



**The development of port and the container transport chain**

**- A case study of Tianjin Port**

Jie Wu

tie10jwu@student.hig.se

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Supervisor: Roland Hellberg

Examiner: Ming Zhao

## Abstract

With the booming volume of international trade, the container shipping industry plays an important role in the world now. The previous literature only shows separate factors for the development of the port. And the container transport chain is only analyzed separately without the development of the port.

With abundant of literatures and theories, the factors influence the development of the port can be divided into two parts. The external factors include the hinterland, the international trade and the policies. And the competition and coordination between different ports constitute the internal factors. The container transport chain is important for the internal factors. It can affect the area of the hinterland and the cost for the customers.

The Tianjin Port is introduced as the case for this thesis. And for the comparison, the mature port Rotterdam and the competitors within Bohai Rim are showed. The data are from official website of the ports and other organizations with high reputation.

And the relationships of the inside and external factors are discussed in the analysis. With the SWOT matrix, the case of Tianjin Port is compared with the mature port Rotterdam and its competitors Qingdao Port and Dalian Port.

The container transport chain in Tianjin has the disadvantages such as complicated information flow system, lower capacity of rail transportation and the over fierce market of the third party logistics companies. By the end of the thesis, how to adopt the container transport chain with the rapid development of the port and some suggestions for the further development of Tianjin Port are given as the conclusion.

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# 1. Introduction

## 1.1 Background

Nowadays countries all over the world rely more heavily on trade and trade linkages increasingly foster global interdependence. As the below figure shows, the growth in international trade for the past years has been driven in large part by the container of cargo. (Lohatepanont et al, 2011)

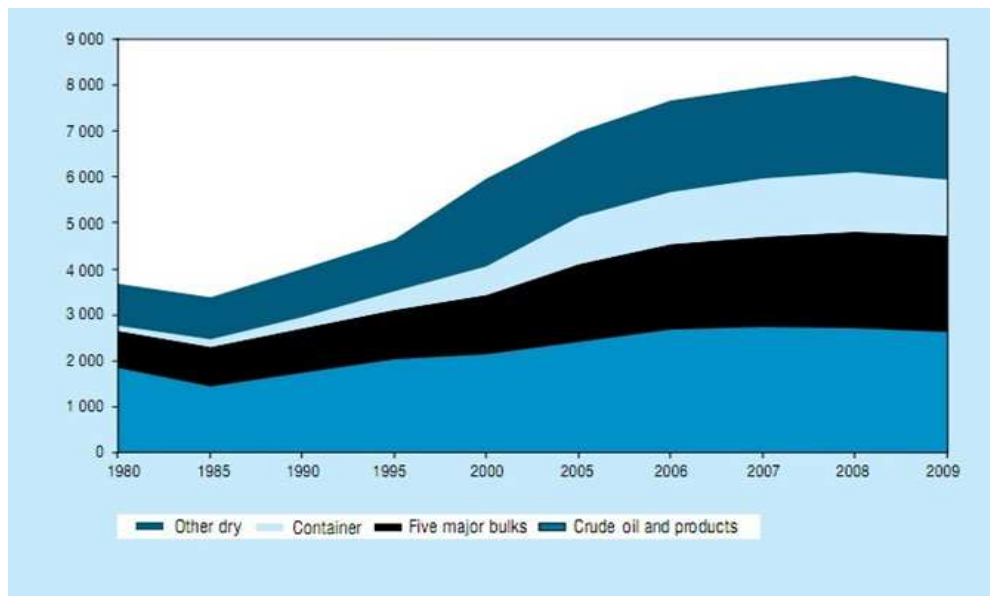


Figure 1 International seaborne trade, selected years, (millions of tons loaded) (Asariotis, R. et al. 2010, p9)

And the developing countries that have rapidest growth in the international trade are more dependent than developed countries. (Ernst 1987, p109)

In the 1980s, after the implementation of opening up policy in China, the volume of China's international trade increased quickly. As a result, the demand of shipping service is developing. The international trade especially the export became one of the most important industries that had driving the development of shipping industry. The report of United Nations Conference on Trade and Development (Asariotis et al., 2010) shows that the Chinese containerized exports accounts for a quarter of the world total. In 2009, China was the world's leading exporter in 2009 with a share of 10% of the world merchandise exports by value. As a result, the shipping industry has been prosperous than whenever before especially after the period when China joined World Trade Organization.

As one of the biggest port cities in China, the container shipping industry in Tianjin

developed well base on the geography advantage of Tianjin Port which is the biggest port of Bohai Sea. And Tianjin Port has the wide economic hinterland includes Beijing, Hebei Province and part of or entire area of ten other provinces with a total area of 45 million square kilometers that represents 46.9% of the country's area. Most of the container liners set their branch offices in Tianjin to make sure their service can satisfy customers within this big market. Due to the size of container ship is going to be bigger than ever before, the facilities in the port need to be updated to match the ship. Tianjin Port has done many projects to expand the width of the main sea lane.

In recent years, the shipping chain in the Tianjin Port had changed slightly with the development of the port and the increasingly sophisticated logistics technology. The volume of container has going up recent years while the shipping chain has change only a little. But with the development of the port, the importance of the shipping chain is showed that can also have some influence on the port. The shipping chain not only includes the different transport methods for the container, but also includes the information flow and different providers in this chain.

Previous literatures and theories are only focus on one specific factor for the development of the port. And some articles are only analyzing the one part of the container transport chain. The author could not found any article about integration of all the external and internal factors for the development of the port. Theory about relationship between the development of the port and the container transport chain has not been found, either.

## **1.2 Aims and Objectives**

The main points of this thesis are to have a deep view in the development of container shipping industry of Tianjin and figure out some plans to develop Tianjin Port. To show the importance of the container transport chain is the other goal of this thesis. What factors can influence the development of port is one academic question that the authors want to get answer. And to work out one model to analyze the development of different container ports is another academic goal.

This thesis intends to answer the following questions:

- 1 What are the main factors influence the port's development?
- 1 How to develop the container transport chain to adapt for the development of port?
- 1 What advantages and disadvantages does Tianjin Port have?

### **1.3 Outline of the thesis**

This thesis consists 6 chapters, including Introduction, Methodology, Literature Review, Empirical result, Analysis and Conclusions.

The first chapter is the introduction about the background, the aims and the outline.

The structure of the thesis and methods used in this thesis will be illustrated in chapter 2.

In chapter 3, some main concepts that related to the research topic will be introduced, the external and the internal factors for the container shipping industry including the hinterland, the international trade, the policies, the information flow and the transportation system. And by the end the author will give the theories of the SWOT model which will be used for the analysis.

The real situation of the Tianjin Port will be present as the case study in chapter 4. The information process for container shipping, the beneficial policies that are applied to different areas or companies, the transportation net for Tianjin Port, the economic status of the hinterland of Tianjin Port will be showed to know the container shipping industry in Tianjin Port well. For the comparison the mature port the Rotterdam will be introduced. Also to know the competition environment, the ports near Tianjin such as Qingdao Port, Dalian Port and Busan Port will be referred.

In chapter 5, the author will analyze the case with the theories and the SWOT model. The external, internal factors and the container transport chain will be analyzed.

In the last chapter, the factors that can influence development of port are summarized. The importance of container transport chain and one model to analyze the development of port are given. By the end, some suggestions are given to Tianjin Port to gain a better future.

## **2. Methodology**

The author first read many books about the shipping industry, and carefully checked the chapter about container shipping and the development of the port. After knowing some key factors of the container transport chain and the development of the port, the author use the database to pick up specific articles with the key words that learnt from the books. An analyze tool SWOT was chose to analyze the case Tianjin Port. And then with the literature review which is based on previous theories, the author checked the data from different official website of the ports or other organizations with high reputation. To have an inside view of the port, many interviews were arranged. The conclusion of Tianjin Port was made by the case study with literature review, interviews and SWOT. The model is also summarized from literature, case study and analysis.

### **2.1 Structure of the thesis**

With many articles and books, the author collected external and internal factors that can influence the development of the port and the knowledge of the container transport chain. And the analysis tool SWOT is introduced in the literature review.

General status and details about Tianjin Port are showed. And to use the SWOT, the competitor Qingdao Port and Dalian Port are presented for easy reference. Rotterdam is showed as a mature port.

In the analysis chapter, details of Tianjin Port are analyzed as the order of literature review. The integration of external factors of development of port, integration of internal factors of development of port and the container transport chain in Tianjin are studied. With the SWOT, Tianjin Port is compared with its competitors Dalian Port and Qingdao Port to see threatens. And Rotterdam is set as a good example to see the weakness of Tianjin Port. The external and internal factors of development of Tianjin Port are considered also.

In the end, the integration of external and internal factors shows the main factors that can influence the development of port. The importance of the container transport chain is given with the knowledge of the literature showed. Some suggestions to Tianjin Port are given from the analysis of Tianjin. And one model to analyze the development of the container port is demonstrated.



