)
1998	1,546	476	2,030	2.8
1999	1,571	502	2,048	3.6
2000	1,648	497	2,068	4.7
2001	1,646	524	2,172	2.3
2002	1,589	530	2,176	3
2003	1,670	573	2,162	3.2
2004*	1,742	633	2,303	4.1

Data source: Clarkson autumn 2004^[23],

4.3.2 Benchmarking application of logistics in oil of port Zhanjiang

4.3.2.1. Analysis of comparison from Throughput volume

The following table shows the oil throughput volume of port of Zhanjiang and Ningbo in lately 3 years.

Table 4.5 Oil throughput for port of Zhanjing and Ningbo
(Unit: Thousand tons)

Year	Port of Zhanjiang	Growth rate	Port of Ningbo	Growth rate
2003	6918.9	14%	17300	16.5%
2004	8400.7	12.1%	20080	11.6%
2005	14600.5	17.38%	30120	15%

Data Collection: by writer from website of port of Zhanjiang and Ningbo.

4.3.2.2. Analysis of comparison from berth and equipment

Port of Zhanjiang:

Port of Zhanjiang has constructed an oil terminal of 300 thousand-tons, which mainly designed for transshipping large scale of metal iron, oil and other break bulk.

Berths for oil transshipment: 5 berths of oil terminal, LOA of the terminal is 893 meter, designed capability of 380 thousand tons, annual capability reaches 17.65 million tons. There are three berths for oil products in construction, with annual capability 2.55 million tons. Present berths for oil product, length of 300thousand-ton terminal is 40 meter, annual capability reaches to 10 million tons, which is the largest land-shore oil terminal in China.

Oil pipeline: there is oil pipeline of 115.5 kilometers (from port of Zhanjing to Maoming oil-chemical). The oil product pipeline which is in construction from Zhanjiang to Pearl River delta is length of 1056 kilometers, designed transporting oil volume of 3 million tons, in which 56 kilometers in Zhanjiang port, total investment 106 million RMB. This project can be completed in 2006.

Port of Ningbo:

There are 132 berths of 0.5 thousand-ton, 17 of 50 thousand-ton, 1 berth of 250 thousand-ton in Suanshan terminal, and another berth of 250 thousand-ton transshipment terminal constructing in Daxie terminal, 2 terminals for 50 thousand-tons oil product ships which is special designed for Zhenhai refineries

plant, above all, Ningbo has the largest berth for 50 thousand-ton LNP and LNG berth in China

Oil volume of processing in main oil-chemical enterprises is keeping constantly increase in Yangtze River Delta and area alongside, according the “Tenth –Five Planning”, Chinese government decides to build oil pipeline among Shanghai-Ningbo-Nanjing, which can transport crude oil 15 million tons in 2010 and 18 million tons in 2020.

4.3.3 Analysis result of benchmarking application

(1) From comparison of throughput volume, port of Ningbo's crude oil volume is much larger than Zhanjiang's, while in the lately two years, 2004 and 2005, the growth rate of Zhanjiang port is higher than Ningbo, which mainly because of the construction of 300 thousand-ton oil terminal. This kind of terminal is the forth one after port of Dalian, Tianjin, Ningbo. Considering the importance of Zhanjiang port in Southwest port-group, it's potential to develop oil logistics.

(2) From comparison of oil product, port of Ningbo has support from large-scale oil plants, such as Zhanhai Refineries plant, and big project of 300 thousand-tons Ethylene of Xiehe oil-chemical plants, which brings large quantity of cargo. Ningbo port pays attention to improving the load&discharge processes to optimize the operation, while Zhanjiang port doesn't have that much cargo sources and its process is in initial phase with low efficiency.

(3) From comparison of berths, berths of port of Ningbo is not better than poet of Zhanjiang, because port of Zhanjiang's 300 thousand-ton oil terminal which is in trial phase is advanced in domestic China, and this terminal will make port of Zhanjiang possibly to surpass most coastal ports, such as Ningbo, and it needs Port of Zhanjiang to pay more attention in infrastructure construction. But Ningbo port has

rare 50 thousand-ton terminals for LNG and LNP, which do good to develop oil chemical logistics and this field can get high return.

