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A research on the competitiveness of Shanghai international shipping center

Chenkai Liu

WORLD MARITIME UNIVERSITY

Shanghai，China

A RESEARCH ON THE COMPETITIVENESS OF SHANGHAI INTERNATIONAL SHIPPING CENTER

By

LIU CHENKAI

China

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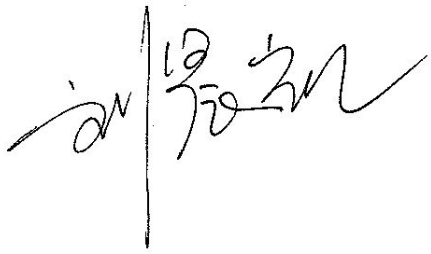
Declaration

I certify that all the material in this research paper that is not my own work has been identified, and that no materials are 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.

Liu Chenkai



Supervised by

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World Maritime University

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Abstract

Title of research paper: **A Research on the Competitiveness of Shanghai International Shipping Center**

Degree: **MSC**

The definition of the International Shipping Center had been physically embodied since the very beginning when the port city London made its debut onto the stage of the world shipping industry. Centuries after, there arise a great many of port cities with the potentials to challenge the previous leading roles. Simultaneously, the definition of the International Shipping Center has always been updating with the trends, being endowed with the new characteristics; besides, the new reality of the modern society has been gradually affecting the shipping industry. Consequently, the competition among the port cities, especially the world's main maritime cities, becomes more fiercely and complex. The paper will primarily demonstrate the competitiveness of the world first-class shipping centers, by putting emphasis on one of the maritime metropolises Shanghai, and comparing it with the existing and potential International Shipping Centers. The paper will not only put forward the qualitative analysis, by using Michael Porter's Diamond Model, but also provide a quantitative assessment, by applying Analytical Hierarchy Process model, to evaluate the competitive world first-class shipping centers. Through the analytical procedure and mathematical expression, the competitive advantages of Shanghai International Shipping Center will be safely displayed in a direct and explicit way, so that it will enable the decision makers to measure the gap between Shanghai and other shipping centers, facilitating the further planning of constructing Shanghai International Shipping Center, which comprises both the physical projects and the intangible infrastructures.

KEYWORDS: International Shipping Center, Port City, Competitiveness, Qualitative Analysis, Diamond Model, Quantitative Assessment, Analytical Hierarchy Process.

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LIST OF ABBREVIATIONS

AD	Antidumping
AHP	Analytic Hierarchy Process
ASEAN	Association of Southeast Asian Nations
BDI	Baltic Dry Index
BIMCO	Baltic and International Maritime Conference
CCIEE	China Center for International Economic Exchanges
COSCO	China Ocean Shipping Company
DP World	Dubai Port World
EBITDA	Earnings before Interest, Taxes, Depreciation and Amortization
FMCDM	Fuzzy Multiple Criteria Decision-making
FTA	Free Trade Agreement
FTZ	Free Trade Zone
GDP	Gross Domestic Product
IAPH	International Association of Ports and Harbors
ICHCA	International Cargo Handling Coordination Association
IMO	International Maritime Organization
ISF	International Shipping Federation
NVOCC	Non-vessel Operating Common Carrier
OSC	Ocean Shipping Consultants
RMB	Renminbi
TEU	Twenty-foot Equivalent Unit
WGQ	Waigaoqiao
WTO	World Trade Organization

Chapter 1 Introduction

1.1 Background

Couple of years ago, at the 24th World Ports Conference which is undertaken by the International Association of Ports and Harbors (IAPH) and first held in China, there raised an unanimous opinion by the top notch of the shipping industry, that Asia has been the fastest developing area in the world with regards to the shipping industry; the world shipping center has transferred into this region. It is said by the president of China Ocean Shipping Company (COSCO) Wei Jiafu that, “of the 20 largest shipping companies in the world, 13 were from Asia, who occupied almost 70% of the total transportation capacity all over the world”. The export increase in China and the whole Asia boost the development of the region and lead the way of the world shipping industry. The CEO of Maersk Container Business Tommy Thomson told that, “8 years ago, the export volume from Europe to Asia was 83% of the import volume from Asia to Europe; as to the U.S., it was 73%. However, the years after, there happened a tremendous change that the export volume from Asia to U.S. was over 200% of that from U.S. to Asia due to the rapid development of Chinese and Asian ports”. The Euramerican ports had to cope with this bottleneck problem and face the challenge from the rising Asian, especially Chinese ports.

In recent years, the ever-increasing shipping industry encountered the unprecedented heavy losses. According to the secretary general of China Center for International Economic Exchanges (CCIEE) Wei Jianguo, the first strike should be the financial crisis, which brought about the downturn of the world economy, sharply cutting off the world trade volume, so that the shipping industry suffered a free falling from the prosperous summit, resulting in the huge capacity surplus. In the next place, the increasing trade friction and investment conflict, to a great extent, not only restricted the impetus of world trade and investment, but limited the strong rebound of the world shipping industry. In addition, the launch of the carbon tariffs and the heaps of the

fierce piracy narrowed the scale and scope of the shipping development, increasing the risk and costs of the international shipping. Nevertheless, it is put forward that while the shipping industry is facing the severe challenge during the post-crisis period, the world trade pattern has been largely changed, enabling the world shipping industry stepping into a period of structural adjustment (Liu, 2010). China used to be a good player during the time of depression, keeping the stability of Renminbi (RMB) helped to contribute a lot in the crisis and gained international power of influence by huge export volume. Also, the launch of the Free Trade Agreement (FTA) between China and the Association of Southeast Asian Nations (ASEAN) indicates that China has prepared to play a leading role in world trade pattern. At the very beginning of the new era in the shipping industry, the gravity of center has gradually transferred into China.

As a developed coastal city in China, Shanghai enjoys a large amount of competitive advantages in shipping territory. Port of Shanghai is a harmonious growing port with the potential of further development and the attraction of rational investment. With the evolution of the world economy and the booming of shipping industry, Shanghai, taking advantage of its competitiveness, has been growing vigorously in constructing the International Shipping Center for almost 12 years. Last March, the opinion of Shanghai constructing International Finance Center and International Shipping Center was officially adopted by the State Council. The comprehensive and systematic planning concerning Shanghai shipping industry has been deployed, which indicates a new economic restructure has made a figure after the depression, and Shanghai is devoting to taking the responsibility of the national mission, simultaneously preparing for the transition into a world top-the-line shipping center.

1.2 Literature Review

What on earth is the International Shipping Center, or to what extent, a port city can be entitled the International Shipping Center. Up to now, there could not be a standard

answer to it around the world. The higher and higher of containers that piled up and the ever-increasing container throughput is just one of the factors with regards to the quantity issue; the port with a huge container throughput is far from the port enjoying a world wide popularity and advanced shipping resources (“Shanghai strives to,” 2007). The International Shipping Center is more than the concept of a physical construction or the solid facility. The concept of the International Shipping Center keeps pace with the times from the very beginning; with the change of era, its pattern evolves from generation to generation, and its function develops from solo to diversification (China Water Carriage Newspaper, 2006). As the first generation of International Shipping Center, London has well developed in the consecutive reaction to the shipping services and been universally accepted for its mature shipping pattern. It is inevitable that London also experienced several times of transition to be qualified for its famous name: firstly, the separation between the port and city center; secondly, the attraction of the further investments on the old dock; thirdly, the construction of the shipping service concentrated area (Yu, 2009). Under the impetus of the rapid development of the Asian economy and trade volume, the world shipping resources, gradually cluster into East Asia, particularly into China (Economic Information Daily, 2010). Presently Shanghai is leading the way of a huge port group in the east of Asia, which indicates that Shanghai is competitive enough to step into the rank of the world top-class shipping center, by means of its good water depth and advanced superstructure. However, according to Xu Peixing, the office manager of the leading group in constructing Shanghai International Shipping Center, “it is obvious that the gap between Shanghai and other dominating port cities around the world still exists, mainly rooted in the intangible infrastructure.”

Taking no account of the container throughput and port superstructure, there also exist some factors concerning the port city competitiveness, which gave out kinds of dedicated inspiration on constructing Shanghai International Shipping Center. As Verhetsel and Sel (2009) showed that, the port city’s operational capacity is mainly due to their linkage between the shipping companies, terminal operators and

international maritime markets; it is the interrelationship with shipping companies and terminals that made London, Singapore, Hongkong, Hamburg, Shanghai, New York to be the world's leading maritime cities. Lee, Song and Ducruet (2008), by applying the cases of some Asian hub port cities, demonstrated that the globalization, transportation revolution, logistics integration and the consequent expansion of port and hinterland redefined the functions of the port cities, and brought about the new competitiveness on freight pattern. According to Low, Lam and Tang (2009), in order to improve the port performance and operation, the competitive and suitable hub port status can be assessed statistically via the formulations and some indices. Yeo, Roe and Dinwoodie (2008) compared the main port cities in Korea and China by identifying some components such as port services, hinterland conditions, transportation availability and logistics costs. With regards to the other competitive factors, the combination of the government policy, ample investment and information system are the ideal vantage in port city competition (Gordon, Lee & Lucas, 2005).

It is indispensable to analyze and carry out the valuation to the selected competitive factors when assessing the strength of the port cities, and also in the comparison among those confirmed International Shipping Centers. What is absolutely necessary to be done primarily is to define the competitive factors that are most concerned in the international background. There are many literatures involved in various aspects respectively. As to the geographical position of the port cities, Malchow and Kanafani (2004) examined some of the U.S. ports via an alternative form of the discrete choice model, and found the geographic location is the critical factor to the port selection rather than port characteristics and vessel schedule. Baird (2006) demonstrated in his work that the geographical location is the main focus to the seaport, especially the transshipment port, to optimally cater for the expanding markets. Chou (2010) by using a Fuzzy Multiple Criteria Decision-making model (FMCDM) to deal with the port comparison in southeastern Asia, evaluated several geographical related factors including transportation distances, operational costs and the qualitative conditions of existing hub locations. As for the hinterland respect, Tan (2007) examined the

economic, social and cultural prerequisites that were evolved into the maritime hinterland of the port city Singapore and Calcutta, and compared the strength and weakness of them on the dominant hinterland. Concerning the transshipment network issue, Fremont (2007) showed that the integrated port to port service and a hub and spoke transshipment system is inevitable and complementary to assure the border transportation coverage. Caris, Macharis and Janssens (2010) compared the scenarios of the discrete and multi-hub transshipment network in the port of Antwerp, in order to facilitate the handling of barges from the seaport to inland destinations. Similarly, Konings (2007) evaluated the competitiveness of the container barge transportation network for Rotterdam, and gave out that the effectiveness of the network is mainly due to the design and organization of the trunk line and allocation of the other channels.

Leaving the intrinsic factors alone, there also exist several literatures concerning intangible competitive factors that have to be taken into consideration. With regards to the trade imbalance, which brings about the fluctuation to the world shipping industry and influences the imports and exports of the port cities, it has been proved in previous literatures that the kind of trade protectionism such as antidumping (AD) will in turn restrain the AD activities proper (Blonigen & Bown, 2002), causing the adverse impact on trade between developing countries (Niels & Kate, 2006), leading to critical trade depressing and diversion phenomena (Park, 2009); on the contrary, launching the FTA which is able to weaken the interests of government on multilateral trade, strongly support the interests of the trading parties (Ornelas, 2004). As for the port investment aspect which is the support and energy to the port strength, Meersman (2005), who specialized in the investment amount that related to the specific port investment and long payback time port projects, showed that even under the uncertain conditions, kinds of investment on port infrastructure and expansion can be witnessed. Although it is still an uphill battle for the investors to put money on the real port estate after the recent depression, “Investment, in particular to provide access and berthage for large vessels, will continue to be needed”, reported by Ocean

Shipping Consultants (OSC). Furthermore, with respect to the environmental issues, Darbra, Ronza and Stojanovic (2004) developed an approach named Self Diagnosis Method to assess the management activities and procedures of the sea port, in order to enable the assessment of sea ports under environmental issues. Similarly, Saengsupavanich, Coowanitwong and Gallardo (2009) did research on the evaluation of the sea port environmental performance by integrating and establishing various performance indicators. Progoulaki and Theotokas (2010) discussed human environment in the literature, proposing that managing human resource of the shipping industry will bring about a sustainable competitive advantage. In addition, the port policy is also ones of the concerns. The common legislative framework is able to lead to a competitive port policy that could achieve the loyalty of the clients (Labajos & Blanco, 2004). The forces of the port policy are driving the development of the sea ports and simultaneously restraining its growth, therefore how the port policy shaping the industry is critical (Pettit, 2008). Besides, Wang, Ng and Olivier (2004) compared two sea port cities in China on the port policies under the situation of internationalization port management.

Making a general review of the previous literatures, it can be concluded that most of them launched a novel way of research by putting emphasis on the assessment projects of the port city competitiveness. The procedure of study, the methodology and the detailed information provided by these literatures are advisable and deserve to apply. Nevertheless, seldom have they referred to the port city competitiveness based on the worldwide scale and international level. Therefore, the further research on the competitiveness of International Shipping Center, specifically Shanghai here, should be deliberately carried out in consideration of the complexity of the competition, the universality of the competitive factors, and the uncertainty of the construction procedure.

1.3 Methodology

Given the very instrument at first, the paper is primarily aiming to decide the appropriate competitive factors for qualitative analysis; then translating them into a quantitative scenario; assessing the gap between Shanghai International Shipping Center and others via a quantitative method; intending to facilitate the decision makers of Shanghai International Shipping Center to carry on the further construction projects, to which all sides of the matter will be paid close attention.

To serve for these purposes, the paper will initially utilize the systematic classification in Michael Porter's Diamond Model to define and afterwards analyze the competitive factors, which are suitable for use in the assessments and comparisons among port cities nowadays. The Diamond Model, also called national competitive advantage model was first suggested by Michael Porter, who is the famous American scholar of strategic management. Under this model, the competitive factors are classified into six various broads for analysis, namely factor conditions; demand conditions; related and supporting industries; strategy, structure and rivalry; government; and chance [1]. By using this method, the competitiveness of Shanghai International Shipping Center can be safely and logically categorized, enabling its reasonable comparisons with other shipping centers.