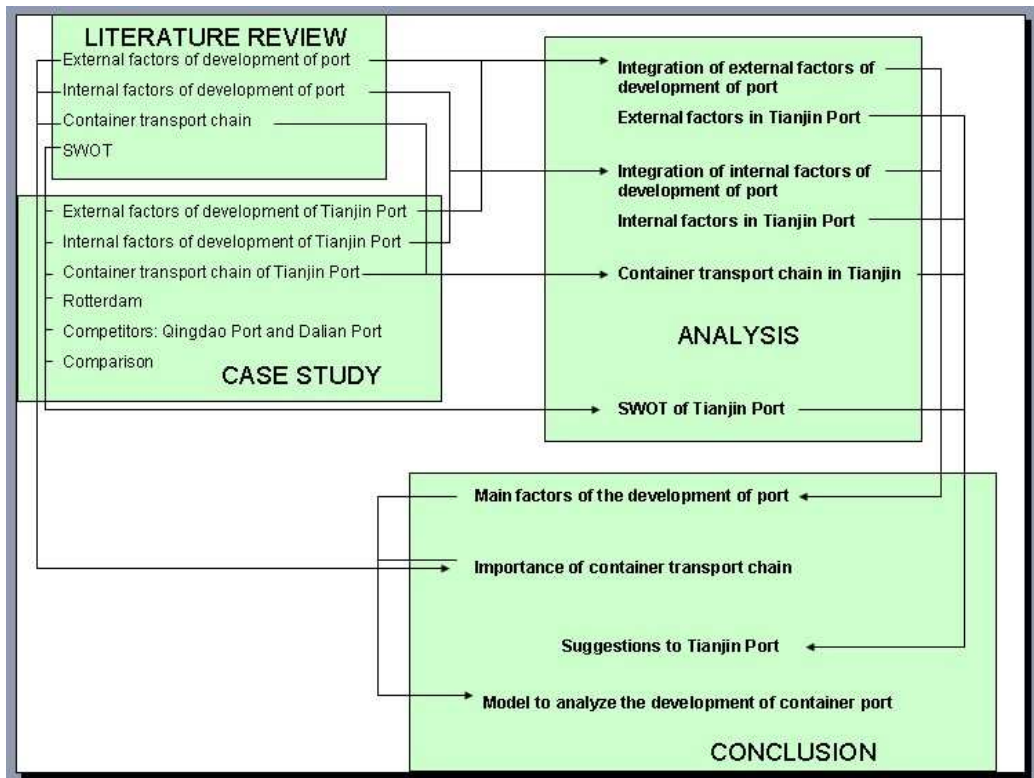


Figure 2 Structure of the thesis

## 2.2 Research approaches: qualitative

In this thesis, qualitative research methods would be used to help the author get the results of the research. They are integrated for collecting the data and analysis.

### 2.2.1 Qualitative methods

The aim of qualitative research is to have a detail description of the status.

#### 2.2.1.1 Interviews

Many interviews were implemented through on line chatting or phone with experienced staffs from different kind individuals of the shipping industry. The companies interviewed include forwarding companies such as Danzas Z.F. Freight Agency Co., Ltd Tianjin Branch and Zhenhua Logistics Group, liner companies like Mitsui OSK Lines and CSAV Norasia Liner Services and shipping agency China Ocean Shipping Agency Tianjin Company. The author carried interviews with many people who are in charge of the transportation for the container from different companies to get one inside perspective for the container transport chain. All the interviewees are well-experienced staffs with widely knowledge in the shipping industry especially for Tianjin Port. The interviews focus on the procedures of the container transportation within the port area, before the gate-in time and after the

delivery. And with the knowledge of different links in the chain, the general status of the chain can be showed in the Chapter 4 after integrating all the records of interviews. Interviews can help the author to know more details in the shipping industry.

Type of company	Name of company	Title of interviewee	Name	Method of interview
Liner	Mitsui O.S.K. Lines, Ltd. Tianjin Office	Manager of Customer Service and Documentation	Emily Yang	Phone interview
	CSAV Norasia Line, Ltd. Tianjin Office	Documentation Clerk	Betty An	On line chatting
	CSAV Norasia Line, Ltd. Tianjin Office	Customer Service	Nahra Zhang	On line chatting
Forwarder	Danzas Z. F. Freight Agency (Tianjin)Co., Ltd	Customer Service	Vivian Liu	On line chatting
	Zhenhua Logistics (Tianjin) Co., Ltd	Manager of Customer Service and Documentation	Lei Wang	Phone interview
Shipping agency	China Ocean Shipping Agency, Tianjin Office	Operator	Xin Liu	Phone interview

Figure 3 Details of interview

#### 2.2.1.2 Literature Reviews

Most of the academic articles about shipping industry are found on the internet database. The words “shipping” and “port” are used as key words to find the relevant literatures. The articles and theories are found from Google Scholar, Ebrary, Emerald and Wiley Online Library. The previous theories help the author to generate new ideas with background literatures. Literature and previous selected theories can deduce hypotheses. (Boeije 2010, p5)

#### 2.2.1.3 Data from internet

Tianjin Port was selected as the specific case, which is facing the continuous growth during recent years. The numerical data about ports is mainly from the official website of ports. And some data are from other non-profit organizations’ official websites such as United Nations Conference on Trade and Development and World Shipping Council.

### 2.3 Reliability and Validity

This thesis is built on the previous academic articles and books with the case study, and then the further view is given by the author. The reliability and validity shows the accuracy and the correctness of the conclusion.

### **2.3.1 Validity**

Valid research relates how the author collects and analyzes the data. It includes the appropriate research strategy, the suitable techniques of relevant data collection and the way of analysis. (Biggam 2008, p99)

In this thesis, the data are collected from different ways such as interview, literature, data collection from the official websites. The interviewees are selected from different companies in order to get different opinions for all the segments of the shipping industry. And books are used to have a background of the topic. After the author get the overall knowledge of the shipping industry, the articles with specific topic and accurate data for the port are picked up from journals and official All the methods are used integrated to avoid one side opinion. And the research strategy for this thesis is the case study with grounded theories. It can analyze the real circumstances with proper scientific theories.

### **2.3.2 Reliability**

The author of this thesis has three years' working experiences in the shipping industry and international trade business. With the experiences, the author has operation and academic background in this field that can help the thesis to be more reliable with abundant access to the qualitative and quantitative resources.

The data are from the official organization for recent years. The organizations have high reputation in the shipping industry. The interviews are reasonable with people who are involved in the shipping industry. Each of the interviewees has about 3-10 years experiences in the shipping industry, and they are still working everyday to deal with the container transportation. Besides that, the articles used in this thesis are published on the journals with academic reputation.

### **3. Literature Review**

This chapter introduces many theories from others' scientific report about shipping industry or other related area.

The author's review of literatures in the shipping area shows that the factor influence the development of the port can be divided into two parts. The first part is about what factors outside the port can influence the development of the shipping industry. The big size and the stable or booming economic of the hinterland, the big volume of international trade and the beneficial policies can accelerate the development of the shipping industry.

In the second part, what factors influence the choice of the port is examined. In other words, this part can help more on the port's competitiveness. But this part doesn't only focus on the competition between different ports, but also concerning the cooperation in the shipping net.

And then the transport chain is showed as part of the supply chain. What is the role that the information flow plays is studied. After that, the container transport system is studied from the nodes perspective and the different services provider perspective. Finally the third logistics company is introduced to have a deep view in the shipping industry market.

By the end of thesis, the SWOT model is introduced. This model will be used in the analysis to gain the Strengths, Weaknesses, Opportunities, and Threats while comparing other ports and analyzing Tianjin Port itself.

#### **3.1 The external factors influence the development of port**

To predict the trend of the Shipping Industry of Tianjin Port, many factors outside this industry should be studied such as the hinterland, international trade and policies. The hinterland means the inland area where abundant of the export and import cargo goes through the port. (Ferrari, Parola and Gattorna, 2011) The international trade brings the demand of the shipping industry all the time. And the policies of the government for the export area and port area affect the port's shipping industry.

##### **3.1.1 The hinterland**

As the gateway within the shipping chain, the ports are reflected by the changing circumstances of the hinterland. And the port function is normally be related to the development of the inland area. The growth of economic drives the demand of the port development. The relationship between the port and the hinterland is always

close. (Hoyle and Charlie, 1995) The area of the hinterland is affected by the nature, society and economic factors. The more mature the transport net between the port and the hinterland is, the wider the hinterland will be. The relationship between the port and the hinterland is interdependent and interactive. If the economics of the hinterland is prosperity, it will have deep ties with other areas. The demand for the shipping transportation can be increased by the development of the economic prosperity. And the development of the hinterland leads to the expanding of the port scale and improving of the port structure. On the other hand, the development of the port can create the positive conditions for the hinterland. Ports competitiveness could affect the regions viability, prospects and propensity for growth. (Munisamy and Singh, 2011) With the growing capacity of the port, the area of the hinterland can spread. The scale of the regional economy, the vigor of the economy development and the area of the hinterland decide the development of the port. The regional economics plays an important role in the development of the port.

### **3.1.2 International trade**

Nowadays countries all over the world rely more heavily on trade and trade linkages increasingly foster global interdependence. International trade is increasing significantly with the expanding global economic integration. And the developing countries that have rapidest growth in the international trade are more dependent than developed countries. International trade is increasing significantly with the expanding global economic integration. Data shows that an increase in the world output leads to the increase in both export and import. The great container trade drives the mass of demand for the container shipping, which can lead to the high volume of the port. (Lun, Lai and Cheng 2010, p51) Due to the function of the shipping industry that is to transport cargos, the international trade between different continents can be possible with shipping industry. (Farthing and Brownrigg 1997, p20).

Many kinds of products can be transported by the container. And the cost of the sea transportation is always much cheaper than the land or air transportation. About 90% of the international trade goods are delivered by shipment due to the low transportation cost. The lower transport cost can reduce the final price for the trade product and lead to the growing trade volume. And the bigger trade volume can decrease the price of the transportation unit through economies of scale and specialization of the shipping operation. Not only has the volume of the cargo, but also the distance between the place of departure and the destination affected the transport demand.

### **3.1.3 The policies**

The attitude of the government is also important for the development of the shipping industry. The restrictive policy can decrease the throughput of the port, while the introduction of the policies to encourage can help the shipping industry to develop. (Lee, 1990) The port is one of the basements of the national economics, so both the

national government and the local government are taking it seriously. In some words, the competition between different ports is part of the competition of policies. The investment from the government and the support of policy can enhance the competitiveness of the port. Some countries carry out accommodative policies or supportive policies to ease the environment of the transportation to support the competition of the port.

### **3.2 The internal factors influencing the development of the port**

The port should improve all the relevant things to adjust itself to fulfill the increasing amount of requirements by the customers and to attract more cargo to get the further development. The competition between different ports is getting fiercer than before, to survive in the market, what factors can influence the choice of ports by the customer should be realized. Here the customers include shippers, consignees, forwarding companies, liner companies and other companies related to the shipping industry. The choice of the port can influence their companies' development and profits.

In the first part, the elements of the port's capability are divided into many parts includes frequency that the ships call at the port, the level of the port operation efficiency, quality of logistics infrastructures, the efficiency of information system, accessibility of intermodal transportation for the cargo, management of the port and other related factors. The cooperation between different ports can enhance the competitiveness on the other side. It will be showed by the end of this part.