5. Strategy of integrated logistics development in port Zhanjiang

In Chapter 5, the main purpose is to do SWOT analysis in port of Zhanjiang to choose strategy for the future development of integrated logistics, and also considering the result of above application of benchmarking, giving suggestions to solve the problem port Zhanjiang faces, then making contribution to construction of port Zhanjiang

5.1 SWOT analysis of port Zhanjiang

Internal	Latent internal superiority (S)	Latent internal weakness (W)
	<ul style="list-style-type: none"> ③ Natural condition superiority ③ Geographical superiority ③ Port superiority ③ The increase of transportation capacity 	The undeveloped economy in Zhanjiang has restricted the port transportation
External	Latent exterior opportunity (O)	Latent exterior threat (T)
	<ul style="list-style-type: none"> ③ The great exploration to the West ③ The formation of Sino-Association of Southeast Asian Nations free trade area ③ 	<ul style="list-style-type: none"> ③ Internal challenge within the province ③ External challenge with the ports around it

The SWOT analysis has provided four kind of strategies for Zhanjiang port, the SO strategy, the WO strategy, the ST strategy and the WT strategy, as the following table shows, these four kind of strategies are the relations which the supplementary mutual benefit and mutually promotes, Zhanjiang port should synthesize them and use them.

	Internal superiority (S)	Internal weakness (W)
	③ Natural condition superiority ③ Geographical superiority ③ Port superiority	The undeveloped economy in Zhanjiang has restricted the port transportation
Exterior opportunity (O)	SO strategy	WO strategy
③ The great exploration to the West ③ The formation of Sino-Association of Southeast Asian Nations free trade area ③ The increase of transportation capacity	③ Depend on interior superiority ③ Use exterior opportunity	③ Use exterior opportunity ③ Overcome internal weakness
Exterior threat (T)	ST strategy	WT strategy
③ Internal challenge within the province ③ External challenge with the ports around it	③ Depend on internal superiority ③ Avoids exterior threat	③ Decrease internal weakness ③ Avoid exterior threat

The above table shows the strategy matrix according to SWOT analysis above:

- (1) SO strategy—Strength & Opportunity strategy
- (2) WO strategy--- Weakness & Opportunity strategy
- (3) ST strategy—Strength & Threats strategy
- (4) WT strategy—Weakness & opportunity strategy.

5.1.1 The SO strategy of the development of logistics system in Zhanjiang port

1. Positively develops the port to extend the service. Breaks traditional management pattern of loading and unloading to store in a storehouse, positively develops the range of service according to the market demand around the port service flow and logistics value chain. Uses the original management superiority and the port resources superiority, take loads and unloads stores in a storehouse as the junction point, through the form of joint capital, jointly operated etc to extend the upstream and the downstream service domain, the service involves transportation, proxy, trade, product deep processing, construction, communication information engineering, labor services exporting, effectively promoted the growth of the transportation of the port, realize the value maximization of the enterprise.

2. Holds all opportunities which the Sino- Association of Southeast Asian Nations trade area start brings, diligently realizes the leaping development. Zhanjiang and the Southeast Asia are geographic neighbors; the economics and trade cooperation has the geographic superiority. In recent years, as the resources constitution, industrial structure and product of both sides have their own characteristic, the reciprocal effect is very strong, and the development of economics and trade relations is extremely rapid. Zhanjiang port makes use of its geographic superiority, massively exports the southwest minerals, the agricultural automobile to Southeast

Asia. Chinese Commission of the National Economic and Trade has assigned the Zhanjiang sugar industry product to be the main product exported to Southeast Asia.

3. Using the strategic opportunity brought by the Great Exploration of the west, unceasingly promotes the port function. At present, Yunnan, Guizhou, Sichuan, Chongqing has an export&import account of 50% every year in Zhanjiang port. The provinces in the Southwest has establishes 100 administrative institution and economic entity in Zhanjiang. Zhanjiang port should continuously use the strategic opportunity brought by the Great Exploration of the west to enhance the cohesive force and the competitive ability of the port.

5.1.2 The WO strategy of the logistics system development in Zhanjiang Port

In order to strengthen the port competitive ability, making Zhanjiang port to be the first choice of import and export port in the interior area of Southwest, Zhanjiang port needs to seek a new way out from the development of modern logistics.