Then, in order to build a bridge between the qualitative competitive factors and the quantitative expressions, the pairwise comparison matrices will be introduced to transfer the phenomena into a numeral environment, which casts off the abstract factors, enabling the pure and visible mathematic comparisons. In this very situation where multiple competitive factors are present, the Analytic Hierarchy Process (AHP) model, which was originally suggested by Professor Thomas Saaty, can be applied as a powerful tool to compare among alternatives (Winston & Albright, 1998, p. 363). It is a feasible, convenient and practical method to cope with the qualitative issues in a quantitative scenario. Firstly, the weights of the competitive factors as well as the world famous shipping centers will be determined. Through the methodization and repartition, the factors in such a complicated problem are able to be closely related

and compared in each platform. After that, check for the reliability of the weights will be carried out to make sure the inconsistencies are not critical. Finally the score will be figured out by means of the matrix multiplication.

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[1] http://www.answers.com/topic/diamond-model#cite_note-traill-1

1.4 Structure

To take a brief look, chapter one gives out an introduction to this paper, including the background of the concerned issues, the literature review of the related works, the defined methodology for the whole research procedure, the detailed structure and layout of the paper proper, and in the end, the restrictions that the author encountered during study.

From the chapter two on, the paper steps into the explicit research phases. Chapter two, overview of International Shipping Center, will pay close attention to its profile, comprising the definition of International Shipping Center, which will express how well a port city can be fully entitled that way; the pattern of International Shipping Center will state the modes of the previous shipping centers and introduce some of the representative ones; the transformation of International Shipping Center will demonstrate the historical evolution of the shipping center based on the most famous one London.

In chapter three, the competitive factors of International Shipping Center will be defined in detail. According to Michael Porter's Diamond Model, the competitiveness could be categorized into six various aspects. In this chapter, they will be embodied in the below sections respectively: specific production factor, such as geographic position, port investment and environment; market demand factor like hinterland condition; supporting industry factor as transshipment network; internal rivalry factor from domestic port city competition; policy and opportunity factor which are firmly associated with government and world trade patterns.

Chapter four intends to discuss the Shanghai International Shipping Center under current world background. The first part of it, impacts of financial crisis, is keen on the analysis of the shipping industry as well as the world shipping center in the post-crisis period; the second part, phases of construction, will give out the steps concerning Shanghai International Shipping Center construction project, and put forward some issues in the practical construction process after the depression; the third part, concerns of competitiveness, will put highlights on the competitiveness transformation of Shanghai International Shipping Center at the moment of the shipping resource reallocation.

The followed two chapters, five and six, will take care of these competitive factors in the qualitative analysis model and the quantitative assessment process respectively. Chapter five, by using the Diamond Model, allocates the factors into six related issues, evaluating the competitiveness of Shanghai International Shipping Center based on the collected facts and figures. Chapter six, by applying the AHP model, processes these competitive factors and the selected world first-class shipping centers via the pairwise comparison matrices, figuring out the score for each participant, and finally appraising the results.

Last but not least, in chapter seven, the author will raise the conclusion and show the outlook of constructing Shanghai International Shipping Center, by displaying the established competitiveness nowadays, the main objective orientation and the further mission planning about the constructions.

1.5 Restrictions

First and foremost, lack of the detailed information concerning the construction procedure of Shanghai International Shipping Center and delicate reports on port city planning were the most concerns that the author encountered during the research process. Although the author tried his utmost to ask for help on some shipping forums and send the questionnaires to the professionals, seldom has someone given a

helping hand and the feedback was nearly sent back. However, it should be largely appreciated that the author got the warmly supports to lubricate his research from his friends who go for further studies abroad, even though that is only a small number of facts and figures. There also arise some restrictions when referring to the previous literatures in hand. Having a general review on them, it can be safely concluded that most of them took care of the specific assessment projects of sea ports rather than a comparison under worldwide scale and international level. However, the methodology and the detailed information provided by these literatures are advisable and worthy of being applied. Considering the International Shipping Centers whose competitiveness are universally important and worldwide oriented, the author is fully aware of that his efforts to the present research on Shanghai International Shipping Center is quite a challenging one with existing materials and few support from the industry. But it is the very fact that encourages the author to carry on this research, and gain the motivation to launch the further study in the future.

Chapter 2 Overview of International Shipping Center

2.1 Definition of International Shipping Center

It is possible that the standard answer to what on earth is the International Shipping Center does not exist even towards nowadays. If concerned on the port scale and total container throughput, Shanghai has been undisputable to step into the rank of the world's top level sea ports, because there are very few ports left to handle over 20 million twenty-foot equivalent units (TEU) per annum all around the world. However, the piles of the containers is just the concept base on quantity, which is not able to entitle a sea port the world's top level shipping center. Although there is no such a standard answer concerning the definition of the International Shipping Center, it has widely and largely been approved that some of the required factors are deemed to be the prerequisites, such as the ample supply of goods, the rapid port collection and

transmission system which is established upon the port infrastructures, the collective shipping resources, the sophisticated shipping service functions, the well-informed shipping information, and the qualified shipping policies. Besides, the capabilities to actively make the world's shipping regulations, as well as the environment to proactively lead the way of the worldwide shipping industry are the most significant factors for the shipping centers to be the wind vane ("Shanghai strives to," 2007).

Taking London for example, it can be safely witnessed that even though the annual container throughput achieves only several million TEU, ranked out of world's 10, but as to the whole shipping industry, London is the well-acknowledged International Shipping Center, and beyond controversy the industry's pricing center as well. Compared with the Baltic Dry Index (BDI), which was initially published by the London Shipping Exchange and has went through one-century history, the index of Chinese costal import and export containers, which was daily published by Shanghai Shipping Exchange, enjoys the lower qualification and less influence, even if it has been one of the world's main shipping indexes and generally taken into consideration by the industry. Anyway, London to the shipping industry is Wall Street to the financial world, every tiny movement of it dramatically affecting the whole industry all over the world. Figure 1 depicts the worldwide coverage of shipping service functions held by London International Shipping Center, where 20% of the world's ship classification societies are resident; 50% of world's tanker charting business, and 40% of world's bulk carrier charting business are proceeding; 18% scale of ship financing and 20% amount of maritime insurance are located.

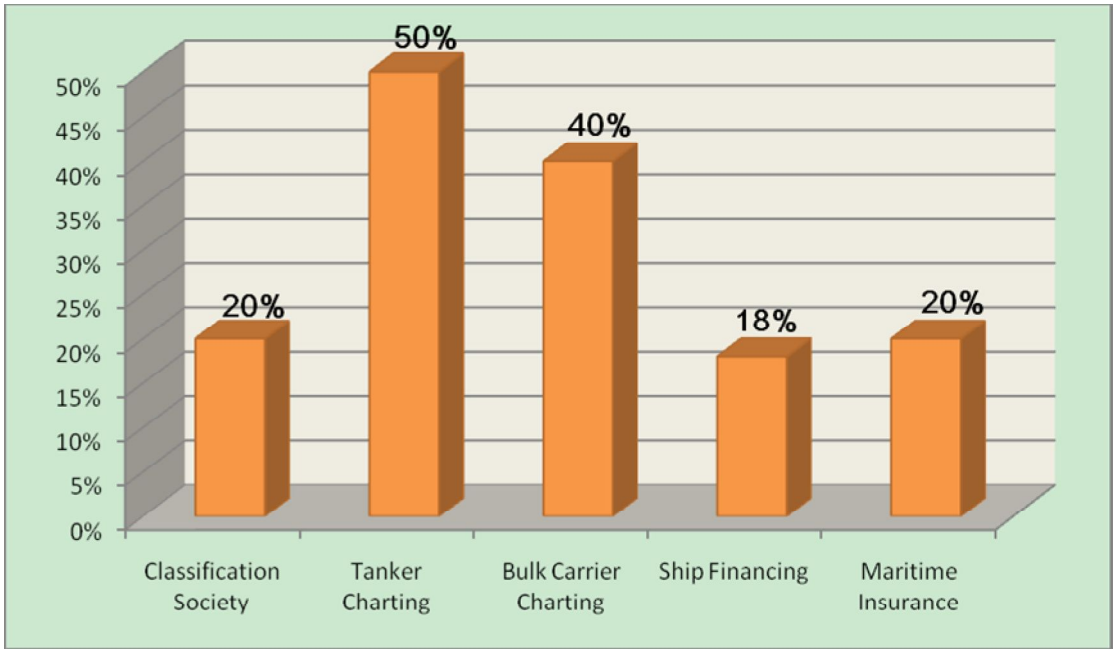

Figure 1－Worldwide Coverage of Shipping Service Functions Held by London International Shipping Center

Source: Drawn by the Author © Liu Chenkai WMU-SMU, (ITL2010), by using Excel Software, and based on Shanghai strives to construct the International Shipping Center, (2007).
http://www.sheitc.gov.cn/sheitc/jsp/jjzx/jjzx_content.jsp?id=20081&num=23-2-6

Similarly, Hongkong is also one of the acknowledged International Shipping Centers. In addition to the prominent container throughput annually, the level of ship operation and ship management could be second to none in the whole industry. Up to now, the fleet it holds and takes care of has been over 6% of the world's shipping capacity, enabling Hongkong to enjoy large amount of revenue from shipping register per year.

2.2 Pattern of International Shipping Center

Generally speaking, there are three common patterns existing among the International Shipping Centers around the world ("The pattern and function," 2006). First, the International Shipping Center that is destined for market transactions and shipping services providing. Such kind of shipping center was developed under centuries-old historical tradition and human culture, and is exclusive for London International Shipping Center. Second is the hinterland-oriented International

Shipping Center, which is aiming to collect and distribute the goods. Rotterdam and New York International Shipping Center that are keen on the hinterland transportation services can be categorized into this sort. Third, the International Shipping Center for transshipment services, such as Hongkong and Singapore shipping centers.

Paying more attention to these International Shipping Centers, it can be safely concluded that with the transition of history, the original selection of the basic pattern and functions for these shipping centers appears to be more stable than other sea ports. For example, Rotterdam and New York International Shipping Center are always focusing on the hinterland aspects, while Hongkong and Singapore International Shipping Center are majoring in the transshipment services. It indicates that the geographic location of the sea ports is the critical factor to shape the pattern and develop the functions of the International Shipping Center. As for those transshipment International Shipping Centers, in addition to their geographic locations, advanced transit trade and supported policy for Free Trade Zone (FTZ) are also the promoting factors.

International Shipping Center is a concept that keeps pace with times, which was given birth at the very beginning, gradually grew from generation to generation with the movement of the time. The first generation of it mainly took care of the goods collection and distribution, as well as some of the transshipment services; the following generation witnessed a value-added processing service for the collected and transmitted goods; the third generation not only remained the previous service functions, but also acquired the integrated resource allocation system in order to optimize the productivity within a border range. As a promising outlook, the fourth generation of the International Shipping Center will expose to the low-carbon and intelligent network-based pattern, so that the environment-friendly and hub-and-spoke shipping centers are able to make debut around the corner (Zhuang, 2010).

2.3 Transformation of International Shipping Center

London, whose linkage shipping services have been mature nowadays, used to be the first generation of the International Shipping Center. The main body of its port had already been removed outwards the city and far from the town center since the very beginning. Although London is ranked out of 100th among the world's container ports at present, with its physical functions declined, it still stands for the neuron of the world shipping network, the incontrovertible shipping pricing and administrative center, creating more benefits in shipping services than in the traditional functions of the sea port. Despite the versatility and complexity, the successful achievement of the perfect transformation of London International Shipping Center can be attributed to the following factors, which symbolize the transformation milestone of the International Shipping Centers and provide some critical inspiration for the later generations.

2.3.1 Separation between Port and City

By the end of the 19th century, London port area had been one of the largest zones for port administrative affairs. In 1940s, the infrastructures of London port was removed eastward, located at the downstream of Tilbury, which is 40km away from the city center (See Figure 2). Thereafter, two port areas nearby the city were closed in succession, forming the pattern of port-and-city separation. For the sake of the berthing requirement of the container vessels, a container hub port had been constructing since 1967 at Felixtowe, north of Times and 100km away from London center. Since the year 1990, the port of Times had been under construction 56km from downtown, and the original port area within the city was took over by commercial business places, recreation areas and housing estates. At the same time, the intangible infrastructures for the upstream shipping services, such as ship financing, marine insurance and maritime arbitration, was grown up in the urban area by relying on the Baltic Exchange [2].

