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Research on developing port logistics in Fangcheng port

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RESEARCH ON DEVELOPING PORT LOGISTICS IN FANGCHENG PORT

By

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China

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Fulfilment of the requirements for the award of the degree of

MASTER OF SCIENCE

(INTERNATIONAL TRANSPORT AND LOGISTICS)

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DECLARATION

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

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

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ABSTRACT

Title of Dissertation: **Research on Developing Port Logistics in Fangcheng Port**

Degree: **MSc**

With the development of economic globalization and China has been a member of WTO, logistics is becoming a symbol of one nation's economic development degree. It provides basic motive to support the development of civil economy, and has deep influence on the world economy.   Logistics has been getting more and more attention.   It is regarded as the 3rd profit source.   Port, as a hub of ocean and rail, is not only a central belt of international trade, goods storage, and distribution, but also becoming an important part of international goods transportation and world economy and trade.   With the development of global multimodal transport, port, as an important node of modern logistics, doing port logistics has became an important subject that the development of ports will face it.

The dissertation is just under this situation, analyzing the status quo of Fangcheng Port, Guangxi, and expounding its existing problems. Then the dissertation does the forecast for the throughput of Fangcheng Port, and analyzes the port logistics business of Fangcheng Port through SWOT analysis and BCG matrix, which based on AHP.   On the basis of these conditions, the dissertation brings forward strategic objective and strategic measures for developing port logistics of Fangcheng Port, namely in line with basing on the feeder port, utilizing superior geographic position and good infrastructure of Fangcheng Port, linking international and domestic logistics nets, and then becoming the regional pivot port gradually to service the great southwestern regions of China.   It should put the keystone on exploiting hinterlands, which strive for the inland source of cargo activities actively through

improving the communication net of linking hinterlands and strengthening the economic contact with other areas while consolidating its traditional economic hinterlands.   Fangcheng Port should put developing modern logistics into its development strategy system to achieve the functional upgrade that from traditional transportation to modern logistics, and to get the leap which from feeder port to the pivot port.

KEYWORDS: Port logistics, Fangcheng Port, Throughput forecast, AHP, SWOT, BCG matrix, Development strategy

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

ASEAN	Association of Southeastern Asian Nations
VHFRT	Very High Frequency Radio Telephone
DWT	Deadweight Tonnage
Sq.m.	Square Meter
CAFTA	China-ASEAN Free Trade Area
CFS	Container Freight Station
MSE	Mean Square Error

1   Introduction

1.1   Background of research

Since the eighties of the 20th century, the logistics industry has become a blossom industry rapidly.   Logistics is regarded as the third profit source after raw materials and processing.   The modern logistics has been separated from producing and circulating process, which has become a professional and new-type economic activity. The logistics industry is growing and being an important new-type pillar of national economy.（Report on China's logistics development of 2001, 2002, p. 5）

Port logistics has become a motivity of developing a port and the growth of cities' foreign trade and economy, especially having higher level economic export-oriented port cities which are importance place for import and export and highly connect with global economy.   It must vigorously develop port logistics industry to maintain and promote mingled port cities with global economy.   So, the modernized port logistics should be the industrial spotlight that actively cultivated by port cities.

1.2   The status quo of relatively research

Due to the greatly development of western regions of China, and continually cooperation in economy and trade between China and ASEAN, the development of Fangcheng Port, Guangxi, has been a hot issue at recent years.   Therefore, many relevant journals, such as *Port & waterway Engineering*, *Journal of Transport and*

Communications Engineering, Guangxi Communication Technology, China Port, Shipping Management, etc, have published articles about Fangcheng Port. These articles provide a lot of precious data and ideas for writing this dissertation. However, there are not many researches and discussions in developing port logistics of Fangcheng Port, especially the academic research that combined with analysis methods which used in the dissertation are even less. The application of these analysis methods is a creative point of the dissertation.

1.3   Object of Research

City Fangchenggang has 4 first-class ports, that is Fangcheng, Dongxin, Jiangshan, and Qisha, of which Fangcheng Port has exceptional advantages on developing port logistics because port's navigation channel is short with little siltation, utilizable coastlines are long, and sea-land communications are convenient. It located in two fanlike junctions of the great southwestern regions of China and Southeast Asia, which plays an important role in implementing the strategy of the greatly developing the western regions and open-up. Meanwhile, Fangcheng Port is the largest port in Guangxi as well as the third largest port in the South China, which shares over 70% of importing and exporting cargoes of Guangxi coastal ports in transshipping cargoes. It also is one of the 20 main pivot ports of our country. Therefore, it has a practical meaning that discusses on how to promote the logistics development of Fangcheng port. It is also a topic that is worth researching.