- (1) Examines the overall plan of the port facility with the idea of logistics.
- (2) Carries out the intellectualized management, the port owns extremely good internal software management system.
- (3) Pays great attention to the construction of the information system.
- (4) Depends on the industry near the port.
- (5) Synthesizes the utilization different transport mode to realize the best transportation network.
- (6) Encourages and the support exporter constructs or rents the warehouse in the port area, running the logistics business, encourages the exporter and the port

affairs company sets up the joint venture to develop the logistics service. In order to promote Zhanjiang port in the western area of our country, strengthen the competitive ability, Zhanjiang Port must speed up the development of modern logistics, work on the following items:

One, analyze the logistics constitution of the port, make a overall plan for the logistics service;

Two, form a widespread relation with the correlation department, and seek for the partner;

Three, speed up the construction of basic establishment, attract massive cargo flow through Zhanjiang port;

Four strengthen the construction of information system; enhance the information degree;

Five strengthen the training of the port workers

Six pay special attention to the port propaganda, let more know about the port. Experts specially pointed out that, the development of the logistics business of the port, rely on the government and the correlation department's vigorously support besides the port own hard-working, including: Positively guidance of the logistics service demand; Vigorously support the port to extend the logistics service, the expanded port operation space: Improve the import and export environment, acceleration the customs' modernization.

5.1 3 The ST strategy of the development of the logistics system in Zhanjiang Port

1. Coordinate well with the city, and seek for the development together. Zhanjiang is an emerging port city, Zhanjiang port was led by the central committee and local authority, but now the leading is all up to local authority, the relation between the port and the city is closer. Politburo committee member, Guangdong provincial party committee secretary Zhang Dejiang proposed "constructing Zhanjiang into the modernized port industrial city" on his inspection, Zhanjiang also proposed "develop the city by the port" strategy. The port superiority is the Zhanjiang biggest superiority, the port not only play key role of modern logistics platform in Zhanjiang, but also one of the most important way of Zhanjiang to attract foreign capitals. The ultimate objective of any port in the world does not lie in the port own prosperity, but the development of the economy in the area. As the Zhanjiang port bureau fully realized its responsibility, must act the important role in the local economy development. Coordinate relations between the city and the port, vigorously develop industry near the port under the city's overall layout and the economic development strategy, form an industrial area near the port. Lead the people flow, the fund flow, the information flow in Zhanjiang with the logistics business, provides the more employment opportunity and the tax revenue for Zhanjiang. Zhanjiang Port must hold the rare opportunity for the port development, solidly completes the work, make another Zhanjiang Port in 3-5 years, the transportation capacity will be over 50-60 million tons, make Zhanjiang a big port in the south and an international, regional logistics center.

2. Pay special attention to the service brand to and the enterprise culture construction. As an underlie service, the service brand and the enterprise culture are the software platform that supports the enterprise' survival and development.

Zhanjiang Port is an important port, is frequent related with the overseas ship owner customer on business, the port work is representing the national image in a certain degree. If the port want were the bridge to connect the domestic and foreign markets, all staff's endeavor is inevitable. Zhanjiang Port strengthen the enterprise vitality through deepening interior reform and establishing the restraint mechanism, make the first-class service brand through cultivates the good service idea of staff, let the customer enjoy the best service. As an enterprise survives on service development, it only has the detachment condition with customer demand. The base point of Zhanjiang Port is persisting to take the market as the guidance, take the customer as a center. Zhanjiang Port initiates the idea that serving for the customer is serving for oneself, taking customer satisfaction degree as the standard for the service. According to different type of goods, different ships, different customer, different service standard should be made, satisfies the customer's individuality service demand, make warm, thorough, effective, and good service a foreign name card for the port.

5.1.4 The WT strategy of the development of the logistics system in Zhanjiang Port

1. Attract the foreign capital positively and cultivate the logistics market. Zhanjiang Port must get rid of the traditional idea of economical center, attract the foreign capital positively, develops port industry like "port near the factory, port near the storehouse" vigorously, attract the market owner invests in and periphery the port depending on the port superiority. At present, the Dalian agriculture group had invested more than 300 million Yuan in the port area, constructing the feed protein project, phase 1, 2, and 3 of the project successively complete and goes into production, producing good economic efficiency and the social efficiency. Russia Taz group, whose storage ranks first in Asia and second in the world, has completed

the liquid ammonia project in Zhanjiang. China oil group invests more than 500 million Yuan, constructing a 945,000 cubic meters oil tanks project in the Zhanjiang Port area; the project is intensely under construction. China oil chemical group has already started the 5 million tons expanding project in Dongxing refinery, the China Shipping oil group has initialized the 2 million ton bunker oil project in Zhanjiang. These port industrial projects will bring over 20 million-ton steady cargo sources every year for Zhanjiang Port once they go into production.