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[2] http://port.sol.com.cn/result.asp?id=clbji

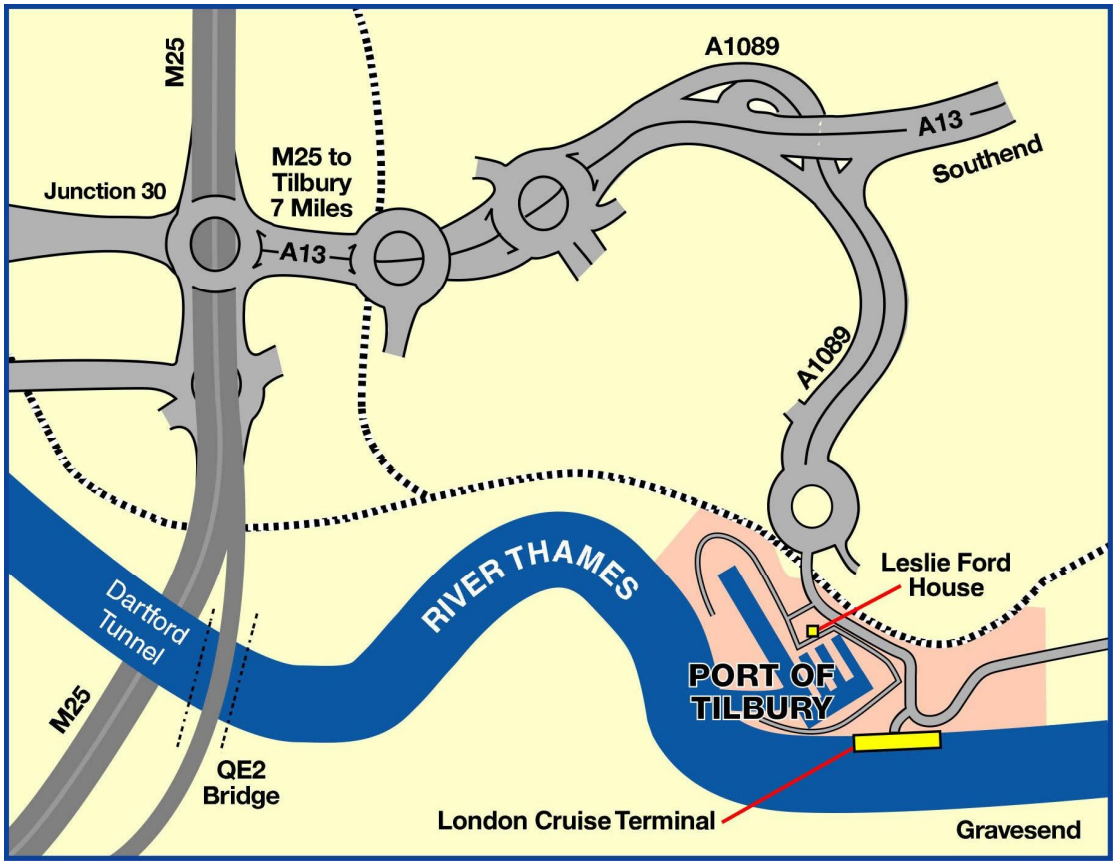

Figure 2—Port of Tilbury
Source: London Cruise Terminal, (2010). Port of Tilbury.
http://www.londoncruiseterminal.com/Maps/comm_tilbury_map_large_version.jpg

2.3.2 Attraction of Reasonable Investment

After World War II, under the declining stage of entire British industry, the old port areas of London could no longer meet the requirements from the new marine technology and traffic communication. The British government authorized some port development companies to carry out the new planning for the declining port areas through the reasonable port policies. The duration of the total development lasted for 17 years, from 1981 to 1998 [3]. In order to promote the development process, the government put into large amount of capitals initially, so that the land upvaluation could be witnessed quickly. The amount of money was used for the land purchase and formation, environmental remediation, infrastructure construction and transport facilities, including an unmanned light railway system and London city airport (Yu,

2009). Moreover, based upon the land upvaluation strategy for port areas, the government published several port preferential policies to attract more private capitals for the port construction program. Thanks to the policies and reasonable investment, the port areas of London regained its energy and gradually developed into an integrated area with financial, commercial and business service functions. This successful transformation of London International Shipping Center not only helped the city out of the industry recession, but also achieved the target of economic restructure by means of the attraction of reasonable investment, so as to enable the development of the London port areas under the situation of government financial difficulties.

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[3] http://port.sol.com.cn/result.asp?id=clbji

2.3.3 Construction of Service Zone

As the most centuried International shipping service center, London is the successful example for constructing the integrated shipping service zone. The separation between port and city was firstly applied at 1940s to transfer the port infrastructures into the downstream area of Tilbury, and following was the development of shipping related services within the city relying on Baltic Exchange, including ship financing, marine insurance and maritime arbitration. Nowadays, these services have become the world brand in shipping industry, with thousands of service businesses engaged in the scale. London, depending on its prosperous shipping service industry, still holds the leading role among the International Shipping Centers. Approximately half of the ship transaction business around the world happened in London, in which several International shipping organization are gathered together, such as International Maritime Organization (IMO), International Shipping Federation (ISF), International Cargo Handling Coordination Association (ICHCA), Baltic and International Maritime Conference (BIMCO), and Baltic Exchange (Yu, 2009).

The construction of Shanghai International Shipping Center was officially launched at

the year 1996, and took over 10 years to get through the transformation processes, achieving the level of world top container port. While London has been gradually declining in its hard power, namely port infrastructures and shipping. Nevertheless, its soft power is able to remain for a long time, covering the shortcomings on throughput, so that the supreme status of London among International Shipping Centers is well preserved.

Chapter 3 Definition of Competitive Factors

In this chapter, the relevant competitive factors of International Shipping Center will be defined in detail. On the basis of Michael Porter's Diamond Model, the competitiveness of industry could be categorized into four various broads which are bidirectional, plus two variables (See Figure 3). They will be embodied within the shipping industry realm respectively at the following sections: the specific production factor, such as geographic position, port investment and environment; market demand factor just as hinterland condition; supporting industry factor like transshipment network; existing rivalry factor from domestic port city competition; policy and opportunity factor which are tightly associated with government and world trade patterns.

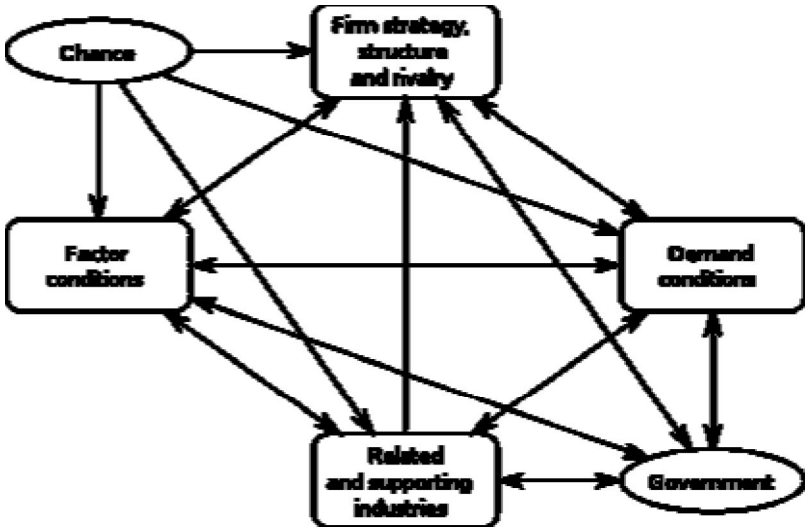

Figure 3－Michael Porter's Diamond Model
Source: Answers.com, (2010). The Porter Diamond.
http://www.answers.com/topic/diamond-model#cite_note-traill-1

3.1 Specific Production Factor

Michael Porter divided the specific production factors into two sorts, namely primary production factors and advanced production factors. The primary production factors include natural resources, climate, geographic position, unskilled workers and fund; advanced production factors compromise modern communication system, information, infrastructures, educated manpower and research institutions (Porter, 2009). It is obvious that the need for primary production factors in the shipping industry becomes lower and lower, since the reallocation of such basic resources is enabled by the global network flow, except for those which are keenly subject to the original natural features, like the geographic position of the sea port. As for the advanced production factors, it is incontrovertible that they are critical to the acquirement of competitive advantages. The prerequisites of gaining the advanced production factors are greatly base upon the inputs of capitals and manpower. Reasonable port investment should be taken into consideration when creating a continuous and abundant capital flow for the International Shipping Center construction. What are also required should be the sufficient and qualified manpower, as well as an environment, in which such talented people are well developed at the research institutions through the tailor-made educational planning.

3.2 Market Demand Factor

Market demand factor, especially the demand from internal and domestic market is the motive power for industry development. Different from the International market, domestic market is a shortcut to quickly seek for the real customer demand as the driving force of competition. The fierce global competition within the shipping industry by no means affects the significance of domestic market. Therefore, the hinterland of

the International Shipping Center is the very beginning and the niche market where the competition started, and obviously the global competitors perform not as good as the local one in local economic hinterland.

It is pointed out by Michael Porter that “the nature of the local customer is critical to the global competition, particularly those professional and captious customers. If they are demanding in some specific areas, the competitive advantage will be easily generated when satisfying their requirements on a higher level”. As to the competition among International Shipping Centers, the good services to the hinterlands are the foundation to shape their future characteristics and the cornerstone to acquire the competitive advantages. After serving the economic hinterland for a long period, the pattern and the regional impact of the potential International Shipping Center will achieve the broadly-accepted extent and well-acknowledged level. In addition, the hinterland of the local shipping center could provide an expected demand for the sophisticated shipping service functions in advance. Consequently, the hinterland is proved to be one of the competitive factors, in that it helps the International Shipping Center to take over the local markets of others when its coverage grows wider and wider.

3.3 Supporting Industry Factor

As to the formation of national competitive advantage, supporting and related industries go through thick and thin together with the competitive industry. It is reminded by Michael Porter that “the condition of industries cluster should largely be paid attention to, since the competitive industry cannot stand alone, but rise abruptly with the mighty supporting industries”. In terms of the shipping industry, the supply of the supporting logistics services is the indispensible linkage in the International transshipment network, and the absolutely necessary supporter in the process of industrial innovation and promotion. Therefore, the first-class logistics service providers, and the connections between upstream and downstream industries could

be the lifeblood in the whole International transshipment network of International Shipping Centers. They exist side by side and play a part together to acquire the competitive advantages in the shipping industry; on the contrary, the competitive domestic shipping industry is bound to lead the way for its supporting and related domestic industries.

China, as one of the developing countries, usually puts together the advanced resources, in addition the development of one industry always takes precedence over other industries, so that the result of unreinforced break-through in one is at the expense of others and the beloved industry is unable to outshine the external competitors without the help from supporting ones. Consequently, the further development of the International Shipping Center in China should tightly focus on the co-development with internal supporting industries, especially the logistics service industry; to some extent, even though the shipping industry has not yet been well-developed in China, a positive International impact can be witnessed if only the upstream logistics service providers have gained the competitive advantages over the global competitors.

3.4 Internal Rivalry Factor

Michael Porter put forward that “the impetus that boosts the industry to participate in the fierce global competition is of great importance, which might be pulled by the International demand, or on the other hand pushed by the local market and the pressure from the internal competitors”. What can be safely concluded is that the most connection factor of creating and maintaining the industry competitive advantage should be the formidable rivalry at the domestic market. As for the International Shipping Center, the challenge from the other domestic sea ports is the main factor that continuously helps intensify the competitiveness of its own. However, it seems to conflict with the traditional concept, which held that the fierce competition among the domestic competitors in the shipping industry will cause the excessive consumption of

the shipping resources, impeding the construction of the economy of scale, lowering the efficiency of the total internal shipping operations, and making it disable to contend against the foreign merchants. Nevertheless, after carrying on the researches among 10 various nations, Michael Porter discovered that the powerful domestic competitors generally exist in the industries that have strong International competitiveness (Porter, 2009). The sea ports must get through the process of fierce domestic competitions, which force them to launch the improvement and innovation, and then to widen and extend the coverage of their impacts at the overseas markets, so as to successfully make a qualitative change into the regional or International Shipping Centers.

3.5 Policy and Opportunity Factor

Government policy factor has impact on each of the above four competitive factors, namely the specific production factor which concerns with the resources; the market demand factor that puts emphasis on the internal and domestic market; the supporting industry factor, from which the competitive industry will be benefit; the internal rivalry factor that is indispensible for the industry promotion, at local, regional or International level. Development opportunity factors are those events that cannot be controlled internally, and are one of the competitive factors that decide the gain and loss.

3.5.1 Government Policy Factor

As pointed out by Michael Porter that “even if the government is equipped with the excellent public functionaries, it could not be determined which industry should be developed appropriately, and to what extent the competitive advantage of the industry has to be achieved”. Put it into the shipping industry, it can be easily seen that the government is not the real participant but the decision maker in the competition of the International Shipping Centers. What the government has to do is just to publish the

relevant port policies, by which the shipping resources can be reasonably allocated and the proper environment for industry progress can be commendably created, and finally these policies will be embodied into the specific competitiveness by the real participants.

The port policies could create the new development opportunities and pressures simultaneously, namely the external costs of the competition. For example, the land reclamation of the port, the construction of the port infrastructures, the fund for subsidizing the involved shipping companies, and the provision of the shipping information platform, are the government's duties to expand and enlarge the other four competitive factors. With the forceful port policies, the production factors such as the vessels and cargo handling equipments are able to be reasonably assigned and allocated within the region; part of the shipping market demand will be in the charge of the government procurement, which is in favor of the competition and innovation; the industry cluster can be reinforced by the government policies for the co-development of supporting industries; above all, the domestic shipping market is assured to be activated as a race condition through the government port policies and the regulations of fair competition, in order to avoid the monopoly situation.

3.5.2 Development Opportunity Factor

The development opportunities might be encountered rather than prayed, and could influence the change of above four competitive factors. Michael Porter listed some of the possible conditions that are likely to form the opportunities: "the invention and creation of the fundamental technology, the faultage of the traditional techniques, the increased production costs resulted from the external cause such as oil crisis, the marvelous change from the financial market and exchange rate, the leap of the market demand, the significant decision from the government policies, and the war". Making a general review of the current situation, it can be found that the trade imbalance is both the bottleneck and the windfall that has a profound and lasting

impact on the shipping industry, especially on the liner shipping, since it is highly sensitive to the regional and International trade volatility. However, the opportunity is bidirectional, when the new shipping center gains the advantages by chance, the previous one can do nothing but face the bleak shipping market; only those centers who have the capabilities to satisfy the emerging shipping market demand, could grip and develop the opportunities all over the world.

Chapter 4 Shanghai International Shipping Center under World Background

At the present time, the world shipping industry is still in the downturn of the financial crisis. The decreased freight rates, the surplus in the vessel supply and the recession of the world trade is continuous to oppress the world shipping industry, so that the strong rebound of the whole industry is hard to be witnessed in the year 2010. As the professor Liu Bing, who comes from the Institute of World Economics of Daliann Maritime University, said that “the world port and shipping industry is going to display an ‘L’ growing tendency within a long period of time in the future”.

The condition of the current shipping industry is largely due to three factors, namely freight rates, ship supply and trade. As to the freight rates, especially that of the container vessels, a downwards trend of the Chinese export container freight rates have been clearly seen since the second half of the year 2008. Up to now, it is a common sense that the freight rates should be increased gradually; however, because of the internal fierce competitions and supply issues, raising the price has already been the wishful thing among the whole shipping industry. The freight rates are not able to rise dramatically this year. As for the ship supply, Lloyd’s List told that: “the delivery of vessel reached at the peak in the year 2009, with almost 10 million tonne of the capacity put into the shipping market”. Thanks to the demolition and surplus capacities removing, the freight rates were balanced temporarily rather than

continuously downwards. For that reason, the oversupply of the shipping capacity will not change substantially in a long while, neither for the freight rates. In terms of the trade issue, if the three economic entities Europe, America and Japan cannot show any sign of recovery, the world trade will keep silence all the way, consequently, the trend of the world shipping industry is only to be effected slightly.