#### **3.2.1 The competition**

The competition for the ports is to gain more cargos as they can. The facilities and the location is the "hard infrastructures", while the other elements such as the management and service level, the efficiency of the port and the operation of information system is the "soft infrastructure".

##### **3.2.1.1 Frequency of the ships calling**

More routes the port has and more frequently the ships calling at the port always lead to competitive carrier cost, greater flexibility with more choices and lower transit time for the customer.

##### **3.2.1.2 Port efficiency**

And port efficiency is another factor which means not only the speed but also the reliability of the port service. The longer time that the ship stays at berth will increase the cost of the Liner Company, and then the cost will be passed to the final customer with higher freight rates. Nowadays with the fast-paced industries, almost every product should be delivery to the market on time, so the terminal operators and the transportation company for the port must be reliable and quickly response to the

delivery order from the customer.

To reduce unproductive waiting time and enable quicker turn-around, some ports operate on a 24-h round-the-clock basis to provide convenient times for anchoring and unloading of vessels.

#### 3.2.1.3 Logistics infrastructures

Adequate infrastructures mean the proper operation facilities and equipments like high quality and big quantity of berths, cranes and tugs, the size of terminal area and container yard can guarantee the capacity of the port. (Zhang, Xi and Zhang, 2011) So that there will not be heavy traffic in the port area which can cause the serious delay to the consignee.

#### 3.2.1.4 Effectiveness of information systems

The information system becomes more and more important in every industry contemporarily. For port management, the high effective information system with reliable security can make the production for the container easier with smooth cooperation. The information systems can allow the shipping to function efficiently and effectively. (Stair and Reynolds 2009, P43)

#### 3.2.1.5 Inland transportation and location of the port

The developed chain of inland transportation can lead to higher efficiency and lower cost for the whole logistics chain of the cargo. Excellent connection to the port includes the rail, road and short sea shipping. Location is also important for the port. (Magold, Reynaud, Seidelmann and Zijst 2009, p156) The ocean and the inland distance can influence the choice of the port due to the different cost. (Malchow and Kanafani, 2001)

#### 3.2.1.6 Port management

The development of the ports relies on the land, equipment and the management level of the port. (Dowd and Leschine, 1990) The service can be improved by the management to satisfy the customers' needs to attract more cargos.

Besides these factors, lower port charge, quicker response to the customer's needs, higher reputation for cargo damage, easier access to the other ports can attract more cargo in the market. (Jose, L. T., 2009)

### **3.2.2 The cooperation**

The ports cluster will not only cause the fierce competition of prices and services but also lead to cooperation between each to serve the general economic interests of their hinterland.

There are two kinds of container ship, one is mother ship and other one is feeder ship. The feeder ship is used to transport the containers from small port to the big basic port, and then the container can be reloaded on to the mother ship from one big basic port to the other basic port. The feeder ship always has a capacity of 1000 TEU while many the mother ships can load 10000 TEU. (Peter 2009, p24) And feeder service between different ports is playing crucial roles in the hub and spoke network system in terms of container transportation. (Wei, Y. Y. and Jasmine, 2006)

### **3.3 Container transport chain**

Supply chain is defined as one set of companies that coordinated for many flows such as products flow, service flow, finance flow and information flow linked to the final customer. (Mentzer et al, 2001) As the definition shows, the container transport chain is part of the supply chain for the purpose of delivering the cargo and the information.

The container transport chain includes many nodes such as warehouse, container yard, container terminal, mother vessel and feeder vessels and so on. All the containers and information move along the network through the most nodes. And the rapid growth of the shipping industry and multimodal transportation heat up the competition. (Cullinane and Wang, 2006)

To understand the container shipping industry better, it is necessary to know the key factors including goods seller and buyer, hinterland transport providers, international transport providers. Further more, interfirm arrangement plays an important role in the chain, since every factor is not independent. Ling Li (2008, p3) defined supply chain management include suppliers, manufacturers, warehouses, transporters, retailers, and customers. So that the container transportation is part of the supply chain.

#### **3.3.1 The information flow**

The flows of the products and the information between different members in the chain are equally important in the supply chain management. The companies can track and monitor the process and make adjustment for the production through sharing the information. (Narayanan and Raman, 2004) As part of the supply chain, the container transport chain also concern the information flow.

Container transport is always a door to door service which can be constituted with ocean transport services and inland transport services through trucks, trains and barges which can delivery the containers in an end-to-end shipping linkage pattern. (Bichou, 2004) The key data for the container is the information about the cargo. The containers are delivered within the net of transport nodes through the linkages such as rails, roads, rivers and oceans. Here the nodes mean the physical location that the container stayed. Freight transport systems are characterized by sequential transfers of



goods between points of origin and destination, generally defined as nodes. (Roso, Woxenius and Lumsden, 2009)

Efficiency in the operations is as important as profitability and success, because shipping is a commodity industry. (Lorange and Fjeldstad, 2010) The goals of logistics is about the “7Rs ” which stands for to deliver the right amount of the right cargo at the right time in the right condition to the right location with the right information to satisfy the right customer. (William and Russ, 1974) The shipper, notify and consignee should be given to the carrier, then the carrier can know who are the customers. And also the weight and volume of the cargo is important for the inland and ocean transport service providers to arrange the right position for the container on the train, the truck and the ship. The detail and accurate information for the container is essential for the transportation.

Shipper provides the most information about the cargo and the customer in the destination. But the sailing schedule such as estimated time of departure and estimated time of arrival and sailing route including calling ports are provided by the shipping company. For the inland transportations, some shippers would arrange them by themselves, the others would to choose one third party logistics company to handle them.

The information transmitting from different actors of the transport chain is necessary to make sure the container is quickly and accurately dispatched from shipper to the final consignee. (Anon 2005, P31) The transit method can be thesis files, fax, phone message, email, and internet based system.

### **3.3.2 Container transport system**

The container transportation is completed by many individuals. The truck operators, the railway companies, terminal operators, the ship companies for the inland river and the international ocean companies load the containers through the chain to make sure that the containers can be delivered efficiently and rightly. And now it is widely accepted that the container port development plan needs to be coordinated with the inland container transport system. The inland container transport system has significant effect on the port development. (Koh, 2001)

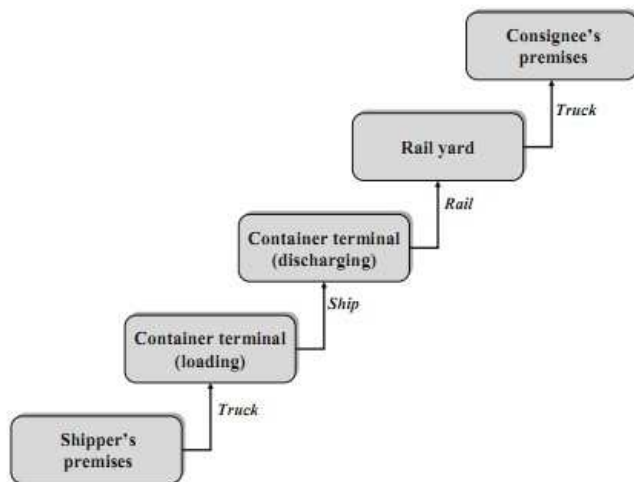


Figure 4 Concept of nodes and links in container transport (Lun, Lai and Cheng 2010, p120)

### 3.3.2.1 Road transportation

Use road to deliver the container is normally faster and convenient before the shipment for the goods seller and buyer. With the road operation, the container can be transported for the door-to-door service. The meaning of door-to-door service means the goods can be directly delivered from the exporter to the importer through different kinds of transport methods such as shipping, land carriage or air transportation. The plan is flexible due to the driver can choose the best route or change the route immediately with their former experiences and the information which is provided by the government. Since the highways are developing quickly in all over the world, the road transportation cost less time than before. But due to the limitation of volume for the flatcar, the amount of containers can be transported is limited. And sometimes, the transport time is influenced by the bad weather.

### 3.3.2.2 Rail transportation

Rail transport is generally limited to serving major conurbations at rather long-distances from the port and the interface towards containers arriving by rail is comparable to that for those arriving by road. With the comparison of the road transportation, the rail transportation has lower environment influence and lower cost per mile.(Roso, Woxenius and Lumsden, 2009) To use rail is normally cheaper than to use road for the transportation if the distance is long. The area of hinterland can be expanded by rail transportation rather than the road net. (Woxenius and Bergqvist, 2011) Due to the larger size, the rails can still delivery abundance of containers with few numbers. Further more, since the train travels through the rails, the transit time of the container is always fixed without delays caused by traffic congestion. For rail net, there are more cost in the initial investment in building the net and the

maintenance.

#### 3.3.2.3 Inland River transportation

Compare with using the road and rail, using the river is slowest for the transportation among all these three methods, while the investment is less. And besides the lower investment, there are other advantages such as lower weather strain, lower transport distance costs, faster throughput in ports and fewer delays which are caused by the traffic congestion. (Roso, 2009.) But due to the lengthy in-transit time, inland rivers are rarely used to transport finished or semifinished products. (Monczka Handfield and Giunipero 2009, p635)

#### 3.3.2.4 Ocean transportation

Most of the container transportations include at least one ocean leg. This part always takes the longest time and distance. International ocean transport service is provided by carriers. And carrier expands the international ocean net by setting the agencies to handle the marketing, customer service, container operation and things about containers or vessels.

### **3.3.3 The third party logistics company**

The barge companies, the trucking companies, railways, carriers, terminal operators and other modal transport operators like private proprietary transport providers are involved in the chain. And many individual involved in the net such as the Liner agency, freight forwarders and port operator. (Ernst 1987, p205) For ensuring the effectiveness of the chain, coordination between different individuals is important. (Frohlich and Westbrook, 2001)

Nowadays, many companies focus on the core competence instead of decreasing the cost. The third party logistics company becomes more and more popular. At first, the aim to use the third party logistics company was to decrease the logistics cost with the economies of scale. But with the development of logistics and strong competition, now many companies choose to use the third party logistics company in shipping chain to make sure the transportation of their products can be efficient. Storage, package, cargo tracking, inland transport service, customer clearance service and other documentation services are the logistics related service in the shipping area. (Lu, 2003) Actually in the shipping industry, the carrier, the transportation providers, the freight forwarder, the cargo brokers and the port operators all can be defined as the third party logistics companies.