2. Construction of cargo consolidation and distribution center for multiple types of goods. Zhanjiang Port has 1.006 million square meters warehouses fields, 256,000 cubic meters oil tanks, disposable storage surpass 3.5 million tons, it has the condition to fulfill the logistics center function. Zhanjiang Port large-scale logistics platform project has been approved by Guangdong Province and department in the central government, and obtains the support of the national debt deduction. Recently the concerned department had included Zhanjiang Port as one of the place to elect for the national 5 million ~1000 ten thousand cubic meters reserves oils project. Zhanjiang Port should continue to implement the cargo collection and distribution center strategy, make Zhanjiang port the biggest collection and distribution center of petroleum, liquid chemical industry, and metal ore.

5.2 Suggestions for Zhanjiang Port to implement the logistics development strategy

5.2.1 Make logistics development plan for the Zhanjiang Port

Linking with the reality of the port, compose a special strategic plan. The plan must deal with several relations.

First, develop of the city near the port. The logistics development of Zhanjiang Port is an overall work. It must serve for the Zhanjiang economy development, serves for the trade of the port-centered area. One of port functions is making the logistics business impetus industrial development. Therefore, Zhanjiang Port should focus on industry near the port (for example, crude oil, processing manufacturing industry, bonded service and so on) and serve the trade well, offer good service for Beijing and the northern area. Second, the internal proportion relation of the logistics industry development. Zhanjiang Port must know where to emphasize in the existing international logistics business, the modern logistics business, the industry logistics business, the commercial logistics business, the agriculture logistics business, the energy logistics business, the grain logistics business and so on the aspect, and reserves the source which the port would need for further development. Third is the relation between the port and the bonded area. The integration of port and the bonded area would solve the second declaration problem, expanding the international current capacity. Fourth is the relation with the foreign capital enterprise. Determine whether they are permitted to join the developing, buying, and the sole ownership operation, even stock domination. Now the logistics competition between the ports is already not only the competition of cargo source, more importantly the competition of development. The one who develops quicker will be able to win the competition; the most important point is the fund. By 2010, Zhanjiang Port accumulates the investment fund 10 billion Yuan; facing with such great fund gap, the first choice is the foreign capital.

5.2.2 reducing the port logistics cost

1. Treat the entire Zhanjiang port logistics supply chain as a system. Zhanjiang Port's future characteristic would be the intensification, the specialization and

efficiency in logistics business. The logistics development of Zhanjiang Port should be promoted, a chain linking the production, storage, the purchasing, loading and unloading, the transportation, the packing, matches delivery, the information should be formed, the ability of transportation and storage of the city should be integrative, unreasonable fees should be cancelled, the operation cost should be reduced, the production efficiency be enhanced.

2. Make good overall plan for the construction of the logistics area and transportation center in the port area. As the experience of the developed countries indicated, multi-purpose, high level, strongly functional, broad radiated synthesis logistics center in the port plays important role in reducing the turnover expense. For example, Japan and Ping Island logistics area, Dutch Rotterdam logistics area all to flow the development play important roles to the local logistics business. There are the container logistics center and the bulk cargo logistics center in Zhanjiang. At present, it is an effective way to reduce the expense on port transportation to construct these two logistics centers

3. Regularly survey the logistics cost of Zhanjiang Port. The logistics cost generally includes storage, the transportation, and management. How many but what is the logistics cost of Zhanjiang Port, what are the proportions? Comparing with other ports, where do we have the cost advantage? There is no answer at present. It is hard to make any practical corrective method without these data.

4. Displays the function of the logistics association. Involving some coordinative port industry business, like profession standard and the authentication of the port logistics business, the profession statistics, professional training and so on, the profession association should display its function. Fully develop the Zhanjiang

existing logistics association, the ship association on association's function, standardize logistics industry behavior, and avoid the disorderly competition, promoting the port logistics industry standardization development.

5. Train high quality logistics specialist staff. It's the strategy key to realize the sustainable development of the port logistics industry to enhance the personnel quality. The Zhanjiang Port logistics departments have to speed up the training of logistics staff. Profits from the international experiences use the domestic and foreign institute resources; develop the training process multi-channel, multi- forms. Making an outstandingly, level reasonable employee team, study and develop the high-tech, transform and promote the logistics industry of Zhanjiang Port.

5.2.3. Transforming management method, sharpening the port competitive ability

Our country's port occupies in East Asia's port group, we can only contends with peripheral ports by enhancing the competitive ability. Things must change from the sole transportation, storage kind of partition service, to the raw material, logistics service of finished product to the consumer kind of entire process, provides the increment service like declaration, the circulation processing, the packing for the user, matches delivers and so on, utilizes the combined transports pattern of "one-ticket", by the simplest way, the best transport distance, the shortest time to complete the procedure, causing the efficiency and the benefit on the greatest degree. At the same time, the service price must also be more elasticity, diverse, combined, forming a public price strategy transformation. As we indicated before, the port's competitive ability can only be enhanced through the adjustment of port's interior management structure, establishment of a perfect port logistics management

system management system, improvement of the logistics service function and the efficiency, and reduction of the service cost.