4.1 Impacts of Financial Crisis

4.1.1 The Integrative Recombination of Shipping Industry

In recent years, the booming shipping market increased the orders of shipbuilding at the ship owners' side. The newly-built vessels were greatly coming into services, so as to result in the situation of surplus shipping capacities. Even though removing the demand factors about the shipping market, the industry is bound to get through the downward period of time and the phase of adjustment, in that the oversupply of the shipping capacity largely outnumbered the real market demand, causing the serious unbalance between two factors. One disaster after another, the financial crisis, which broke out at the late 2008, made the plummet of shipping industry accelerated. Under the double strike from the decreased freight demand and the surplus of the shipping capacity, the operational condition of the shipping business get from bad to worse.

According to the CEO of China's Sinotrans Group Company, Li Zhen, "it is feeble for the industry to recover from the recession currently owing to the surplus market pattern and the property of the shipping industry". Just before the crisis, the industry enjoyed a positive situation, in which the expanding was at the high speed, with increasing shipbuilding orders, leading to the serious capacity surplus. Nowadays, although the new orders are at a decreasing pace to avoid the shipping crisis in advance, it is obvious that the number of vessel delivery will be increased within several years time. Most probably, the growth of the capacity supply could still be faster than the market demand, even if the world trade takes a turn for the better,

continuously restraining the recovery and the flourishing of the industry. Moreover, since the shipping industry is capital and technique intensive, the laggard shipping capacities and shipbuilding techniques lengthen the replacement period; it is really hard to weed out these bottlenecks from the high investment and high risk shipping markets currently. Therefore, it is agonizing to make an essential recovery from the downwards and stagnant situation of the industry.

Simultaneously, the financial crisis led to a great change in the world trade pattern, which resulted in a structural adjustment period of the world shipping industry. The laggard shipping capacities is deemed to be eliminated by the large scale merger and acquisition, as well as the integrative recombination. Li Zhen put it in that way: “after crisis, the world shipping industry step into the monopolistic competition, in which China is aiming to promote the International competitiveness, secure the maritime transport, and above all, integrate the shipping resources as an irresistible proceeding”.

Looking back upon the history, the shipping integrative recombination is the main trend of the market; particularly the shipping alliance is able to lower the total internal costs, spread the risk and increase the competitiveness (Cariou, 2000). During the downturn, it is inevitable for the shipping industry to closely cooperate with the downstream logistics industry and cargo owners, sharing the shipping resources and information; in addition it is absolutely necessary to build the strong relationship between each shipping company and each logistics service provider, in order to achieve all-win cooperation in the post-crisis period, even if some of them are existing opponents. Presently, among the world 20 largest shipping lines, except for the top three, almost the rest of them are launching the large scale shipping alliance in the three eastward and westward trunk lines (See Table 1). Even the Maersk, MSC and CMA-CGM developed a series of ship route cooperation in some regions with other shipping lines.

Alliance Group	Participating Line	Transpacific	Number of Sailings per Week Asia-Europe	Transatlanti	Slot capacity (TEUs)	# Ships
Grand Alliance	P&O Nedlloyd NYK Hapag-Lloyd OOCL	West Coast 6 East Coast 2	7	2	645,748	278
Maersk Sea-Land		West Coast 5 East Coast 3	4	6	544,558	228
New World Allia	APL-NOL MOL Hyundai	West Coast 9 East Coast 1	4	1	447,358	178
United Alliance	Hanjin DSR-Senator Cho Yang * UASC	West Coast 8 East Coast 1	5	2	342,566	152
Cosco/K Line/Yangming		West Coast 7 East Coast 1	4	3	380,689	207
Evergreen		West Coast 5 East Coast 2	3	1	311,951	132

Table 1—Non-alliance and Alliance Carriers on Three Trunk Lines
Source: Muller, G. (2009). Carrier Rates, Alliances/Consortium. Retrieved from the unpublished PPT of Prof. Muller, G.

4.1.2 The Transition of International Shipping Center

With the rapid development of Asia economy and trade, the regional shipping industry grows by leaps and bounds, so that the global shipping resources gradually gathered into Asia area, with the focus on East Asia and center gravity in China. At the present time, three International Shipping Centers, which are respectively depended on Bohai Bay, Yangtze River Delta and Pearl River Delta, are under construction in China. In detail, the northern International Shipping Center in China is supported by the port of Tianjin, Dalian and Qingdao; the Shanghai International Shipping Center is based on the port of Shanghai and backed by Jiangsu and Zhejiang Provinces; the Hongkong International Shipping Center is established upon the port of Shenzhen, Guangzhou and Hongkong proper (The International Shipping Center transferred into China, 2010). The transition and layout of International Shipping Centers in China complies with the concept that the world financial center has also been removed eastwards, in order to satisfy the rapid development of China.

According to the suggestions from Qian Yongchang, the president of China Communications and Transportation Association, the countermeasures to the development of Chinese shipping industry in the post-crisis period should be: “first, getting a clear picture of the current shipping industry, identifying the competitiveness, grabbing the opportunity at the new starting point, and contributing the strength together for the industry; second, continuously maintaining and supporting the macroeconomic policies; third, preparing in advance for the situation that the developed countries imposes carbon tariffs on China; forth, launching and publishing new policies which aim to encourage the integrative recombination of domestic shipping businesses”.

4.2 Phases of Construction

4.2.1 System-driven Phase

The whole 90s of last century witnessed the system-driven phase of constructing Shanghai International Shipping Center. In this phase, the main target of Shanghai is to satisfy the requirements of Pudong area development and opening up, achieve the leading role in economy within Yangtze valley, and become International economic, financial and trade center. Then it was able to put forward the plan of constructing Shanghai International Shipping Center, as well as to provide the assumption and further planning based on the local and national level. As pointed out by the central collective leadership in 1995 that “the construction of Shanghai International Shipping Center is the key to the development of Pudong area, the promotion to build Shanghai economic center, and the exploitation to the whole Yangtze valley”. Just in the same year, it was conceived to build a deep water port at the Yangshan island where is 30km away from Luchao port in Shanghai Nanhui District. In the year 1996, the final option of the construction was officially adopted by the State Council, so that the program of constructing Shanghai International Shipping Center, which is based on Shanghai deep water port and supported by the ports cluster in Jiangsu, Zhejiang

Province, was formally launched. By the end of 1997, the construction leading group in Shanghai area, Shanghai Shipping Exchange, and Shanghai Combinational Ports System Management Committee had been established (Yu, 2009). Consequently, Shanghai International Shipping Center step into the system-driven phase. However, due to the poor foreign trade of China at that time, and the difficulty to handle competitions within Yangtze Delta area, the construction of Shanghai International Shipping Center did not make the headline compared with the constructions of other centers.

4.2.2 Market-driven Phase

The market-driven phase of constructing Shanghai International Shipping Center began after China gained the membership of the World Trade Organization (WTO), and ended before the break out of global financial crisis in the year 2008. There is no doubt that China entering the WTO is a big step to actively participate in the global competitions, and be the forefront of world trading countries, with its Gross Domestic Product (GDP) ranked number two around the world. In that period, Shanghai and the whole Yangtze Delta area led the way in foreign investment and foreign trade nationwide; simultaneously, the development climax of Shanghai shipping industry was proved by the facts that port of Shanghai achieved the world top cargo port in 2005, and the container throughput of Shanghai port reached number two in the world in the year 2007 (Yu, 2009). It can be safely figured out that the actual reason why the construction of Shanghai International Shipping Center was highly promoted is mainly due to the processing trade pattern of China, as well as the market power which is brought by the status of China in global system, rather than the launch of Yangshan Port area project, which is the first bonded port area of China. On the other side, although the coordination and cooperation mechanism was originally established among the port administrative authorities, the regionalization of labor division and the collaboration of port cluster have not yet been effectively solved, and the competition between port cities became even more violent.

4.2.3 Transformation and Promotion Phase

The period after world financial crisis till the year 2020 should be the third phase of Shanghai International Shipping Center construction, namely the transformation and promotion phase. The 2008 global financial crisis that ignited by the U.S. subprime lending crisis inflicted heavy losses on world shipping industry. Just like the virtual property bubble, credit demand bubble and surplus production bubble in this financial downturn, the world shipping industry also experienced a phase of borrowed boom. Before the year 2008, the longest flourishing period in world shipping industry, which lasted for almost 6 years, has been witnessed since the beginning of history (Yu, 2009). However, followed the recession period of world economy, the global trade activities entered another depression, even though the world shipping industry that always has apparent periodicity sharply turned to the winter period. It can be seen obviously from the steep fall of the world freight rates index, which was largely affected by the decreased global trade volume. In such a background, there is no doubt that the construction of Shanghai International Shipping Center has to satisfy the higher requirements and objectives, which have already been proposed by the State Government in construction opinion. In order to achieve the expedited transformation targets of Shanghai International Shipping Center, and undertake the service promotion objectives, Shanghai is required to integrate the shipping resources in Yangtze Delta area, refine the overall arrangement of shipping services provision, exploit and establish the comprehensive pilot zones for world shipping development, proactively and appropriately launch the shipping finance services as well as multiple financial methods, gear up and standardize the development of passenger liner industry, become the well-acknowledged International Shipping Center with the capability for shipping resources allocation worldwide (Xie, 2009).

4.3 Concerns of Competitiveness

For the sake of the transformation of Shanghai International Shipping Center, and the

new capabilities to reallocate the global shipping resources, there arise three major concerns about the competitiveness achievements: firstly, the advancement of development patterns; secondly, the breakthrough of resource allocations; thirdly, the reception of high-end shipping services.

4.3.1 Advancement of Development Patterns

First and foremost, in order to acquire the competitive advantage in world shipping industry, it is necessary and inevitable for Shanghai to put emphasis on the advancement of development patterns, so as to increase the profit margin of Shanghai International Shipping Center, and enable the join forces between the constructions of two centers, namely financial and shipping centers in Shanghai.

The port development is closely related to the level of local manufacturing industry, and changes with its transition. At present, the rapid development of Shanghai port manufacturing industry is just about the forth industry tendency after port of London, New York and various ports in East Asia, greatly affecting world shipping history and global port operational patterns. However, as discussed, the pattern of International Shipping Center is an evolutional concept; the track of its development always changes accordingly with the promotion and transformation of world economy as well as the technological revolution. Seen from London, the experience told that the key to maintain and develop the competitiveness of Intentional Shipping center is to pay attention to the shipping service functions. Similarly, the cities with the world-class sea port or first-class shipping companies, started to put forth efforts on the establishment of shipping soft power in recent years, endeavoring to build the International Shipping Center and acquire sufficient shipping resources before the decline of their hard competitiveness. For example, in 2008, the Economic Coordination Committee of Korea government put forward that: the transformation of port of Busan should focus on the new target of “global logistics network services strategy”, instead of the original “Northeast Asia transportation hub” program; port of Gaoxiong in Chinese Taiwan

Province, revised its objective of “overseas transshipment center” to “regional logistics services center” (Yu, 2009). Such kind of advancements in port development patterns reflected that the quantitative-oriented expanding scale has gradually converted into the transformation, which is mainly based upon the shipping service quality and port effectiveness.

It is not the coincidence that Shanghai International Financial Center and Shanghai International Shipping Center are constructed simultaneously. As proved by history development, world financial centers are always accompanied by the shipping centers; the former is rooted in the world trade volume that brought by shipping industry, and the latter is depend on the support of developed financial industry. It can be seen clearly that the famous International Shipping Centers such as London, New York, Tokyo, Singapore and Hongkong are also well-known International Financial Centers. The developed financial industry of these shipping centers is able to solve the monetary problems for local shipping companies and ports, giving full play to the shipping investment, ship finance, balance accounts and maritime insurance; in return, the shipping activities proper largely help to ensure the fund flow worldwide. Consequently, an appropriate environment of financial services could make it guaranteed that the shipping industry is bound to be prosperous, so that the join forces between the constructions of two centers in Shanghai should be highlighted, with great efforts to develop maritime insurance, ship chartering, and shipping trust services, establish the integrated service zones.

4.3.2 Breakthrough of Resource Allocations

The second prerequisite for Shanghai to gain the competitive advantage is to break down the walls that barricade the integration of shipping industry in Yangtze Delta area, achieving the target of shipping resource allocations in this region. As proved by the practices of foreign ports, the integration of shipping resources could dramatically promote the economic concentration and the ability to develop shipping derivatives. In

this situation, it can be seen from these port cities that the original layout of passive productions converted into the active ones, and their excessive dependence on the hinterland shipping resources was replaced by the application of integrated shipping resources home and abroad, creating neonatal economic growth points and brand new industry chains. These countries used to establish the specific multi-zone administrations, in order to increase the whole competitiveness of the port cluster and break down the adverse impact that brought by the division of administrative districts.

Although the administrative committee of Shanghai combinatorial ports system was established in early 1997, the obligation that the State Government authorized to the system did not work well; moreover, the regime of administrative cooperation within Yangtze Delta area that signed in September 2009 was still short of the essential power and operational regulations (Yu, 2009). Therefore, one way for Shanghai International Shipping Center to achieve the competitive advantages is to proactively integrate the shipping resources in Yangtze Delta region, refine the task allocation of service functions, promote the regional development of shipping industry based on the nationwide level, and depend on the real conditions and foundations that provided by the economic situation of Jiangsu and Zhejiang Provinces in the post-crisis period.

4.3.3 Reception of High-end Shipping Services

Last but not least, the further concern of competitiveness could be the capabilities for Shanghai International Shipping Center to prepare for the reception of high-end shipping services, which is destined to transit into Yangtze Delta area. At present, there exists the mismatching status of world shipping industry. In general, because of the transition of global manufacturing industry and world trade, the center of shipping industry is located in Asia, especially in China; however, the global shipping services center is always seated in Europe, so it is too far away for Shanghai International Shipping Center to be able to manipulate the overall situation. Nevertheless, due to the higher and higher housing price and income in London, the shipping service costs

have been increasingly upwards. One of the port research reports showed that: “port of London is bound to loss its superiority in shipping service functions within 10 to 20 years in the further”. Consequently, the high-end shipping services are most probably to transit into Asia owing to its strong hard power, and there is no doubt that China will be the first choice to enjoy such an eastward transition.