#### 3.3.4.1 Liner companies, truck companies and rail companies

The business of the transport company is to create value for the customer during the transportation. There are two methods to create value in the shipping chain, one is

decreasing the cost such as offer lower freight charge, and the other one is to bring more benefits to the customer like enhance the service level or decrease the transit time for the cargo. In some cases, the transportation supplier may able to act as customer broker, paying customer duties and some kinds of taxes and bill them to the final consignee. (Johnson and Bade 2010, p67)

#### 3.3.4.2 Freight forwarders

The freight forwarder can provide related logistics services for international trade. The containerized or other packaging, transportation booking with different transport providers like liner companies and truck providers, export licenses or permits, customs clearance can be offered with only one freight forwarder. From the start the freight forwarder can advise the customer for the issue of freight costs like the ocean freight cost, the port surcharge, the insurance cost and their service fee, document that the shipper should prepare, custom clearance procedures and the possible date of delivery to the final consignee. (Gouws 2004, p156) Each forwarder handles a huge number of booking during one period, which means that the handling plan for the cargo is flexible with high time consumption. (Krajewska 2007, p91) And due to the large scale that the forwarder company handled before, the forwarder is familiar with the import and export regulations, methods of transportation and the documentation with different members in the shipping chain.

#### 3.3.4.3 Port operators

The port can be divided into many parts, and the most important parts are the container yard and quays. A container yard which is used for store the container for a short period to wait the shipment typically takes up about 60–70% of the total terminal area. And the quay is essential for the containers to be loaded on the vessels or unloaded from the vessels. In recent years, due to the increase of the ships size and the development of container shipping, the port operation need to improve itself to be more efficient for handling the cargos. (Manuela and Lourdes, 2008)

### **3.4 SWOT**

SWOT is a scientific tool that can be used to analyze the competition of the market. But in this thesis, it is treated as the theory with introduction of how to use it.

To maintain high competitive in the changing market, many companies use the analyze model SWOT to evaluate the situation. As a classical model, SWOT has been widely used in analyzing many companies. SWOT is used to analyze the Strengths, Weaknesses, Opportunities, and Threats in a company or for a project. (Neil 2007, p87) And also it can be used in the business.

#### 3.4.1 Internal Factors

The strengths and weaknesses are usually internal. They are all inside the research objects. The strengths are what the object is good at, it enable the object to perform well. And the shortage of resource always causes the weaknesses; it may prohibit the object to have a good performance. Internal facts include five parts: material resources, internal immaterial resources, external immaterial resources, human resources and competencies. When many companies are able to provide the similar product or service to the customers, the one has more profit margin or market potentials is more competitive than others. It means the competitiveness is to help the company to gain more profit with expanding market. The strength can be any thing that is superior than other competitors', such as the reliability, the reputation, the service, the product or others. Although the competitiveness is the integration of strengths, to analyze the specific advantage can help the company to enhance strong points and avoid weaknesses. To compare the status with the competitors in the market can help the company to have a deep view in his own advantage and disadvantage. And this procedure should be done with the respective of the customers not the company itself.

#### 3.4.2 External Factors

But the opportunities and the threats are generally external. They all concern about political environment, economic environment, social environment, government policies and location. (Nadine and Anne 2007, p 13) With the development of the economy, society and technology, the global information network and the economic globalization make the competition more open and strong. This environment influences the growth of the company. The environments are divided into two parts, one is the threat, and the other one is the opportunity. The threat in the environment is the challenge that caused by the disadvantage in the development of the trend. If the company cannot take any action for this situation to improve itself, the competitiveness will be decreased. And the opportunity is the area that the company can have competitive advantage which may help to attract more customers. To enhance the capacity with handling the opportunity will bring more profits in the market.

#### 3.4.3 SWOT Matrix

SWOT matrix is used for analyzing the resources with environment opportunities. (Pike 2008, p122) Through this model, the advantage and disadvantage can be showed more clearly. Where need to be strengthen and which part can be change are easily for the company to find.

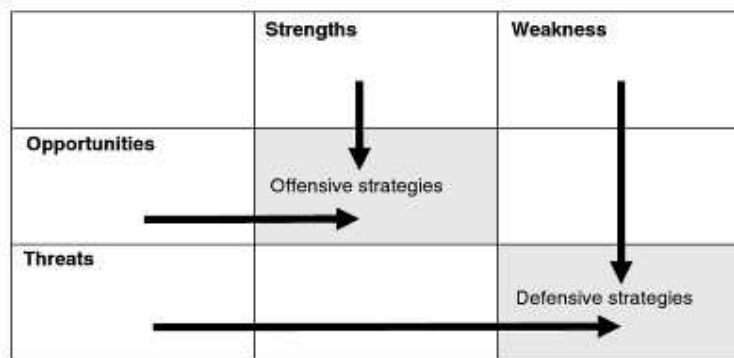


Figure 5 SWOT Matrix (Pike 2008, p122)

### 3.5 Summary

The author's finding from the above literature reviews is that the development of shipping industry in the port can be influenced by outside and internal factors.

External factors are out of the port's control. The hinterland of the port is part of the external factors. The development of economy, the industry structure and the area size of the hinterland are the main elements for the hinterland. And the volume of the international trade is another external factor which directly influences the cargo volume for the port. And the policy is the last external factor which was published by the government. The beneficial policy can encourage the development of the port.

Most of the internal factors can be improved by the port itself. The internal factors concern the competitiveness and the coordination between competitors. The better coordination between the ports also enhances the competitive advantage with easy access to the other hub port. The competitiveness show that the frequency of the ships calling, the port efficiency, logistics infrastructures, effectiveness of information system, inland transportation chain and port management are the main elements for competition.

And the container transport chain is divided into three parts. The higher efficiency of information flow, the easy access to the hinterland by sea, rail, road and river and the rational market of the third party logistics companies are important for the container transportation.

And the SWOT matrix can be used to analyze the status of the port to get the suggestion for further development. It can show the strength, weakness, opportunity and threats for the object. And combined internal and external elements, the detail of the port can be observed clearly.

## **4. Case study-Tianjin Port**

As one of the biggest port in China, Tianjin Port has been developing for many years. Tianjin Port is the gateway of Capital Beijing and also the nearest entrance to Bohai Delta and Midwest Region of China for the other countries by shipping.

In this chapter, the general status is present to have an overall view. The external and internal factors such as the hinterland, international trade, beneficial policies, competitiveness and the coordination will be showed with details of the container transport chain.

And the mature port Rotterdam will be showed as the good example of container port. The Qingdao Port and Dalian Port also are introduced with some data for the comparison.

### **4.1 The external factors that can influence the development of the port**

#### **4.1.1 Hinterland**

The direct hinterland of Tianjin Port includes Beijing, Tianjin, Hebei Province and Shanxi Province. The total area is 373,000 square kilometers (3.9% of the national) with 124 million people (9.8% of the national). In 2000, the GDP in these four areas was 1,081.6 billion RMB, and the amount of Import and Export totally valued US\$49.7 billion, with 12.1% and 10.5% of the national value respectively. (Anonymous, 2004)

The most area of the hinterland for Tianjin Port, with Beijing and Tianjin as its economic and foreign trade center, has a good development in all the industry. The heavy industry that includes coal, electric power, metallurgy, petrochemical and construction materials is the foundation to support the development of this area. The leading industry of this area is the light industry, which contain machinery, textile, food, and electrical industry. And, the most developing part is the tertiary industry with technology, transportation, telecommunications, traveling, international trade and finance as its core parts. This area has a stable supply of agriculture products and a general growth in the forestry, graziery and fishery industry.

The indirect hinterland of Tianjin Port covers about 4.17 million square kilometers with 115 million people, occupies respectively 43% and 9% of the national amount. With vast territory and resources, this area is China's most important place of production including livestock, coal, petroleum, and rare material. (Tianjin Port, n.d. )This area has the richest coal resource in Xinjiang, Xi'an and Ningxia, and has

the richest petroleum resource in Xinjiang. There are great varieties of minerals in this area, and the reserves are very considerable. Also, this area is famous for non-metallic mineral, like the tobarthite in Mongolia, the salt resource in Qinghai, the white mica in Xinjiang and so on.

The heavy industry mainly in resource contains about 75 percents of the whole industry exploiting is the primary component of the indirect hinterland area. The exploitation of the production like calcium carbide, ferroalloy, raw coal, crude oil, sugar, lumber, and electricity generation holds a very important position in the market

But the most parts of the indirect area are plateau, desert and arid land, and the economic development level is low. Export-orient economy there is not popular; the level of international trade is lower than the other parts of China. But with the implementation of the Go To West, the economy and international trade of indirect hinterland will be enhanced. The potential development is certainly existed.

#### **4.1.2 International trade**

##### **4.1.2.1 Bohai Bay Economic Rim**

In the year 2010, the total export and import value of Yangtze River Delta Area, Pearl River Delta and Bohai Bay Rim is 22578 hundred million US dollars, an increase of 33.4 percents. The portion is already 76 percents of the total value of international trade in China. The Yangtze River Delta Area contributes 10881.6 hundred million US dollars; the increase is 35.3 percents comparing to the year 2009. The Pearl River Delta contributes 7510.8 hundred million US dollars; the increase is 28.4 percents comparing to the year 2009. And Bohai Bay Rim contributes 4186.4 hundred million US dollars; the increase is 22 percents comparing to the year 2009. (National Development and Reform Commission, 2011)

##### **4.1.2.2 West Region**

The total export value of West Region is 1068 hundred million US dollars in the year 2008, it increased 935.4 hundred million US dollars that the year 1998 during which year the total value is 132.4 hundred million US dollars. The value in the year 2008 is eight time of the year 1999, that means the average annual growth is 23.2 percents. In the same period, the structure of industry has improved in west region. There is an increase at all the time in the amount of exporting integrated electronic components and other electronic products as well as other high technology products. The value proportion of these products is 6.9 percents in the year 2008; it has 3.7 percentage points more that it in the year 1999.