The port must act as the circumstances permit to develop its own characteristic logistics business. The ports are different in size, strength, and levels, different types of ports have different management goal and the market localization, even if they are all in the logistics business, the service scope and emphasis are also different. The key position port is only minority after all; the ports, which could admit large-scale ships above 200,000 tons, or the 5000TEU ships port are less. The key position port should expand their business and step in new logistics service domain on the foundation of the traditional business, using its own technology and the strength superiority, striving to be a logistics center. It's important for the middle and small-scale port to carry on the self-appraisal localization. They may choose the way to cooperate with the big port and look for the cut-in spot of the business according to the business scope.

Speeds up standardized advancement of the port, connect it with the international market. A unified standard is extremely important. In this vigorous development time of our country, an entire set of national logistics standard system should be established as soon as possible to standardize the logistics market and the enterprise, manage and the guide the logistics market and the enterprise, promote our country's logistics industry to international market, make this business develop in a healthier direction, and gradually close up to the international standard, make logistics standard system of our country match with international logistics standard system. The port should positively use the facility and the related technical equipment according to the international general standard in the process of the development, put unified technical standard and technical management standard to

each link implementation. The standardization of logistics business is the foundation of the modernization of circulation industry, the commodity and satiation of packing standardization the bar coding of logistics information, attire modular loading&discharging and the transportation, the dimensions standardization of the tray, the container, the truck platform and so on, is the premise of the realization of a highly effective, economical system.

Conclusion

Port of Zhanjiang is a multi-functional port equipped with 22 terminals, 174 berth windows, designed capability of annual 60 million tons, and now is member of southwest coastal port-group, who will develop bulk and container terminal logistics. As a port, which has superior natural conditional, Zhanjiang devotes itself to develop iron ore, oil and container businesses. But since Zhanjiang is recovering from a economic regression which was caused by the smuggling affairs in late 20 century, it's very important for her to develop to keep pace with other coastal ports.

In my dissertation, Choosing Port of Ningbo to be Zhanjiang's benchmark is primarily because port of Ningbo is the one of the fastest-developed port in China, who also is multi-functional port, with iron ore terminal, coal terminal, and relatively developed container terminal. After applying methodology of Benchmarking in analysis of comparison of these two ports, Gap between two ports can be find:

- (1) High logistics cost,
- (2) Low container cargo sources.
- (3) Consolidation and distribution constraints for hinterland's undeveloped infrastructure.
- (4) Fierce competition with neighboring ports in Central Gulf of Tonkin.

Port of Zhanjiang should learn from development of Ningbo, for example, port of Ningbo adopt attracting outside capital to construct terminals together, including capitals from shipping companies, oil companies, and other kinds of companies who have business with port of Ningbo. Port of Ningbo start to build competitive and cooperated relationship with port of Shanghai, Zhanjiang should cooperate with ports

around, such as port Beihai, Fangcheng, Qinzhou, which are the same kind of Zhanjiang, in order to avoid over-construction of port infrastructure and re-segment the core competence of these ports. In overall view of macro-development of Chinese ports planning, these kind of relationship will enable healthy development Gulf of Tonkin, thus to diversify the functions of port group of Gulf of Tonkin.

Last part of this dissertation is SWOT analysis in Port of Zhanjiang, then give four kinds of strategies for development, which should be carried out together to enhance the strength of the port to overcome the weakness, taking great policies and outside opportunities to confront fierce competition and remove threats from in and outside.

During make this dissertation, I myself did apply theory learn from classes to practical cases in port of Zhanjiang while I was collecting data and materials to do analysis. But for limitation of data collection and constraints of my academic level, this dissertation inevitably exist some inadequacies and due to language proficiency limitation, there may exist some improper expressions. I sincerely wish assessor consider these factors when evaluate my dissertation, looking forward to your professional comment and correction.

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Appendices

Port Zhanjiang's location on Gulf Tonkin:



Source: <http://www.chineseports.com>

Port Ningbo's location in Yangtze River Delta:



Source:<http://www.chineseports.com>

Chinese coastal ports:



Source: <http://www.chineseports.com>