Although there still exist some tricky and outstanding issues in constructing the Shanghai International Shipping Center, such as the development of shipping service functions and the establishment of the lagging soft power; on the other hand, those well-known International Shipping Centers have already achieved the inborn and acquired competitive factors for a long period of time; Shanghai is firmly grasping the opportunity of this eastward transition, laying out an anchor to whirlwind so as to complete the hardware construction of International Shipping Center, and become the world top sea port on total throughput when developing the soft power simultaneously. For this purpose, it is indispensable to base on the Yangtze Delta hinterland, depend on the rapid development of national and regional economy, and rely on the equipped talent in both shipping and financial aspects; but what is necessary to be paid attention to is that the strong and direct competitions from other potential shipping centers are still the huge challenges, even if they share the experiences and resources during the transformation process of Shanghai International Shipping Center.

Chapter 5 Qualitative Analysis on Competitiveness of Shanghai International Shipping Center by using Diamond Model

5.1 Factor Conditions Issue

Before establishing the powerful and everlasting competitiveness in world shipping

industry, it is indispensible for Shanghai to develop the production factors, particularly the advanced production factors, whose availability and sophistication mainly affect the quality of the competitive advantages. If the competitiveness of Shanghai International Shipping Center has been built on the primary production factors for a long while, it would not be stable enough to maintain the established advantages; however, the primary production factor is the foundation for all constructions.

5.1.1 Geographic Position Factor

One of the primary production factors that should be taken into consideration is the geographic position of Shanghai International Shipping Center, which is located at the intersection of the Yangtze Delta coastal area and the Yangtze River proper. This predominant geographic position provides Shanghai with specific resources in the development of shipping industry. The Shanghai International Shipping Center that centered in Shanghai, starting from Lianyungang in north area to port of Wenzhou in south, and extending westward to port of Nanjing (See Figure 4), has already been the large scale port cluster; the multi-function shipping service zone; and influential strategic rear, where the scale of economy that brought by the booming shipping industry can be witnessed. Moreover, the Yangshan Deep Water Port, which is seated outside the Hangzhou Bay and connects with the advanced transportation network in Shanghai (See Figure 5), is able to give play to the expanded economic hinterland of Shanghai and sufficient box sources.

Figure 4—The Influence Basin of Shanghai International Shipping Center
Source: Marked by the Author © Liu Chenkai WMU-SMU, (ITL2010) based on the Map of Coastal Ports in China, (2010).
http://news.xinhuanet.com/politics/2006-09/14/xin_1620903151433953257665.jpg

Figure 5—Location of Yangshan Deep Water Port
Source: Marked by the Author © Liu Chenkai WMU-SMU, (ITL2010) based on the Map of Yangshan Deep Water Port Location, (2010).
http://www.sgict.com.cn/gdweb/UserFiles//image/map.jpg

5.1.2 Port Investment Factor

Thereafter, it is indispensable to maintain and expand the competitiveness of Shanghai International Shipping Center by developing the advanced production factors. One advanced factor that once enabled the further development of London International Shipping Center, and lubricates the whole construction plan of Shanghai International Shipping Center in the previous years should be the port investment. However, it can be clearly seen that the investment on the port sector, whether from investment banks or private equity funds, was not immune to the bubble economy at the end of the year 2008; particularly, the deterioration of Dubai Port World (DP World) reflected the high risks of port investment (Hailey, 2009). The sudden termination of the bubble economy was the grievous news for those investors who had paid several times earnings before interest, taxes, depreciation and amortization (EBITDA) for

some of the most important port real estate. Many preferred to follow the assumptions that the industry would bounce back and the market would return to previous levels, while many somewhat backslid from the expansion planning.

As reported by OSC that: “port investment, in particular to provide access and berthage for larger vessels, will continue to be needed”. Before and after the world financial crisis, it can be safely witnessed that the money put on the deep water channel for Shanghai International Shipping Center is a reasonable and timely port investment program. According to Weng Mengyong, who is the vice minister of Chinese Ministry of Transport, “this program attracted the most investment, carried on the largest and most complicated project, and lasted for the longest time in Chinese port constructions”. This both-way deep water channel starts from the East China Sea to Shanghai Waigaoqiao (WGQ) port, with approximately 92.2km in length, 350 to 400m in width, and 12.5m in depth [4]. Once completed, the third, fourth generation container ship and medium tonnage level vessels can easily get through from two directions; the container ships of later generations and the supermax bulk carriers will be satisfied by the deep water condition that provided by this channel. Therefore, this successful investment greatly helped to open up the thoroughfare at the mouth of Yangtze River, promote the construction project of Shanghai International Shipping Center, give full play to the transportation of this golden watercourse, and provide the impetus to the economic development of Yangtze Delta and the whole Yangtze valley.

Although the economic recession basically increased the cost and risk of the port investment, many have awoken to avoid the overinvestment and make reasonable planning in the new reality. Shanghai International Shipping Center is now looking carefully at its previous investments and defensively at the new ones. In all, there is a post-crisis environment in which the expansion investments on Shanghai International Shipping Center perform well and in order.

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[4] http://www.chinadaily.com.cn/dfpd/2010-03/22/content_9624670.htm

5.1.3 Soft Environment Factor

Although the Shanghai International Shipping Center have taken advantages over others on hard power factors, such as container throughput, density of shipping schedule, and the International transshipment volume of containers, the gap between Shanghai International Shipping Center and those leading ones is still distinct due to the imperfect soft environment factors, for example, the level of port information system, the scale of vessel possession and operation, the shipping derivative, International influence, the supervision system of shipping market, as well as the relevant institutes and colleges. Above all, the shipping service function is the real bottleneck that confronted by Shanghai International Shipping Center at present; the services like ship management, chartering business, marine insurance, maritime arbitration and shipping consultant are underdeveloped compared with the world top shipping centers.

Lack of the advanced deep water port was once the bottleneck that restricted the development of Shanghai International Shipping Center; nowadays, it has been satisfied by the construction of Yangshan Deep Water Port, and the outstanding issue is converted to the soft environment. In addition, the volume of freight cannot be uniformly upward, since the total commodity around the world has its limits. As confirmed by experts that “according to the tendency of world shipping industry, once the throughput of Shanghai port achieves 30 million TEU, the pace of development will be slow down” (“Shanghai strives to,” 2007). It indicated that the expanding of scale and the increasing of quantity is not always beneficial, and what Shanghai International Shipping Center should plan in advance is to exploit more room for shipping service functions, in order to build the soft environmental condition for further competitions, even if Shanghai is bound to be entitled the world first container port.

Up to now, Shanghai has been continuously carrying on some relevant actions, such as launching the futures transaction of shipping index, promoting the construction of

International shipping pricing center, refining the service functions of Yangshan bonded port, and preparing to establish the ship registration system so that more vessels could register the classification society at home. Michael Porter put that: “in real competition, abundant resources and inexpensive costs often resulted in the ineffective resource allocation; however, insufficient resources and adverse conditions are always the promotion for industry to update and upgrade”. Therefore, the huge container throughput and the low-cost labor forces at port of Shanghai cannot always ensure the booming of Shanghai International Shipping Center; but the lack of high-end shipping resources, and the difficulties to launch sophisticated shipping service functions can be the stimulation to acquire the advanced competitiveness.

5.2 Demand Conditions Issue

The port cities are not simply the ones that happened to be on the shoreline, but the maritime economic centers with various cultures, politics, and trades combined (Tan, 2007). It indicates that the port cities act as the key connecting points in global or regional commercial network, and the main centers that have no physical boundaries, but supported by the interaction of flow of goods and people. Therefore, as a real International Shipping Center, it is inevitable that the surrounding economic areas, namely the hinterland, have to be strong enough to support the operation of the forefront, and competitive enough to attract the market demand, enable the internal capital flow and create favorable conditions for external competitions.

The predominant geographic position and the large scale port cluster in the east of China have created a well-designed strategic hinterland for Shanghai International Shipping Center, which not only enjoys the integrated and advanced shipping resources, but also takes over the lion’s share of regional transportation volume due to the ever increasingly market demand. As recorded, in the year 2009, the GDP within Yangtze Delta area, including Jiangsu and Zhejiang province plus Shanghai, achieved 7.2 trillion RMB, increasing 10.4% compared with that of last year; the total

retail sales of consumer goods increased by 17.4% to nearly 2.5 trillion RMB [5]. The tremendous consumption value and volume reflected the huge market demand, which continuously provides the shipping center with more shipping demand internally and externally.

In a broad sense, the wide attraction range of port of Shanghai and its neighbor ports, as well as the whole Yangtze valley, Longhai area, and the region alongside the Zhejiang-Jiangxi railway is the mutual and shared hinterland of Yangtze Delta port cluster; Jiangsu, Zhejiang, Anhui and Jiangxi provinces are the exclusive hinterland of Shanghai International Shipping Center and the cross connection area for adjacent ports; moreover, city of Shanghai proper is the direct hinterland of its own [6]. These hinterlands have got the advantages in economy, and are able to provide the production factors, in order to meet the requirements from the frontline. They possess the capabilities for goods processing such as steel, petrochemical complex, textile and good at generating the electricity; whether the kinds, quality and scale of such production is outstanding nationwide. Furthermore, most of the manufacturing plants are established along the river, for example, the leading role in steel making industry Baosteel built the plant along the Yangtze River, so as to make full use of the shipping resources, and in return, the regional shipping services could be well developed through the bilateral market demand. Besides, thanks to the prosperous and productive hinterlands, Shanghai International Shipping Center is able to expand its shipping service functions to the import-and-export-oriented economy, acting as the contact window to connect the both demand sections at home and abroad.

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[5] http://www.uss9.com/News/20817.html

[6] http://port.sol.com.cn/result.asp?id=dji

5.3 Related and Supporting Industries Issue

As is known to all, the automobile industry in the U.S., German and Japan cannot do

without the support of relevant industries, such as steel, mechanical, chemical and components. Just like it, the world shipping industry can no longer live alone without the strong assistant from logistics, transportation and service industries, which provide the shipping industry with more sophisticated competitive advantages and derivatives than the one lack of these supports. As the prosperous metropolis in China, Shanghai is aiming to construct the four world-level centers simultaneously, namely International Economic Center, International Financial Center, International Trade Center, and the International Shipping Center. Anyone of these for centers cannot stand solely but develop with other centers, in that the overall strength of the city greatly depends on the integrated industries involved; the weakness of one industry could be the bottleneck to the whole picture.

According to the report, in the year 2009, the total value of Shanghai imported and exported commodities shared 1/3 of the total national trade amount, and 1/5 of the whole national service trade account (“Shanghai to submit,” 2009). It seems that the shipping volume and value of Shanghai have already been competitive enough at present; however, the achieved volume and value are mainly enabled by the supporting and relevant transshipment networks, and how to increase the worldwide influence of Shanghai International Shipping Center is in need of the warm help from other industries. At this very beginning, it was proved and witnessed by the huge construction planning of the Hongqiao Integrated Transportation Hub in Shanghai (See Figure 6). “The Hongqiao commercial district will play the role as the important catalyst of the city’s future planning to lead the development of Shanghai and neighboring area”, said by Sha Hailin, the chairman of the Shanghai Commission of Commerce.

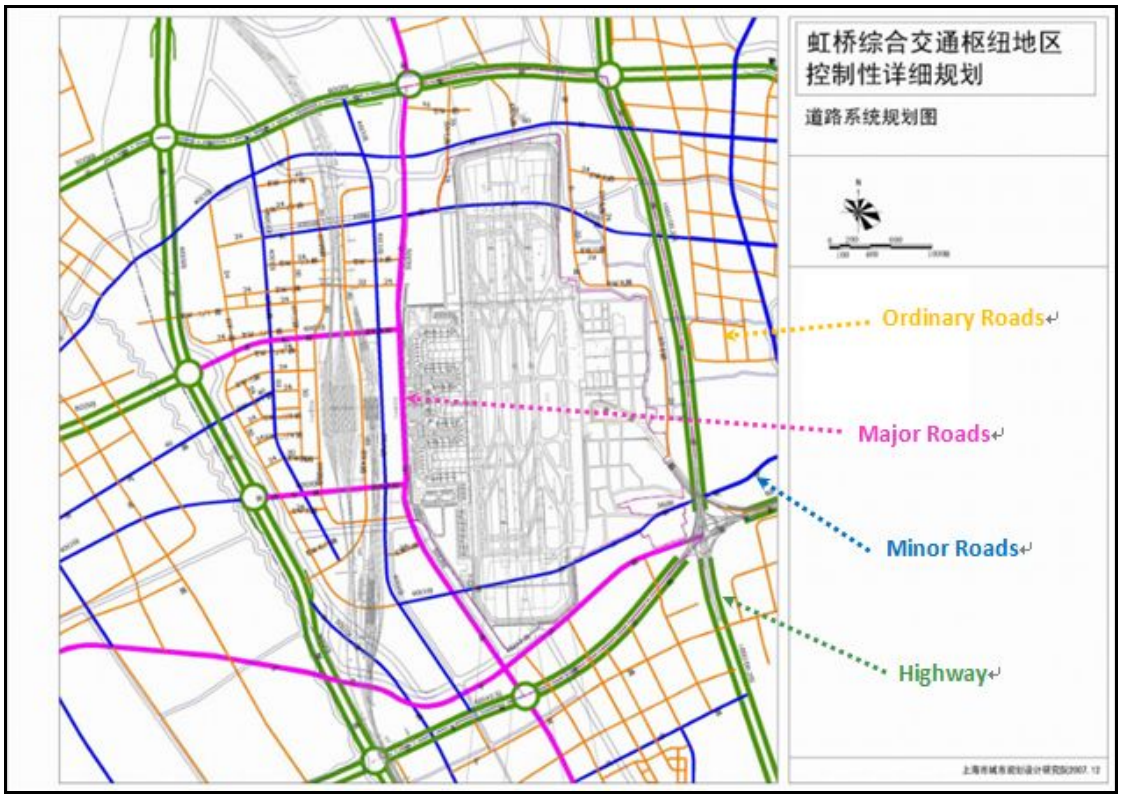

Figure 6—The Road Planning System of Hongqiao Integrated Transportation Hub
Source: Marked by the Author © Liu Chenkai WMU-SMU, (ITL2010) based on the Map of Honqiao Hub Planning, (2007). Shanghai Academy of Urban Planning and Design.
http://www.shghj.gov.cn/Ghj_CMS/uploads/ghgs/hg4.jpg

As the most complicated transshipment hub, Hongqiao Integrated Transportation Hub is the stimulus and support to the construction of the four centers in Shanghai, and one of the core projects that help the city to commendably serve for the Yangtze Delta area, the whole Yangtze valley, the country, as well as the critical logistics connection to the global transshipment network. The general construction planning could be revealed like this: build 4 comprehensive newly states and one airport terminal that can accommodate the International flight; 10 platforms for magnetically levitated train; 30 stations of inter-city and super-speed trains; one metro station that has 5 railways inside and one inter-city shuttle bus station [7]. This large-scale and integrated transshipment system is able to combine the several flows together, not only including the transportation function, but also the commercial transactions and social communications. Besides the transport stations, the headquarter of enterprise, the

service business, the financial institutes, the logistics distribution centers which handle the processing, packing or warehousing value-added services, as well as the shopping malls and theme plazas can be put into this huge crystal, so that the construction of the four centers is able to enjoy the strong support from this project and gain the specific competitiveness with its updating or upgrading.