During these ten years, as the open gate for the international trade, many beneficial policies were implemented by the government. The main purpose is to drive western the process of reforming and opening, accelerate the development of international



trade, support the new industry and project and maintain the good environment for the investment.

From the area of Bohai Rim and Pearl River Delta, many state customs implement the cooperation with West Region to decrease the complexity of the procedure for export. The supervision of the characteristics are plentiful, the cargo can be supervised with multimodal transportation. The companies can proceed with the export procedures in the West Region instead of going to the ports or ask logistics agent to handle the export for them. It is more convenient and efficient than before. And it will certainly encourage the companies to export their products.

#### **4.1.3 Beneficial Policies**

The government of Tianjin implemented Preferential Policy for bonded area of Tianjin Port. No matter where the investor is from, he can use the value-added and consumption tax exemption. Goods shipped between the bonded port areas and other countries are not subject to import and export quotas and licensing certificates. According to these policies, all the companies or individuals that run the business such as international trade, international logistics, manufacturing, commodity exhibitions and other related industries can be applied to the beneficial policies. And the cargo imported from other countries that will be stored in the bonded area can be exempted from the import value-added tax and consumption tax. The cargo is also exempted from the export quota control and license management. The storing time of the cargo has no limitation and the cargo can be transported overseas free.

Machine equipments, construction materials, office supplies and the raw materials and the spare parts that are use for export from other countries are exempted from import value-added tax, consumption tax, export quota control and license management. Both the state-owned enterprises and the foreign-funded enterprises can open foreign cash account. The exchange settlement of the earning can be done if only the companies want to do so. The trade with other countries and processing the goods for export in the bonded area can have fewer procedures with the cash flow. Merchandises produced by enterprises within free port for the purpose of selling in the free port or outbound transporting are free of VAT.

There are many beneficial policies for the logistics company in Tianjin. For the new big distribution, purchasing, packaging, storing and other specific logistics company, the government of Tianjin will apply lots of reduction or exemption of tax to encourage the logistics industry in Tianjin. The transportation company and the storage enterprise can gain subsidy and other beneficial tax policies when they invest for the transport and storage facilities.

## **4.2 The internal factors of Tianjin Port**

### **4.2.1 The competitiveness of Tianjin Port**

#### Infrastructure

Tianjin Port is the biggest manmade harbor which is important for foreign trade in China. It locates in the west of Bohai Sea that is also one starting point of Eurasian Continental Bridge. As the marine gateway of Tianjin and Capital Beijing, Tianjin Port has nearly 260 square kilometers of water and about 72 square kilometers of land area. Till now, the ship which has the tonnage of 30 billion ton can sail in the channel of Tianjin Port. And the depth of deepest area is 19.5 meter.

Four port zones including Beijiang, Nanjiang, Dongjiang and Haihe constitute the Tianjin Port. Beijiang is used for handling the containers and groceries, while Nanjiang focus on the bulk cargo. As the newest port area, Dongjiang is the Bonded Port Zone. And Haihe port zone is the oldest one which is used for the operation of small ships with tonnage under 5,000 tons.

In 1860 Tianjin Port was developed as an international commercial port with terminals built in the both sides of Haihe River. Except the Haihe port area, Xingang was built from the year 1939, and till 1945 it can sail 5,000 tons ship and has 4 berths. After the founding of People's Republic of China, the modification and reinstatement of Tianjin Port started in 1951. From 1958 to 1961, six berths with 10,000 deadweight ton had been built. And a big scale of projects expanding the port area was carried out from 1973.

#### Port Efficiency

In the year 2007, the average productivity of Vessel is 300 containers per hour, while the average productivity of Crane is 36 containers per hour. (Tianjin Transportation and Port Authority, 2009)

#### Port Management

The first open port to the foreign companies to invest in China is Tianjin Port. And the first Chinese-foreign joint venture of terminal is in Tianjin Port with coordination of the company from Norway. (Anonymous, 1999) Now, many the terminal companies and other related shipping companies in Tianjin Port are joint ventures with foreign firms. In this situation, the Tianjin Port can get lots of experiences from developed ports and world-class companies to enhance the service level of it.

#### Frequency of calling

There are more than 400 sailings per month with different destinations of hub ports.

## Information system

There are five internet platforms for the exchanging information and trading. They are land transportation business platform, bulk trade platform, logistics information platform, Dongjiang information sharing platform and Nanjiang bulk supervision platform. But only the transportation business platform and bulk trade platform can be used now, the others are still being built. And for other information like the custom clearance information, manifest information and others need to be trace from other system.

## Others

Now the Tianjin International trade and Shipping Service Center is built for the custom clearance, inspection, services of port, financial service, consultant service, information service and so on. It is the biggest integrated shipping service center and electronic port in China. And the Tianjin International Trade and Shipping Service Zone is building with the aim to provide the comprehensive service of international trade, marketing, exchanging of information, human resources and other business.

Below picture is about the revenue of the different businesses in Tianjin Port. The revenue from container handling is less than half of the non-containerized cargo handling, but the growth rate of container handling is eight times of the non-containerized cargo handling.

Type of business	Revenue			
	2010 HK\$ million	2009 HK\$ million	Growth amount HK\$ million	Growth percentage
Cargo handling operations	5,464.4	5,028.4	436.0	8.7%
Of which: Non-containerised cargo handling	3,958.7	3,830.3	128.4	3.4%
Container handling	1,505.7	1,198.1	307.6	25.7%
Sales business	7,755.5	5,971.3	1,784.2	29.9%
Other port ancillary services business	1,832.8	1,507.8	325.0	21.6%
Total	15,052.7	12,507.5	2,545.2	20.3%

Figure 6 the revenue of the different businesses in Tianjin Port(Tianjin Port 2011, p 9 )

The throughput of Tianjin Port is illustrated as below picture for recent five years.

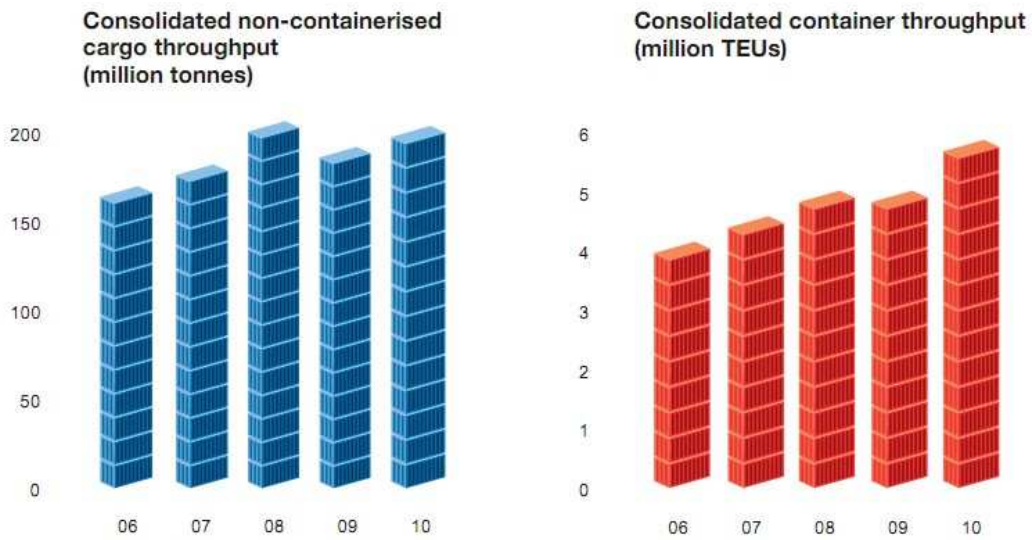


Figure 7 The cargo throughput of Tianjin Port (Tianjin Port 2011, p 5)

#### 4.2.2 The coordination of Tianjin Port with other ports

Tianjin Port has close and friendly relationship with 12 ports in Japan, Korean, American, Holland and other countries. And Tianjin Port has connection with 400 ports in more than 180 countries. There are more than 400 sailings per month with different destinations of hub ports.



Figure 8 The connection with other ports (Tianjin Port, n.d.)

## **4.3 The container transport chain in Tianjin Port**

### **4.3.1 Information Flow**

From the interviews with different operator in different forwarder companies (Danzas, DHL, OOCL logistics, Zhenhua Logistics), different customer service staffs and documentation staffs from different liner companies (Mitsui OSK Lines and CSAV Norasia) and the staff from shipping agency (Penavico) , the information flow of Tianjin Port can be concluded as below.

Before the gate in time, the information of the container such as the shipper, consignee, port of delivery, description of the goods is passed from the shipper to the forwarder and then to the Liner company. Normally the process from the shipper to the forwarder is by fax or email. And the forwarder will pass the information to the booking agency that has the right to book the space for the containers directly from the liner company and is always a big forwarder with high reputation and abundant fund support. After that, the staff of the liner company will book the space and input most of the data in their system. The staffs in container yard can track the information about the type and the amount of the containers that the shipper need from the liner's official website.

After loading the goods into the container, the shipper will inform the forwarder the final detail of the container such as weight and commodities. For special containers like flat rack the accurate data of the width and length exceeding the standard should be provided. For open-top container, the exact dimension of the height should be informed either. And in some cases, such as dangerous cargo, the liner company would ask for the dangerous class, the package class, the certificate of packing and other necessary thing. All the information are used for the arrangement of the containers on the shipboard and the transshipment during the journey or make sure the container are safe to be load on board.

On the other side, the liner will send an EDI report with the specific information to the shipping agency who handles the communication with the ship owner company and the terminal. And then the mother ship's owner company can make the plan of the positions where the containers should be load on board. The terminal company can use this EDI report to arrange the proper position for the containers in the container yard to make the loading efficiently. All the EDI reports are sending by Email. And for many cases the EDI reports are downloaded from different systems. A little mistake will cost plenty of time to check the wrong, besides that there's still some mismatched sections between each other's EDI report. In the terminal, the operation system called IBM eServer i820 is used to arrange the container truck to the right quayside cranes to decrease the waiting time.