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[7] http://www.upla.cn/news/_contents/2007/01/69-15671.shtml

5.4 Strategy, Structure and Rivalry Issue

As seen above, the reasonable resource allocations that brought by the port clusters, as well as the integrated industries factor help to forge the strong competitiveness for Shanghai International Shipping Center. It can be easily approved that when the surrounding markets of Shanghai are able to collect the factors, such as labor forces, capitals, resources, information and creative ideas, in a rapid way, the whole shipping center of Shanghai is bound to be more competitive than that of others. The large-scale port cluster and combined industries is the first step that the port city acquires its competitive advantages, by releasing the energy from its own economic characteristics, and unleashing the throughput supply to satisfy the inward or outward market demand (“The ranks of,” 2007). In order to gain the further and advanced competitiveness, the launch of the fierce internal competitions between the sea ports is inevitable. Such kind of the strategic competition could happen as the structural adjustment, among the neighboring cooperative sea ports, the regional port clusters, and even the International maritime metropolis.

As for Shanghai International Shipping Center, there exist a number of predominant cooperative and competitive port cities, which could not only be the driving force to the development of Shanghai International Shipping Center, but also the sponge to gradually absorb the experience and advanced resources from port of Shanghai, so that the whole strength of the shipping center can be elevated via mutual benefit,

establishing the versatile, multifunctional and diversified shipping cluster. For sake of the big picture, these sea ports have their own definite orientations as the development planning (See Table 2); absolutely, through the mutual reference and learning, each of them has achieved the comprehensive competitiveness to a certain extent (See Figure 7).

Effective-oriented	Shenzhen	Wuxi		
International-oriented	Shanghai			
Creative-oriented	Qingdao	Wuhu	Suzhou	
Proactive-oriented	Guangzhou	Nanjing	Nantong	Rizhao
Potential-oriented	Yingkou	Jinzhou	Wuhan	
Taiwan Strait-oriented	Xiamen	Fuzhou		
Governmental-oriented	Tianjin	Qinhuangdao		
Rocketing-oriented	Lianyungang	Yantai		
Privatized-oriented	Ningbo-Zhoushan	Zhongshan		
Conservative-oriented	Dalian	Zhanjiang		
Environmental-oriented	Zhuhai	Haikou		

Table 2—The Functional Orientation of Chinese Ports
Source: Drawn by the Author © Liu Chenkai WMU-SMU, (ITL2010), by using Excel Software, and based on the Chinese Port Function, (2007). Shipping China. http://wu.shippingchina.com/?package=performance07&module=home&act=tplto&skin=port01

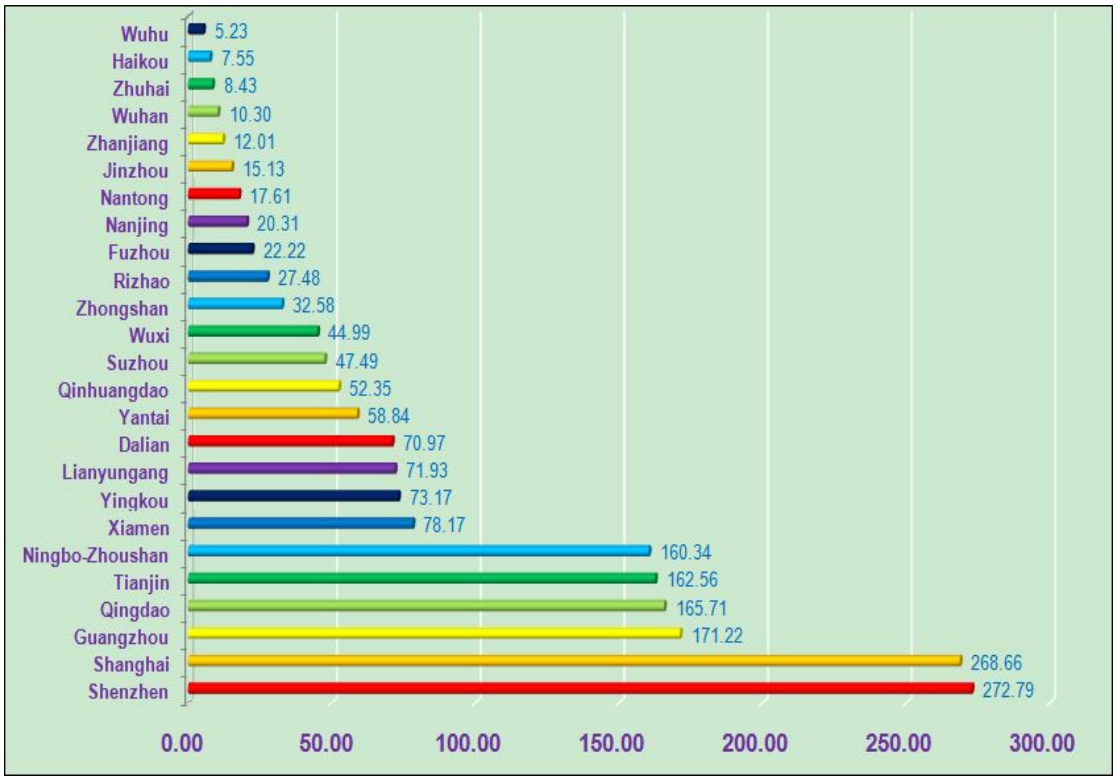

Figure 7—The Comprehensive Competitiveness of Chinese Ports in 2007
Source: Drawn by the Author © Liu Chenkai WMU-SMU, (ITL2010), by using Excel Software, and based on the Ranks of Comprehensive Competitive Power among Chinese Ports, (2007). Shipping China.
http://wu.shippingchina.com/?package=performance07&module=home&act=tplto&skin=port02

Since a long time ago, the south and north wings of Shanghai have been gradually establishing an integrated port, becoming the great existing competitor of Shanghai. At the south, Zhejiang province has been making full use of the shipping resources, achieving the target of resource combination between port of Ningbo and Zhoushan, and gathering the shipping capacity of Beilun, Chuanshan, Daxie, and Jintang area together to be the large-scale professional container harbor; at the north, Jiangsu province has also been striving for the port integration, by binding Zhangjiagang, Taicang and Changshu in union to create the new brand of Suzhou harbor ("The pros and cons," 2005). Many considered that they were the repetitive constructions of these port clusters other than Shanghai International Shipping Center; however, the fierce competition, which mainly triggered by the construction of Yangshan Deep Water Port in Yangtze Delta area, is a fair contest rather than the cutthroats

competition. At present, in order to speed up the development of this area, a huge and reliable port cluster is most wanted, which has to be generated through the reasonable division of labor function and the appropriate resource allocation. Above all, these measures cannot be simply manipulated by the governmental policies, but from the very competitions that objectively decide the functional orientations and resource reallocations by nature.

5.5 Government and Chance Issue

As suggested by Michael Porter: “the government and chance factors are playing the roles of the catalyst and challenger to encourage and promote the industries to raise the ambitions of achieving the higher competitive advantages”. In the shipping world, the government, to a great extent, has to establish some of the specific criteria, regulations and principles to push the participants to refine their operational performances; to stimulate their further development, so as to meet the advanced market requirements; to specialize the division of labor, so that some of the competitions are definite and allowed, but the vicious ones eliminated; as well as to prevent the monopolized situation and over-protection, in that such kinds of market conditions will prolong the formation of the competitive advantages, keeping the involvers at the statues of the competitive deficiency. Simultaneously, the current world situations yielded out several new realities after the financial crisis, among them, the trade imbalance factor largely imposes the pressure on the global trade volumes. Consequently, it is the decisive moment for the government to launch the reasonable port policies, by which the Shanghai International Shipping Center is able to survive and grow in such a world that is full of opportunities and challenges.

As the fastest growing economic entity in the world, China has witnessed the sharp rise of the external trade in recent years, which was followed by more states paying close attention to Chinese trade policies. Thereafter, at the beginning of 2010, a free trade agreement between China and the ASEAN was finally launched, which

indicated that China is preparing to spread its prosperity to the regional areas, and even to play a leading role in relocating the current world trade pattern ("China-ASEAN Free Trade," 2010). Generally speaking, the ever increasingly market share of China is mainly due to its keeping the currency weak. However, as proposed by the U.S. president Barack Obama that "in the year 2009, half of the American deficit should blame for the export of China, and the new round of trade protection actions will be carried out between two countries". Trade is a determinant factor that keeps the world shipping transportation working; once the trade imbalance happens within a wide range, the imports and exports sea freight volume can no longer reach the equilibrium, so that the maritime transportation will be greatly influenced.

It is obviously that the shipping market of Shanghai International Shipping Center will be the victim to the trade imbalance, particularly for the liner shipping, which is highly sensitive to the trade volatility regionally and globally. It will make the things from bad to worse if the liner traffic volume of steel and coal, which is destined to the U.S., has been largely decreased by the aggravated trade protectionism from the U.S. government. Never in the history has the eastbound transpacific shipping services experienced such a disaster. Therefore, it is a real challenge nowadays for Shanghai to face with the bleak global market. The problems that the government could and has to solve are the empty containers reallocation issue, as well as the establishment of more FTZs. Although under the adverse situation that brought by the current world trade patterns, the competitive advantages of Shanghai International Shipping Center are difficult to be created; however, they can be acquired, in another way, from the competitors, if they do not perform in a good condition.

Chapter 6 Quantitative Assessment on Competitiveness of Shanghai International Shipping Center by using Analytic Hierarchy Process Model

6.1 Establishment of the AHP Model

When analyzing the competitiveness of the International Shipping Centers by simply applying the qualitative method, the results always cannot be direct and explicit, and it is difficult to select among the alternative port cities of which one should be the outstanding shipping center. For example, there might be one famous International Shipping Center that is better gifted with the geographic position, but poor at the advanced shipping resources; another shipping center which enjoys the thick port investment, while suffering from the bleak market demand of its hinterland; the one whose hard power such as the transshipment network is well-developed, but the soft environment like the sophisticated shipping service functions are really uncivilized; and also the one, which not only experiences the fierce domestic competitions internally, but also confronts the aggravated trade imbalance externally, however, the reasonable port policies support its further development. In order to compare these qualitative factors that could be abstract and uncorrelated, and to choose among the alternative top-level International Shipping Centers, the mathematical method named AHP model will be displayed to solve this issue.

The AHP model compromises two critical factors, namely the objectives and the alternatives. At first, the decision problem is able to be decomposed into a hierarchy of many easily comprehended sub-problems where the two factors located; for these sub-issues, it is not complicated to tackle independently [8]. The so-called objectives are the multidimensional aspects of the criteria, which are the determinations of the quantitative assessment; the alternatives are those that participate in the competition and the final results of the decision. In addition, there exist several decision situations including the merely choice, which picks up one of the alternatives from the given ones; the ranking that put the alternatives in order from the greatest to the worst; and on the contrary to the above two is the prioritization, in which the relative merit of the alternatives will be determined (Forman & Saul, 2007). As to the case here, the selected alternative International Shipping Centers are bound to be evaluated via

each of the vital objectives; and the ranking of them will be demonstrated. Therefore, the AHP model here aims for several quantitative assessments on the selective International Shipping Centers with the main target of competitiveness appraisal (See Figure 8).

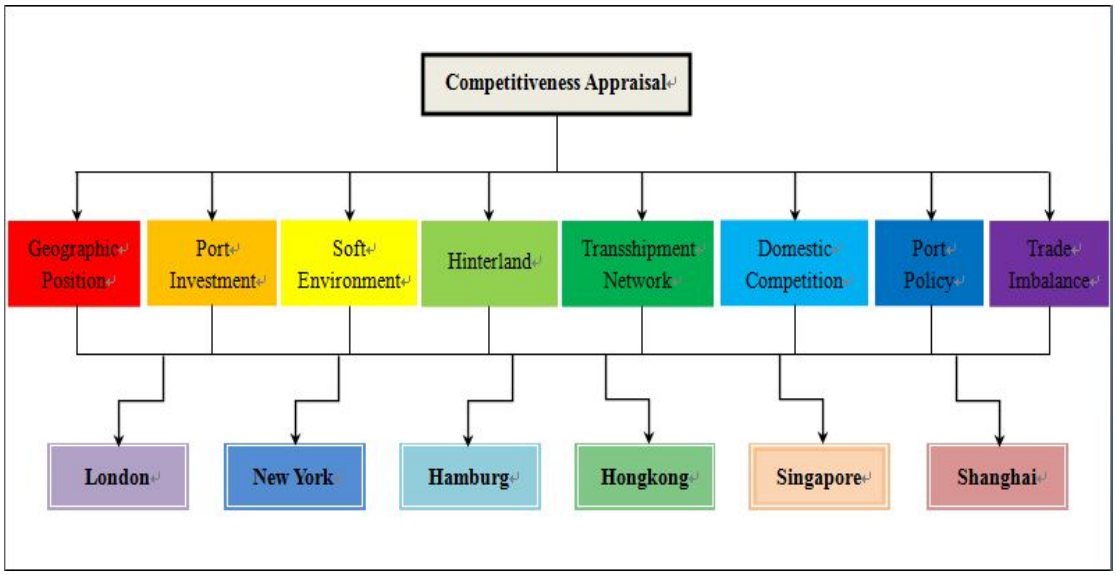

Figure 8—AHP Structure about the Competitiveness of International Shipping Centers Source: Drawn by the Author © Liu Chenkai WMU-SMU, (ITL2010), by using the textbox based on the Word Software.