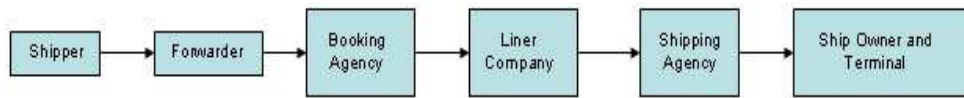


Figure 9 Flowchart of information

### 4.3.2 Rails and roads

#### 4.3.2.1 Rails

Tianjin is the crossroads of many rail routes. Jingshan rail covers many cities and towns in Hebei Province. The transportation from Beijing to Shanghai can use the Jinghu Road which covers Hebei Province, Shandong Province, Jiangsu Province, Anhui Province, Beijing, Tianjin and Shanghai. There are many important industrial cities along this route. Some of the area is the big basement of coal, iron or oil, while some parts is bread baskets or cotton production area. And the cargo transported in South are mainly the iron, coal, wooden stuffs, cotton, oil and rice, while for the North the cargo are always the machines, instruments, clothes, flour and tea-leaves. The longest rail through Tianjin is the Jingguang Rail which covers 98 cities and towns in Beijing, Tianjin, Hebei Province, Shandong Province, Henan Province, Anhui Province, Hubei Province, Jiangxi Province, Guangdong Province and Hongkong.

But most of these rails are outside Tianjin Port, they are located in Tianjin. The connection between the rail and the port is always the road. There are only two rails in Tianjin Port, however most productivities of the rails are transportation for bulk goods.

The picture below is the rail net near Tianjin Port.



Figure 10 the rail net near Tianjin Port (Tianjin Port, n.d.)

The container rail transportation in Tianjin has a huge gap with international developed countries. In the year 2005, more than 20 percents of the total volume of container is transported by the rail in the developed countries, while only 2 percents of total is transported by rail in Tianjin Port.

#### 4.3.2.2 Roads

There is a highway called Jingjintang High way which connects Beijing, Tianjin and Tanggu District outside the port. And also there is another normal road for this direction. Besides those roads, many roads connect the Tianjin Port with the Center of Tianjin City.

And there is one road called Danla Highway which covers the east, middle and the west area of China. The beginning of the road is Dandong in Liaoning Province, and the end is Lhasa in Tibet. The road crossed 9 provinces is 4590 kilometers long. Part of it is highway, and part of it is common road.

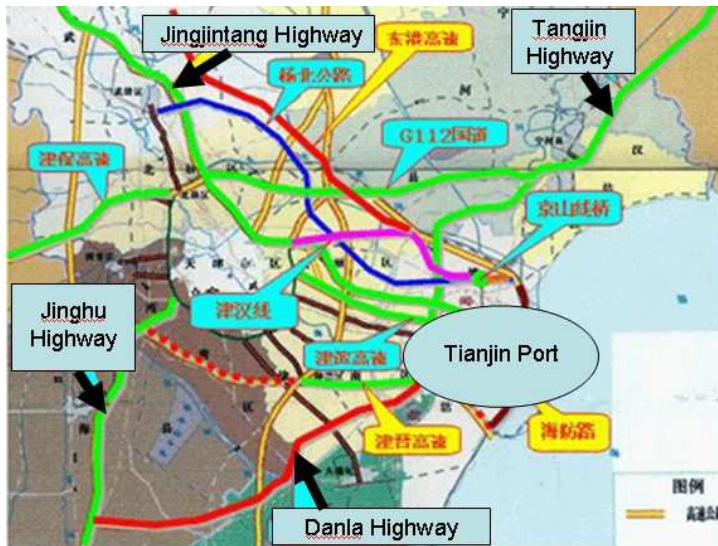


Figure 11 the road net near Tianjin Port(Tianjin Port, n.d.)

### 4.3.3 Logistics Center

Dongjiang in Tianjin Port is divided into three parts: terminal operation area, logistics processing area and comprehensive service area. The logistics processing area located in the middle of Dongjiang can offer many kinds of logistics services such as cargo processing, distribution, purchase, repackaging and allocation. Dongjiang is the largest and most opened free port in China.

Besides Dongjiang, there is another container logistics center in Beijiang. The main function is for the cargo storage, transportation, packaging, processing, distribution, dispatching. Less container loading, devanning operations, service of repair and washing boxes, freezers service, empty container transportation and other services related to the container are offered.

And in the city of Tianjin, there are many kinds of logistics center. Tianjin Airport Industrial Park and Tianjin Airport International logistics Zone are the extensive areas of Tianjin Port Free Trade Zone. One bulk cargo logistics center is located in the Nanjiang which is used to handle the transportation, storage, loading and unloading, transit and changing the package of coal, coke, minerals and other bulk cargos. And there are other kinds of logistics centers for the different specific cargos such as metal stuffs and fisheries foods or for the different specific services like express service and transportation.

Tianjin International Freight Forwarder Association (TIFFA) is a social group approved by Tianjin Commission of Commerce and registered in Tianjin Administration Bureau of NGOs. By the end of 2010, TIFFA has about 2000 members which constitute about 90 percent of the total freight forwarder companies. It means there are more 1800 forwarders in Tianjin to provide related shipping services to the



customers. (Tianjin International Freight Forwarder Association, n.d.)

## **4.4 Mature Port – Rotterdam**

To know the development of container shipping industry, Rotterdam is a good example to be studied. From the history of how the Rotterdam developed, the common points can be provided.

As one of the busiest port in European, Rotterdam has been developing for many years. In 1961, Rotterdam got the biggest cargo volume in the world. And for nearly 40 years, the port of Rotterdam maintained the first place of the biggest ports list.

### **4.4.1 The history of Containerization**

Before the containerization, all goods except bulk cargo were moved piece by piece in break bulk which always caused damage with inefficiency of handling and transportation. After the first container was introduced in New Jersey, the container shipping industry was born and emerging quickly. The container made the transportation much safer, cheaper and faster than ever before. Because the container shipping need new vessels and equipments which needs big investment, Rotterdam was busy with reconstruction of the port till the mid 19 century.

The first full container terminal was built in Eemhaven port area in 1967 by the European Combined Terminals. In that period the continuing development of international trade leads to the sustained growth of container shipping industry. The Maasvlakte was constructed to convert water into land to raise the sandbank to the proper height. Many massive container facilities were built in Massvlakte terminals which handled one fifth of the total throughputs of Rotterdam in 1988. ( Notteboom, 2000)

In the early age of 1990s, the terminals in Rotterdam faced construction of fully automatic equipments and facilities which can enhance the efficiency of the container operation. At that period, Rotterdam was still taking the plans to build abundant infrastructure to satisfy the requirements of growing container volume in the future.

### **4.4.2 Distribution center**

After that Rotterdam was the expanding distribution centers. The continuing container growth leads to the increasing demand of distribution facilities. At the end of 19 century, many international companies participated in the operation of the container terminals in Rotterdam. The competition is gradually shifting from port authorities to private terminal companies who are trying to build a regional network. During that period, the development of container shipping industry caused competition between Rotterdam and Antwerp.

Values can be added through the process of storage, package, manufacture and other procedures within the warehouse and distribution center. And then the cargo can be transit to the hinterland through different modes of transportation.

Many international companies have set distribution centers in Rotterdam to handle their businesses in Europe. Most of so-called Ultra Large Container Vessels are used for the Asia-Europe trade, given the large volumes transported on this route. Rotterdam is one of the most important base ports in this route, and it is trying to satisfy the increasing future demand for container capacity with building new terminals on Massclakte 2 which is Rotterdam World Gateway and APM Terminals. There is also a new trend of using the refrigerated container to transport fruit, fish, meat, medical supply or something else which need to be kept in the low temperature.

The most common methods of deliver the container from Rotterdam to the destination are by rail, road, and barge service.

Rotterdam has 340 rail shuttles per week which are in and from the port. And these rails are connected with many economic centers that are deep in Europe. The port is an increasingly attractive rail hub due to the new rail routes to Czech Republic, Austria, Hungary and France. There are 14 different traction operators and 21 intermodal rail operation providers which make the rail transportation service can be gained in the reasonable price with high quality.

Road transportation is suitable for the medium size cargo with short distance or for the cargo which is urgent for the shipment or inland transportation. By using the trucks, the container can be delivered to many destinations in Europe varies from 8 hours to 4 days. ( Port of Rotterdam, n.d.)

Because Rotterdam has two rivers Rhine and Maas, 40% of the cargo travelled by inland shipping to various destination. And using the inland shipping can decrease not only the cost, but also the environmental pollution. Every year about 34,000 sea-going vessels and 100,000 inland vessels call at the port of Rotterdam. (Port of Rotterdam, n.d.)

#### **4.4.3 Logistics center**

There are many related service providers in Rotterdam. All the resources can be integrated for the container shipping industry.

<p><b>Forwarding and shipping</b></p> <ul style="list-style-type: none"> <li>Freight forwarding (397)</li> <li>Inland shipping (103)</li> <li>Liner agents (82)</li> <li>NVOCC (112)</li> <li>Shipbrokers (87)</li> <li>Shipping companies (133)</li> <li>Shortsea / feeder (43)</li> </ul>	<p><b>Supplies associated industries</b></p> <ul style="list-style-type: none"> <li>Bunkering (36)</li> <li>Containers - sale, rental, leasing, repair (78)</li> <li>Equipment, materials, shipstores, service rendering companies (232)</li> <li>Industry - general (156)</li> <li>Safety and security (68)</li> <li>Shipbuilding and repair (102)</li> <li>Towage and salvage (26)</li> </ul>	<p><b>Transport</b></p> <ul style="list-style-type: none"> <li>Airfreight (97)</li> <li>Barge operators (95)</li> <li>Rail transport (55)</li> <li>Road transport - containers / reefers (134)</li> <li>Road transport - groupage (125)</li> <li>Road transport - tanks / silo (33)</li> </ul>
<p><b>Finance, consultancy &amp; services</b></p> <ul style="list-style-type: none"> <li>Accountants, notaries and attorneys (19)</li> <li>Banking - insurance (33)</li> <li>Employment (22)</li> <li>Transport consultancy - consulting engineers - IT (118)</li> </ul>	<p><b>Port promotion</b></p> <ul style="list-style-type: none"> <li>Port authority (6)</li> <li>Interest organisation (17)</li> </ul>	<p><b>Cargo handling</b></p> <ul style="list-style-type: none"> <li>Cargo superintendents - classification - surveyors (84)</li> <li>Container depots (49)</li> <li>Custom formalities / broker (78)</li> <li>Stevedores - terminals (84)</li> <li>Tank storage (26)</li> <li>Warehousing and distribution (227)</li> </ul>



Figure 12 the amount and the kinds of logistics provider in Rotterdam (Port of Rotterdam, n.d.)