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[8] http://en.wikipedia.org/wiki/Analytic_Hierarchy_Process

6.2 Determination of the Weights

6.2.1 Pairwise Comparison Matrices

As seen above, the AHP structure for this discussion has been built, which comprises the necessary objectives and the selected alternatives, namely the competitive factors and the world top-level shipping centers. The 8 competitive factors here include geographic position, port investment, soft environment, hinterland, transshipment network, domestic competition, port policy and trade imbalance; while the 6 chosen sea ports here are consisted of London, New York, Hamburg, Hongkong, Singapore

and Shanghai. In order to get the weights of these objectives and alternatives in revelant areas, the pairwise comparison matrices have to be launched afterwards.

In a pairwise comparison matrix, the entry in row i and column j of A, which is labeled a_{ij}, indicates how much more or less important this objective i is than objective j; the importance here means how is the influence of this objective compared to others, and measured on integer from 1 to 9, which is well explained in the below table (See Table 3). Moreover, the entry for every a_{ii} should be 1; for each a_{ji}, the result is $a_{ji}=1/a_{ij}$; the entry of an even number like 2 means the importance is in-between the odd ones.

Importance	Explanation
1	Objective i and j are equally important.
3	Objective i is slightly more important than j.
5	Objective i is strongly more important than j.
7	Objective i is very strongly more important than j.
9	Objective i is absolutely more important than j.

Table 3—The Explanation of the Importance Index in Pairwise Comparison Matrices
Source: Drawn by the Author © Liu Chenkai WMU-SMU, (ITL2010), by using Excel Software, and based on the Interpretation of Values in Pairwise Comparison Matrices. Winston & Albright, (1998). The Analytic Hierarchy Process. In W. Winston & S. Albright (Eds.), *Practical Management Science* (p. 364).

In this case, the relative importance of the competitive factors can be displayed as follow (See Table 4), according to the results of the qualitative analysis in the previous chapter. For example, the entry $a_{11}=1$ means the geographic position is equally important to itself; while the entry $a_{21}=6$ indicates the importance of the port investment is in-between the strongly and very strongly more important to the geographic position, and on the contrary, the entry $a_{12}=1/a_{21}=1/6$.

Objective	Geographic Position	Port Investment	Soft Environment	Hinterland	Transshipment Network	Domestic Competition	Port Policy	Trade Imbalance
Geographic Position	1	1/6	1/8	1/5	1/6	1/4	1/4	1/3
Port Investment	6	1	1/3	3	1/2	4	4	6
Soft Environment	8	3	1	5	3	5	5	7
Hinterland	5	1/3	1/5	1	1/2	3	4	5
Transshipment Network	6	2	1/3	2	1	3	4	5
Domestic Competition	4	1/4	1/5	1/3	1/3	1	2	2
Port Policy	4	1/4	1/5	1/4	1/4	1/2	1	2
Trade Imbalance	3	1/6	1/7	1/5	1/5	1/2	1/2	1

Table 4—The Relative Importance of the Competitive Factors
Source: Drawn by the Author © Liu Chenkai WMU-SMU, (ITL2010), by using Excel Software.

Based upon the above table, the pairwise comparison matrix of the competitive factors is able to be acquired by using the Microsoft equation editor:

$$A=\begin{bmatrix} 1 & \frac{1}{6} & \frac{1}{8} & \frac{1}{5} & \frac{1}{6} & \frac{1}{4} & \frac{1}{4} & \frac{1}{3} \\ 6 & 1 & \frac{1}{3} & 3 & \frac{1}{2} & 4 & 4 & 6 \\ 8 & 3 & 1 & 5 & 3 & 5 & 5 & 7 \\ 5 & \frac{1}{3} & \frac{1}{5} & 1 & \frac{1}{2} & 3 & 4 & 5 \\ 6 & 2 & \frac{1}{3} & 2 & 1 & 3 & 4 & 5 \\ 4 & \frac{1}{4} & \frac{1}{5} & \frac{1}{3} & \frac{1}{3} & 1 & 2 & 2 \\ 4 & \frac{1}{4} & \frac{1}{5} & \frac{1}{4} & \frac{1}{4} & \frac{1}{2} & 1 & 2 \\ 3 & \frac{1}{6} & \frac{1}{7} & \frac{1}{5} & \frac{1}{5} & \frac{1}{2} & \frac{1}{2} & 1 \end{bmatrix}$$

6.2.2 Weights of Objectives

Following the mathematical method in AHP model, the weights of the objectives can be easily derived. At First, the original pairwise comparison matrix has to be normalized to get another matrix named A*, via dividing each of the entry in the column by the sum of the entries in this column (See Table 5): $a_{ij}^{*}= \frac{a_{ij}}{\sum_{i=1}^{n} a_{ij}}$

Objective	Geographic Position	Port Investment	Soft Environment	Hinterland	Transshipment Network	Domestic Competition	Port Policy	Trade Imbalance
Geographic Position	0.0270	0.0233	0.0493	0.0167	0.0280	0.0145	0.0120	0.0118
Port Investment	0.1622	0.1395	0.1315	0.2503	0.0840	0.2319	0.1928	0.2118
Soft Environment	0.2162	0.4186	0.3946	0.4172	0.5042	0.2899	0.2410	0.2471
Hinterland	0.1351	0.0465	0.0789	0.0834	0.0840	0.1739	0.1928	0.1765
Transshipment Network	0.1622	0.2791	0.1315	0.1669	0.1681	0.1739	0.1928	0.1765
Domestic Competition	0.1081	0.0349	0.0789	0.0278	0.0560	0.0580	0.0964	0.0706
Port Policy	0.1081	0.0349	0.0789	0.0209	0.0420	0.0290	0.0482	0.0706
Trade Imbalance	0.0811	0.0233	0.0564	0.0167	0.0336	0.0290	0.0241	0.0353

Table 5—The Normalized Importance of the Competitive Factors
Source: Drawn by the Author © Liu Chenkai WMU-SMU, (ITL2010), by using Excel Software.

According to the above table, the normalized pairwise comparison matrix of the competitive factors could be displayed as below:

$$A_{norm}^{*}=\begin{bmatrix} 0.0270 & 0.0233 & 0.0493 & 0.0167 & 0.0280 & 0.0145 & 0.0120 & 0.0118 \\ 0.1622 & 0.1395 & 0.1315 & 0.2503 & 0.0840 & 0.2319 & 0.1928 & 0.2118 \\ 0.2162 & 0.4186 & 0.3946 & 0.4172 & 0.5042 & 0.2899 & 0.2410 & 0.2471 \\ 0.1351 & 0.0465 & 0.0789 & 0.0834 & 0.0840 & 0.1739 & 0.1928 & 0.1765 \\ 0.1622 & 0.2791 & 0.1315 & 0.1669 & 0.1681 & 0.1739 & 0.1928 & 0.1765 \\ 0.1081 & 0.0349 & 0.0789 & 0.0278 & 0.0560 & 0.0580 & 0.0964 & 0.0706 \\ 0.1081 & 0.0349 & 0.0789 & 0.0209 & 0.0420 & 0.0290 & 0.0482 & 0.0706 \\ 0.0811 & 0.0233 & 0.0564 & 0.0167 & 0.0336 & 0.0290 & 0.0241 & 0.0353 \end{bmatrix}$$

Then, the estimation of the weights for objectives, namely the average value of the entries in row i of A_{norm}^{*}, could be carried out on the basis of the specific formulation:

$$W_i=\frac{\sum_{j=1}^{n} a_{ij}^{*}}{n}$$

$$W_1=\frac{0.0270+0.0233+0.0493+0.0167+0.0280+0.0145+0.0120+0.0118}{8}=0.0228$$

$$W_2=\frac{0.1622+0.1395+0.1315+0.2503+0.0840+0.2319+0.1928+0.2118}{8}=0.1755$$

$$W_3=\frac{0.2162+0.4186+0.3946+0.4172+0.5042+0.2899+0.2410+0.2471}{8}=0.3411$$

$$W_4=\frac{0.1351+0.0465+0.0789+0.0834+0.0840+0.1739+0.1928+0.1765}{8}=0.1214$$

$$W_5=\frac{0.1622+0.2791+0.1315+0.1669+0.1681+0.1739+0.1928+0.1765}{8}=0.1814$$

$$W_6=\frac{0.1081+0.0349+0.0789+0.0278+0.0560+0.0580+0.0964+0.0706}{8}=0.0663$$

$$W_7=\frac{0.1081+0.0349+0.0789+0.0209+0.0420+0.0290+0.0482+0.0706}{8}=0.0541$$

$$W_8=\frac{0.0811+0.0233+0.0564+0.0167+0.0336+0.0290+0.0241+0.0353}{8}=0.0374$$

In all, the proportion of the weights for each competitive factor should be:

$$W_i=\begin{bmatrix}0.0228\\0.1755\\0.3411\\0.1214\\0.1814\\0.0663\\0.0541\\0.0374\end{bmatrix}$$

6.2.3 Weights of Alternatives

Now that the weights for each competitive factor have already been determined, the next step is to decide the weights for each selected world top-level shipping center with regards to every factor. In consideration of the practical situations of each shipping center that has been discussed in previous chapters, as well as the feedbacks from the questionnaires, which were deliberately sent to the related shipping professionals and a board range of the nonprofessional people, the weights of the cities in each regarding area have been summarized and calculated out (See Table 6). The score, just like that of objectives, is measured on the integer from 1 to 9; and the results from the professionals take a greater weight during calculation due to

their strong reliability and high precision.

	Geographic Position	Port Investment	Soft Environment	Hinterland	Transshipment Network	Domestic Competition	Port Policy	Trade Imbalance
London	7	8	9	6	6	6	8	7
New York	8	7	7	7	9	6	7	6
Hamburg	6	7	6	7	7	7	7	7
Hongkong	8	6	8	6	7	7	8	7
Singapore	7	6	7	6	6	7	7	8
Shanghai	9	8	6	9	8	8	6	8

Table 6—The Weights for Each Shipping Centers with Regards to the Specific Fields
Source: Drawn by the Author © Liu Chenkai WMU-SMU, (ITL2010), by using Excel Software, and based on the practical surveys as well as the feedbacks from the questionnaires.

6.3 Check of the Consistency

As the pairwise comparison matrices comprise take both the subjective and objective factors into consideration, it is inevitable that the result will suffer from the inconsistency. However, the inconsistency is to be allowed if it is not serious enough to affect the assessments in the permissible range, which comes from the experience. In AHP model, the check for the consistency has 5 steps as follow.

First and foremost, the computation of the AW should be processed, by multiply the pairwise comparison matrix A with W_i, which has been calculated out above and stands for the weights of the competitive factors here:

$$AW = A \times W_i = \begin{bmatrix} 1 & \frac{1}{6} & \frac{1}{8} & \frac{1}{5} & \frac{1}{6} & \frac{1}{4} & \frac{1}{4} & \frac{1}{3} \\ 6 & 1 & \frac{1}{3} & 3 & \frac{1}{2} & 4 & 4 & 6 \\ 8 & 3 & 1 & 5 & 3 & 5 & 5 & 7 \\ 5 & \frac{1}{3} & \frac{1}{5} & 1 & \frac{1}{2} & 3 & 4 & 5 \\ 6 & 2 & \frac{1}{3} & 2 & 1 & 3 & 4 & 5 \\ 4 & \frac{1}{4} & \frac{1}{5} & \frac{1}{3} & \frac{1}{3} & 1 & 2 & 2 \\ 4 & \frac{1}{4} & \frac{1}{5} & \frac{1}{4} & \frac{1}{4} & \frac{1}{2} & 1 & 2 \\ 3 & \frac{1}{6} & \frac{1}{7} & \frac{1}{5} & \frac{1}{5} & \frac{1}{2} & \frac{1}{2} & 1 \end{bmatrix} \times \begin{bmatrix} 0.0228 \\ 0.1755 \\ 0.3411 \\ 0.1214 \\ 0.1814 \\ 0.0663 \\ 0.0541 \\ 0.0374 \end{bmatrix} = \begin{bmatrix} 0.1918 \\ 1.5872 \\ 3.0653 \\ 1.0553 \\ 1.6282 \\ 0.5536 \\ 0.4412 \\ 0.3046 \end{bmatrix}$$

Secondly, the calculation of the λ_{max} is to be carried out, by figuring the ratio of each entry in matrix AW to the corresponding entry in matrix W_i and averaging these ratios,

namely: $\lambda_{max} = \sum_{i=1}^{n} \frac{AW_i}{nW_i}$

$$\lambda_{max} = \frac{0.1918}{8\times0.0228} + \frac{1.5872}{8\times0.1755} + \frac{3.0653}{8\times0.3411} + \frac{1.0553}{8\times0.1214} + \frac{1.6282}{8\times0.1814} +$$

$$\frac{0.5536}{8\times0.0663} + \frac{0.4412}{8\times0.0541} + \frac{0.3046}{8\times0.0374} = 1.0503 + 1.1305 + 1.1233 + 1.0866 +$$

1.1222 + 1.0432 + 1.0199 + 1.0175 = 8.5937

Thirdly should be the calculation of the consistency index, namely CI, according to the formulation: $CI = \frac{\lambda_{max}-n}{n-1}$

$CI = \frac{8.5937-8}{8-1} = 0.0848$

Fourthly is the calculation of the consistency ratio CR, via dividing the CI by the random index RI, which gives the average value of CI if the entries in A were chosen at random (See Table 7). Since there are 8 entries of objectives here, so the corresponding RI should be 1.41.

n	2	3	4	5	6	7	8	9	10
RI	0	0.58	0.9	1.12	1.24	1.32	1.41	1.45	1.51

Table 7—The Random Index for AHP Model
Source: Drawn by the Author © Liu Chenkai WMU-SMU, (ITL2010), by using Excel Software, and based on the Random Indices for Consistency Check for AHP Example. Winston & Albright, (1998). The Analytic Hierarchy Process. In W. Winston & S. Albright (Eds.), *Practical Management Science* (p. 368).