Due to the logistics need information flow to be efficient, the port has developed Portbase which is used for transmitting all the logistics information in ports of Rotterdam and also Amsterdam. Through the Portbase's port-transcending Port Community System, companies can benefit from a multitude of intelligent services for simple and efficient information exchange, both between companies and between the public and private sector. The speed and accuracy of exchanging the information can be enhanced by using the Portbase. This system can maximize the competitive force for all the participants include forwarders, shipping liners, customers, Custom and the port.

#### 4.5 Competitors

Top 50 World Container Ports is showed by the World Shipping Council. Two ports near Tianjin Port are on the list. Dalian Port, Qingdao Port and Tianjin Port are in the Bohai Rim which means their hinterlands are overlapped.

RANK	PORT	COUNTRY	VOLUME 2008 (MILLION-TEUS)
1	Singapore	Singapore	29.97
2	Shanghai	China	27.98
3	Hong Kong	China	24.49
4	Shenzhen	China	21.40

5	Busan	South Korea	13.45
6	Dubai	United Arab Emirates	11.83
7	Ningbo-Zhoushan	China	11.23
8	Guangzhou Harbor	China	11.00
9	Rotterdam	Netherlands	10.78
10	Qingdao	China	10.32
14	Tianjin	China	8.50
23	Dalian	China	4.50

Figure 13 Parts of Top 50 Container (World Shipping Council, 2009)

#### 4.5.1 Qingdao Port

Established in 1892, Port of Qingdao consists of 4 areas: Qingdao old port area, Huangdao oil port area, Qianwan new port area, and Dongjiakou port area. It is a comprehensive port, providing services of loading and unloading, storage, and logistics for containers, coal, crude oil, iron ore, grain, etc. International passenger service is also available. (Qingdao Port, n.d.) Having established trade relations with over 450 ports in more than 130 countries and regions across the world, it is an important hub for international trade and sea-going transportation along the west bank of the Pacific. Every week more than 700 ships calling at the port. Port of Qingdao is always ready to accommodate the largest vessels in the world. Port of Qingdao is the world's largest port for inbound iron ore, China's largest port for inbound crude oil, and China's 2nd largest port for international trade. It boasts the world's highest productivity for the handling of container and iron ore. In 2010, Qingdao Port Group realized total throughput of 350.12 million tons, up 11% year on year. Container volume reached 12.01 million TEU, growing by 17% over last year. With 1.3% of China's total quay length, Qingdao Port gained 6.9% of the country's total throughput.

The foreign trade container terminal of Qingdao Port situated in Qianwan Harbor. There are 20 berths with the length of 6577meters. The alongside depth is 18 meters, and the route water depth is 15 meters. The stacking yard is 4.15

million square meters, with the capacity of 403.3 thousand TEU and 1360 reefer plugs. The terminal has 67 container bridge cranes, 106 rubber-tired cranes and 61 orbited container gantry cranes. There are 95 container trucks, 16 forklifts for heavy containers and 19 forklifts for empty containers now. And there are about 160 sailing routes including ocean-shipping routes, Asia shipping routes and domestic lines. The maximum productivity of Vessel is 497.95 containers per hour. The maximum productivity of Crane is 105 containers per hour. The maximum productivity of Berth per vessel is 48.68 containers per hour. (Qingdao Port, n.d.)

#### 4.5.2 Dalian Port

The Port of Dalian is important to China's trade economy. It offers great space, deep water, and year-round ice-free navigation. It's a convenient port for the northeastern region and Inner Mongolia to develop the international trade. The port now has more than 80 professional berths for the loading need of containers, crude oil, refined oil products, bulk ore, grain, coal, and other modern roro-shipping, including more than 50 million-tons- capacity berth. The biggest ship of container terminal owned by PDA ( Port Dalian Co.,Ltd.) can handle is the ship with 14100TEU. With more than 90 international and domestic container shipping routes with the connection to more than 100 ports all over the world, Dalian Port has become the one of the largest container hub ports in the northeastern region. There are about 85 routes including oversea sailing routes and domestic sailing routes. There are more than 300 ships calling at Dalian Port per month.(Dalian Port, n.d.)

	The max Productivity of Crane	The Max Productivity of Vessel
DCT	88 container/hour	294 container/hour
DPCM	74.43 container/hour	222 container/hour
DICT	57.27 container/hour	156.9 container/hour

Figure 14 Terminal-operation Efficiency

DCT (Dalian Container Terminal Co., Ltd.), DPCM (Dalian Port Container Co., Ltd.), DICT (Dalian International Container Terminal Co., Ltd.) are the important joint venture in Dalian Port with DPA as the domestic controlling company. DCT, DPCM and DICT now have 13 berths, with the depth of 9.8-16.0 meter. The total handling capacity is 5.05 million TEU per year. There are 10 berths of 100,000 ton-class, and all the three company have the capacity of berthing 10,000 TEU ship. The DCT has the yard of 740,000 square meters, with the capacity of 49,000 TEU. The DPCM has the yard of 255,000 square meters, with the capacity of 25,000 TEU. (Dalian Port, n.d.)

## 4.6 Comparison

Below table is some data of Rotterdam, Tianjin and its competitors. The data is from the official website of each port. The data cannot cover every function of the port, but some comparison can be made with limited data. All the data below are concerned efficiency, production and logistics service of the ports.

Ports	Ships calling per week	Deepest water depth	Productivity for vessel (ctnrs/hour)	Productivity for crane (ctnrs/hour)	Number of forwarders
Tianjin	100	19.5	300	36	397
Qingdao	700	18	497.5	105	
Dalian	75		294	88	
Rotterdam	2650(2000 inland ships)				1800

Figure 15 Comparison between different ports

## 5. Analysis

### 5.1 Analysis of external factors for Tianjin Port

#### 5.1.1 Integration for all the external factors that influence the development of the port

Different articles have different views on the issue of development of the port. After combining the viewpoints that the articles mentioned, there is some relationships between the different factors that can influence the development of the port.

The scale and the economy of the hinterland can interact with the development of the port, while the volume of international trade also can influence it. Actually the bigger scale the hinterland is, the bigger volume of international trade will be handled in that area. And also the more prosperous the economy of the hinterland is, the more demand of international trade will be in the region.

The beneficial policies that are published by the government used for accelerating the development of the port can push the development and attract more investment. And the result can also lead to the sustained and rapid developing economy and expanding size of the hinterland.

All these three factors should be integrated to be considered in the development of the port to work out an efficient way for the best output.

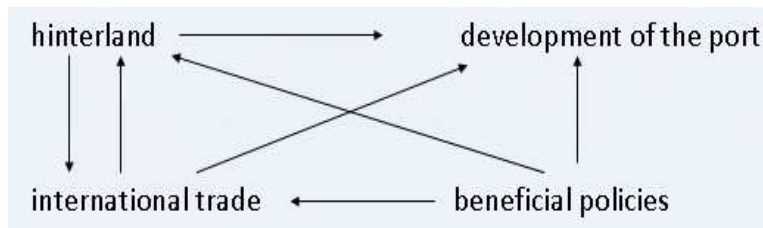


Figure 16 Relationship of external factors

#### 5.1.2 The external factors in Tianjin Port

In this part, with the theory basement, the hinterland, international trade and the policies will be analyzed for the Tianjin Port separately first. By the end, the integrated status will be given.

##### 5.1.2.1 Hinterland

The hinterland of Tianjin Port is very large. It includes developed cities like Tianjin and Capital Beijing. But due to the large size, it also includes many backward regions. That means the development of the economy in many parts especially the west part of China is not very mature. However after the implementation of development of the

west regions policy, the government published plenty beneficial policies to attract international companies to invest in the west area to help various industries and economy develop in this area. It supports the development of the area, which can finally support the development of Tianjin Port.

But on the other hand, the expansive hinterland of Tianjin Port is also overlapped by Qingdao Port and Dalian port. It means the competition in the hinterland is intense. How to gain more share in this market is important for the development of Tianjin Port.

#### 5.1.2.2 International trade

The international trade of China is expanding all these years. The volume of export and import is booming with the development of international trade. Nevertheless not all the cargos are suitable for the container transportation, for coal, raw metal stuffs, grains and other things the bulk shipping is more economical. However, the government of China is encouraging all the companies to export end products instead of raw materials and the companies notice that selling end product can gain more profits and higher core competitiveness, the demand of container shipping will be increased.

And the custom of Tianjin has set agencies in West Region of China to satisfy their requirement to simplify the procedures for the international trade companies to bring more cargo to Tianjin Port.

#### 5.1.2.3 Beneficial policies

The government of China implemented many beneficial policies to create a favorable investment circumstances to the Binhai New area. The big financial support is also given to this area include the Tianjin Port. And Binhai New area supports the development of Tianjin Port. The financial environment and human resource market are maintaining active with the support of the government.

#### 5.1.2.4 The summary of the external factors of Tianjin Port

The scale of hinterland for Tianjin Port is large with only a few economically developed area. But the other parts of the hinterland have the gigantic potential with the fulfillment of China's intensive development strategy of the western regions. And although there are more bulk cargos than the containerized cargos, with the development of the industry in this region, the volume of containerized cargos will go up in the foreseeable future. With the policies which are used to encourage the development of Tianjin Port by the government, it has more beneficial policies than other ports. The potential of Tianjin Port can be predicted.



## **5.2 Analysis of the internal factors in Tianjin Port**

### **5.2.1 Integration of the internal factors**

The internal factors is the elements that can affect the choice of the customer to choose the port. These factors can be improved by the ports itself. Normally the entire integration of these factors is considered as the qualification of the port. To balance the development of different internal factors can have the maximized result with limited invest.

### **5.2.2 Analysis of the internal factors that influence the development of Tianjin Port**

The competitive force of the port does not only include the competitiveness, but also include the capacity of coordination with other ports in the shipping net. The competitiveness of the port can show the superiority of the port comparing other ports, and the connection within the shipping net can enhance the advantage with easy access to the world.

With the advance experiences from the joint ventures from development ports, the quality of management in Tianjin Port can be ensured to be improved quickly to some extent.

With the long history of shipping industry, Tianjin Port is built as one of the biggest ports in Bohai Rim. With the beneficial policies from the central government, the Port has plenty of financial support to improve the facilities of the port and the structure of the port zone to satisfy the growing demands from the customers. Other ports cannot get these unparalleled advantages.

But compared with Qingdao Port and Dalian Port, Tianjin Port need to invest more money for the development of the port area due to it is an artificial harbor. But the city Tianjin is municipality directly under the Central Government that means it has more financial support from the Central Government to expand the port area and to strengthen it self.

The number of weekly calling ships in Tianjin Port is smaller than the mature port competitor Qingdao Port, which means the choice of the schedule for customers is less flexible than Qingdao Port.

The beneficial policies of Dongjiang Bonded Zone and other area in or near Tianjin Port can decrease the cost and the time for the companies with shipping and international trade to attract the customers. This Bonded Zone is set by the national government to increase the competitiveness of Tianjin Port. And with many logistics center in Tianjin City, lots of professional logistics services can be provided conveniently.

However, the location of the logistics centers connected to Tianjin Port is too decentralized, which may cause the waste of the resources. And sometimes the customers have to separate their orders with different service providers in different centers. That will cost extra surcharge for the cargo and decrease the efficiency.

Different individuals have different information system for the cargo. There is no access for each other to share the information quickly and conveniently. The information exchanging is going one by one always with different format, which may cause time for handling it, and it is easy to occur mistakes. There is no system for the customer to track the information for their containers for all the procedures such as location of the container, the inspection of it, rechecking the manifest or so on. Even the port is building many platforms on the internet; different platforms are built for different activities related to the shipping industry. That means for one container, the individual involved in the shipping chain need to search on the many webs to get all information together.

### **5.3 The container transport chain for Tianjin Port**

#### **5.3.1 The information flow**

The information flow is complicated with many steps and different information transmitting methods. The phone message, fax, email and different electronic methods are used to share the information about the container through different individuals. That could cost lots of time with repeating the same information to different concerned parties. And the more steps the procedure has, the more possibilities to have errors. To avoid the mistake during the communication procedure, making the process easier for concerned parties are necessary.

And from the customers' perspective, if all the websites for the shipping industry in one port can be integrated into one website, it will be easier for them to find information about the cargo which means more convenient and efficient service the information system is.

#### **5.3.2 The rail and road**

The rail transportation for container is underdeveloped in Tianjin Port when compared to the mature ports. Only 2% of the cargo is transported by rail in Tianjin Port while 22% of the cargo is transported by rail in Rotterdam Port.

And there are only two rails in the port, which results the limitation for the volume of the rail transportation. Many containers are used the flat truck as shuttle instead of directly transfer the container from the port terminal to the rail or from the rail to the port terminal for the interval between the terminal and the rail. And this process will cost more money and time additionally for the loading and unloading.

Beside the lack of rail in the port area, there is no rail for the quick growing hinterland the West Region of China from Tianjin Port. With the development of economy, the international trade in West Region will has a rapid and continuous growth. Due to the government has published many policies to encourage the industry there, the international trade for the end product will expand more quickly than the bulk cargo. All these will lead to the growing demands for the container transportation. The more the demands are, the more rail transportation will be needed. Because the rail can deliver huge amount of container with low cost compared to the road transportation, it will decrease the cost of international trade and enhance the competitiveness of the product in the market of the destination.

### 5.3.3 The third party logistics companies in Tianjin

With many logistics centers locating in Tianjin, abundant of logistics companies have set agencies there.

Port	Volume	Forwarders
Rotterdam	10.78	397
Tianjin	8.5	1800

Figure 17 Volume of third party logistics companies in Tianjin and Rotterdam

As the above table shows, volume of Tianjin Port is only three fourth of the volume of Rotterdam Port, but the number of forwarding company in Tianjin Port is more than four times of it in Rotterdam port.

That makes the competition in the market fierce, and it can help the customer to gain a reasonable cost for the service. And also the third logistics companies are attempting to provide better service to gain a dominant position to get more market share. But it also causes another circumstance; there are many small and medium sized logistics companies in the market.

## 5.4 SWOT of Tianjin Port

	Strength	Weakness
Opportunities	The beneficial policies from the national government give Tianjin Port the advantage than other ports. (S/O) The Binhai New Area provides superior environments of human resources and market for shipping industry, this competitiveness is superior than the competitors include Qingdao Port and Dalian Port. (S/O)	Most parts of hinterland of Tianjin Port is not developed, which result the container volume is not great. The hinterland is developing quickly with the implementation of large-scale development of the western region. The containerization in west region will increase with the encourage policies of completed products. That can cause the huge increase for the

	The management of the port is improving with the joint ventures with firms from developed ports.(S/O)	<p>demand of exporting container cargos. (W/O)</p> <p>Most transportation within the area of the Tianjin Port is through the road, which cost more money than the rail. And for the peak season, it may cause the traffic congestion. The loading and unloading procedure between the truck and the train decrease the efficiency of the chain.(W/O)</p> <p>Tianjin Port is lack of common information system for all the concerned parties to use to share the information of the container, especially compared to Rotterdam which has the Portbase system for all concerned individuals in the chain. The information flow of Tianjin Port now is so complicated that results lots of errors in the processing procedure. And these errors may cause the delay of the container transportation. (W/O)</p>
Threats	Many logistics centers can support different professional logistics services to the customers. That may bring more cargo to Tianjin Port. But the locations of the logistics centers are too decentralized, that cost more money and time with the complicated procedures. (S/T)	<p>The Qingdao Port is already having more volume than Tianjin Port with more frequency of the ships calling. (W/T)</p> <p>For the hinterland West Region of China, many ports include Qingdao Port, Dalian Port and the southern ports Shanghai are all want to expand the container market there. (W/T)</p>

Figure 18 SWOT of Tianjin Port

With the SWOT matrix, the future of Tianjin Port is still showed as good trend because of lots strengths and opportunities. And the weakness and threatens showed the container transport chain need to be improved to enhance the competitiveness and adapt the trend of the development.

## **6. Conclusion**

### **6.1 The main factors influence the development of the port**

With the previous literature review and the case, the main factors can be divided into two parts: external and internal. The external factors include the hinterland, the international trade and the policies, while the competitiveness and the coordination constitute the internal factors. All of the factors can not be considered separately. They can affect each other to decrease or increase more potential for the development of the port. The easier access to the hinterland and other ports, the higher efficiency of the port, the better service of the port and the convenience of the information system can help the port to gain more customers and market share. And all those can lead to the expansion of the hinterland. Also the economy and the international trade of the hinterland can be improved by the better port, while the beneficial policies can encourage these effect.

### **6.2 The importance of the container transport chain**

With the development of the inland port, the function of the container transport chain is becoming more important in the market. The higher efficiency of the information flow, the easier access of the inland transportation and the rational market of the third party logistics company are necessary for the container transport chain. The integration of these elements can expand the area of hinterland for the port. And also the competitiveness of the port can be improved with the development of the container transport chain.

The easier access to the wide hinterland with suitable transportation can decrease the cost for the final products during the international trade process and help to ensure the delivery of the goods to be on time for the consignees' schedule of sale or production. And the better container transportation chain can enhance the reputation of the port to gain more market share. With this good result, the hinterland can be expanded. It will bring more containers for the port.

The efficient information flow can save the time for all the individuals involved in this chain. And it can decrease the error which may cause the delay and extra surcharge for the container transportation. Once the error happened, the good information system can check it out and make a flexible plan for the situation. And with the convenient information system, all concerned individuals can get the right information from it by themselves instead of waiting for others' response.

The rational market of third party logistics can provide reasonable price and good service to the customer, and it can ensure the sustainable growth of the service supplier market. Only with the sustainable growth, the service can be improved. If the competition is too strong, it may lead to the low price which can not encourage the

development of the shipping industry. And too many companies involved in this market will decrease the economics of scale due to the many companies are small-medium size.

### **6.3 The suggestions to Tianjin Port**

As the SWOT matrix of Tianjin Port, some suggestions are as below.

Invest more for developing the rail transportation to improve the rail net for Tianjin Port. Built more rails within the area of Tianjin Port to enhance the capacity for the inland transportation. So that using the flat truck as the shuttle for the containers can be less. It can decrease the cost and increase the volume for the container transportation. And the rail transportation can reduce the environment effects. Building more rail terminals for the loading and unloading the containers from the flat truck to the ship or from the ship to the flat truck can improve the efficiency.

Strengthening the supervision of the market of third party logistics companies can avoid the keen competition which may leads to the unhealthy growth of the shipping industry. The healthy market can support the development of the port. The government can publish some policies to support the development of the third party logistics companies which have the good potential in management or operation.

The port can improve the information net to satisfy all the kinds of companies within the shipping industry. Integrating the websites can decrease the complexity of tracking the information. And with the development of the information system, the number of errors can be decreased with simple and easy transmitting.

Developing the Dongjiang Port Area, that is the Bonded Zone with beneficial policies that the competitors Qingdao Port and Dalian Port do not have, can enhance the situation of Tianjin Port in Bohai Rim.

When developing the shipping industry for Tianjin Port, the environment should also be considered seriously. The green logistics can help the port to gain a sustainable development with limited resources and higher profits.

In general, Tianjin Port need to improve the container transport chain with building proper facilities and information net and control the market to develop itself. And the advantage such as beneficial policies in specific area should be enhanced to overcome the competition with competitors.

## **6.4 Further Research**

Due to the time limitation of this thesis, it has not included how can port clusters influenced each others' development. Next research will be the study of the ports clusters. The function of the ports cluster, and the example of ports near Rotterdam will be examined to get the conclusion how to improve the port self to speed up the development with the ports cluster.

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