$CR = \frac{CI}{RI} = \frac{0.0848}{1.41} = 0.0601$

The final step is to compare the CR with the value 0.1, which is suggested by Professor Thomas Saaty who initially put forward the AHP model; if the ratio of CI to RI is smaller than 0.1, it indicates that there is no serious inconsistency found in the pairwise comparison matrices, and the degree of consistency is satisfactory for application. As it is shown above, CR=0.0601 is smaller than criterion 0.1, so this pairwise comparison matrix of the competitive factors is able to be used in assessing the alternative International Shipping Centers.

6.4 Calculation of the Score

Once the weights of the objectives carried out and the check for consistency done, what is going to do is to combine the weights of competitive factors and the weights of the alternative shipping centers together. For example, as to London, the calculation of the final score should be:

S_{London}= 7×0.0228+8×0.1755+9×0.3411+6×0.1214+6×0.1814+6×0.0663+8×0.0541+7×0.0374= 7.5427

So, one simple and convenient mathematical way to calculate the final scores is to multiply the two matrices, namely the matrix of the competitive factors and the matrix of the alternative shipping centers, so as to get the integrated one, in which the final scores of the selected International Shipping Centers are safely displayed:

$$S_w=\begin{bmatrix}7&8&9&6&6&6&8&7\\8&7&7&7&9&6&7&6\\6&7&6&7&7&7&7&7\\8&6&8&6&7&7&8&7\\7&6&7&6&6&7&7&8\\9&8&6&9&8&8&6&8\end{bmatrix}\times\begin{bmatrix}0.0228\\0.1755\\0.3411\\0.1214\\0.1814\\0.0663\\0.0541\\0.0374\end{bmatrix}=\begin{bmatrix}7.5427\\7.2818\\6.6361\\7.1211\\6.5592\\7.3539\end{bmatrix}\rightarrow\begin{bmatrix}\text{London}\\\text{New York}\\\text{Hamburg}\\\text{Hongkong}\\\text{Singapore}\\\text{Shanghai}\end{bmatrix}$$

6.5 Assessment of the Results

Seen from weights of the alternative shipping centers, it can be concluded that some of the International Shipping Centers are better than all in the specific areas, such as the soft environment for London, the transshipment network for New York, and the best geographic position as well as the hinterland for Shanghai; however, as to these centers, the rest of the competitive factors stand in the commonplace as others do. In addition, the weights of the competitive factors take various proportions, ranging from the least important to the most important respectively. Consequently, the two matrices composed the integrated vector for the final scores of the shipping centers, which shows the rank of these selected sea ports with the detailed four decimal numbers (See Figure 9).

Figure 9—The Final Scores for the Selected International Shipping Centers
Source: Drawn by the Author © Liu Chenkai WMU-SMU, (ITL2010), by using Excel Software.

Definitely, London is second to none currently in the world shipping industry, by achieving 7.5427 in the total score; while Shanghai is 0.1888 lower than London at the second place, which is not far away from the third New York, whose score reaches 7.2818 finally; as for the others, they are still in the developing processes, chasing after the leading ones, by making full use their strengths in some particular areas.

On second thought, since these competitive factors have their own weights in

calculations, which means any changes to them will lead to different results, so it can be supposed that the factors with the higher weights will have a greater impact on the final scores, and those inferior ones will cause tiny influence to the results. In order to prove the above assumption, the experiment goes like this: firstly, the three least important competitive factors, namely the geographic position (0.0228), the trade imbalance (0.0374) and the port policy (0.0541), will be excluded and others remain (See New Results in Figure 10); secondly, the most important factor, namely the soft environment (0.3411), will be taken away and others keeping unchanged (See New Results in Figure 11).

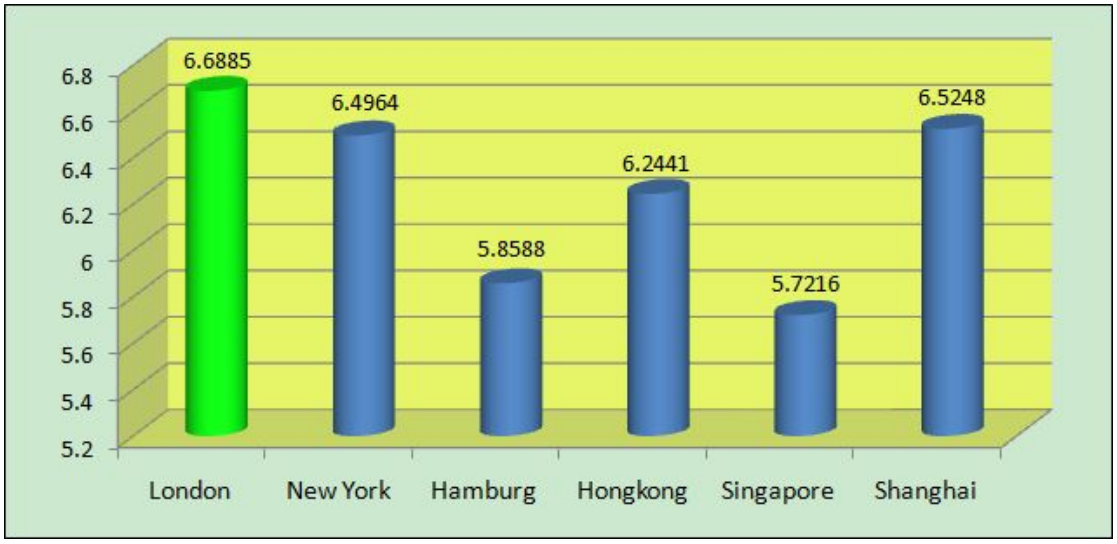

Figure 10—The Final Scores of the Selected Shipping Centers without Regard to Geographic Position, Trade Imbalance and Port Policy Factors

Source: Drawn by the Author © Liu Chenkai WMU-SMU, (ITL2010), by using Excel Software.

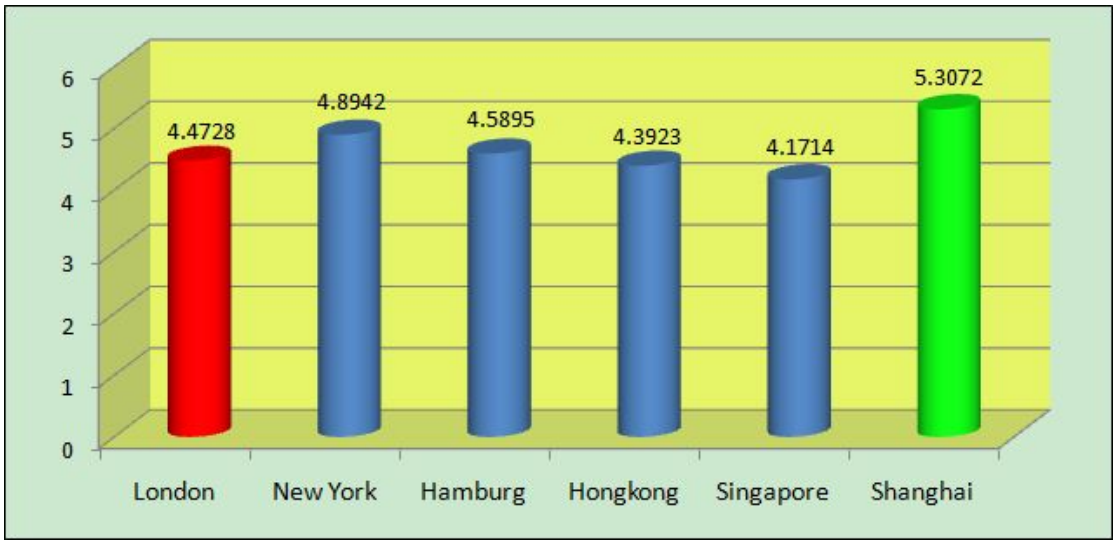

Figure 11—The Final Scores of the Selected Shipping Centers without Regard to Soft Environment Factor

Source: Drawn by the Author © Liu Chenkai WMU-SMU, (ITL2010), by using Excel Software.

In Figure 11, it can be found that even if the three least important factors are removed, the final rank of these shipping centers keeps the same as the previous one, which indicates that the geographic position, trade imbalance and the port policy have little influence to the construction of the International Shipping Center. The reasons could be: the geographic position is the primary not the advanced production factor, and is hard to change in nature; the trade imbalance always exists and fluctuates, however it is nothing but the current financial crisis occasionally enlarged its impact; the port policy is published by the government, just to lubricate the shipping industry, and the government is the onlooker, having nothing to do with the practical operations.

While the results in Figure 12 told us a totally different story: without the strong support from the soft environment of shipping, London is outnumbered by Shanghai, New York and even Hamburg in final score, which means the well-built shipping environment is the pillar for London to maintain its status of the world maritime empire; the score of Shanghai will be largely over the others without regard to the soft environment, which in reverse implies that Shanghai has something to do in constructing the soft power to balance its comprehensive competitiveness in the

shipping industry; for the rest of the shipping centers, the gap between them is not so conspicuous than that in the previous figures if the soft environment factors taken away, which indicates that the hard power will be no longer the determinative element when assessing the strength of the well-equipped International Shipping Centers, but replaced by the soft ones.

Last but not least, the total score that Shanghai got can be expressed as follow:

$S_{Shanghai}$= 9×0.0228+8×0.1755+6×0.3411+9×0.1214+8×0.1814+8×0.0663+6×0.0541+8×0.0374= 7.3539

If Shanghai gets one more score on soft environment factor, namely score for soft environment of Shanghai increasing from 6 to 7, then the total score should be:

$S_{Shanghai}$= 9×0.0228+8×0.1755+***7***×0.3411+9×0.1214+8×0.1814+8×0.0663+6×0.0541+8×0.0374= 7.6949

In this situation, Shanghai will outnumber London, which is 7.5427 at present, on the comprehensive competitiveness. Therefore, it is critical for Shanghai to establish the soft environment of shipping industry while developing its shipping hardware.

Chapter 7 Conclusion

Due to the economic globalization, Chinese shipping and port development stand and fall accordingly with the world shipping industry. Presently, the whole industry is confronting such issues as the increasing oil prices, subprime crisis in the U.S., the recession of the global stock market, the slowdown of the economic development, and the pressure from various environments; therefore, the efforts are most wanted in achieving the scientific, harmonious as well as the sustainable development in Chinese shipping industry, particularly in the construction of the Shanghai International Shipping Center, which is the very forefront of this transformation.

7.1 Established Competitiveness of Shanghai International

Shipping Center

Learnt from the above, it is known that the total construction progress of Shanghai International Shipping Center has been last for over 12 years, under the leadership of the State Council, and the cooperation with Jiangsu, Zhejiang Province. After all, the remarkable competitiveness has been witnessed: firstly, the great progress can be seen from the port infrastructures, as WGQ port area is able to handle 16 large-scale container berths and 4 branch line container berths with over 15 million TEU capacity; while Yangshan Deep Water Port holds 13 large container berths with over 7 million total container handling capacity (Xu, 2009); moreover, a 10-meter depth deepwater channel was launched at the mouth of the Yangtze River to accommodate the super level vessels. Secondly, the shipping resource reallocation is speed up. By the end of the year 2007, Shanghai has already owned 958 International shipping and related businesses, including 40 maritime transportation corporations, 111 shipping agents, 57 International ship management businesses, and 750 non-vessel operating common carriers (NVOCCs); in addition, the world top 50 shipping lines have launched their liner shipping services in Shanghai (Xu, 2009). Thirdly, the port management in Shanghai has been under law-based control, as the government published several port policies to regulate the current port management system, and simultaneously carries out some researches on the soft environment building. Thanks to such measures and fruits, the competitiveness of Shanghai International Shipping Center was not only be achieved from the hardware constructions, but also acquired from the established soft power.

7.2 Objective Orientation of Shanghai International Shipping Center

The challenges that Shanghai International Shipping Center currently meets should be the transformation of the industrial structure, the recession of the world economy and the fierce competitions from the neighboring port cities. Therefore, in order to

accordingly match with these changes and transformations, Shanghai is bound to promote its service functions, with shipping services included. Consequently, as for Shanghai International Shipping Center, one target is to improve the port collection and transmission system via developing the related modern logistics, so as to build up an influential transportation hub for the regional transshipment network; the second objective is definitely to promote the soft power by attracting more shipping financial services, not only to satisfy Shanghai proper, but also to meet demand of the whole hinterland along the Yangtze valley.

7.3 Further Planning of Shanghai International Shipping Center

In view of the established competitiveness and the uncompleted objectives of the Shanghai International Shipping Center, it is necessary for Shanghai to launch the further development plans correspondingly. First and foremost, the collection of the shipping resources is critical to all in promoting the constructions of the soft power and improving shipping service functions, since the resources, especially the advanced human resource, compose the industrial foundation to support a modern shipping system with finance, trade, law, consultation, policy and service integrated. Then, the constructions of the port infrastructures at the Yangshan Deep Water Port have to be accelerated, because Yangshan port acts as a regional transportation hub to link the neighboring port clusters together, making full use of the port cooperation, and reinforcing the transshipment efficiency. Furthermore, the suited logistics system has to be developed in order to increase the economic capabilities of Shanghai International Shipping Center, in that Shanghai affords almost 2/3 of the import and export cargos now, which are from and to the Yangtze Delta area as well as the Yangtze valley, so the inland highway and waterway logistics system is key to the both cargo flow and money flow.

The administrative department of Shanghai, with the help from all sectors of the

community and according to the requirements of globalization, marketization, and regulation, has been closely paying attention to the construction processes of Shanghai International Shipping Center, trying best to promote the shipping service functions, create the environment for fair competitions and give out strong supports to the growing shipping businesses. It is certain that with the efforts of all, Shanghai is bound to be a more energetic and prosperous port city; while the port of Shanghai is able to enjoy a promising investment value; and the whole Shanghai International Shipping Center will be competitive enough to lead the way of the world shipping industry.

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