1.4   Contents of research

Firstly, the dissertation will briefly introduce the concept of logistics and port logistics, basic characteristics of modern logistics, and the function of port logistics. Secondly, it will analyze the status quo of Fangcheng Port, which includes Fangcheng Port's advantages, opportunities, existent problems, and so on. Thirdly, it will apply three kinds of forecast methods to forecast the future throughput of Fangcheng Port, and try

to combine AHP with SWOT and BCG matrix, which makes theory have a quantitative result to support the dissertation's view.   And then the dissertation will give analyzed results.   Fourthly, the dissertation will bring forward the total idea and give some suggestions.

2 Modern logistics and port logistics

2.1 The concept of logistics and basic characteristics of modern logistics

Logistics indicates the physical movement that entities from suppliers to demanders, which is composed by a series of economic activity that create time and spacial avail. Logistics is an integration of transportation, storage, packaging, discharging, circulation, processing, and information process, etc.（Wang Zhitai，2001，p. 4）

Modern logistics is a strategic measure that wholly considers manufacture, transportation, sales, and other markets in accordance with the goal of satisfying customers' requirements. The characteristics of modern logistics represent specialization, integration, internationalization.

2.2 The concept of port logistics

Port is an engaging in discharging, storage, and processing place. Its operation forms logistics that is port logistics. Port logistics is a special product of logistics, and has an important position at the whole logistics service chain. As shown in figure 1, port's position in the logistics service chain.

Gathering and Distribution
Port Storage
Multimodal transport

| Direct Hinterlands | | Cargoes | Port | Cargoes | Other Places in the Nation |
| Indirect Hinterlands | | | | | Foreign Places |

Upstream of Service chain   Downstream of Service chain
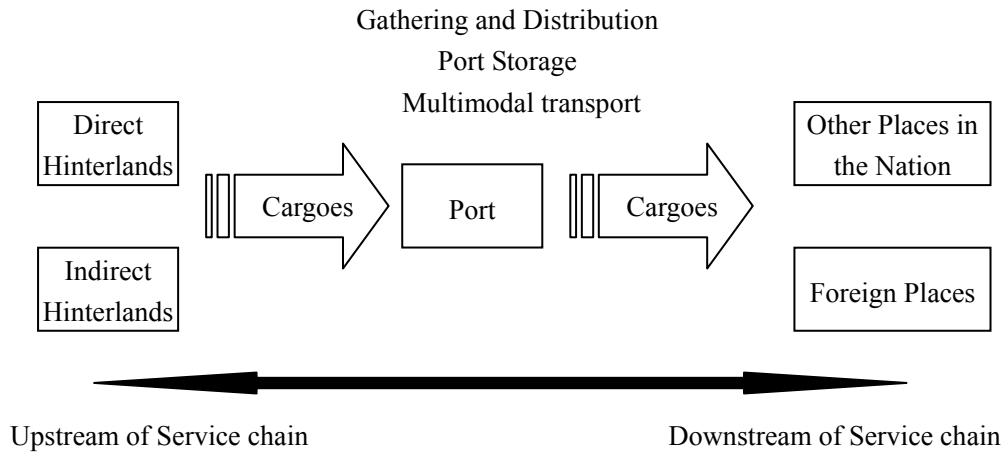
Figure 1 - Port's position in the logistics service chain

2.3   The functions of port logistics

Port logistics has been being an important step in the development chain of modern logistics.   The driven effect, port to logistics industry, not only includes shipping industry, but trade, ocean shipping, information, finance, etc.

In the whole logistics service chain, port is a gathering and distribution place that has a great number of cargoes.   It has a lion share in cargoes transportation, and provides the most inexpensive transport condition.   Shipping has advantages of large freight volume and lower cost compared with land and air transportation.   The freight volume of a 50,000 dwt ship is equivalent to that of 1000 train cases with 50 tons. International logistics completed depending on port basically. (China's Logistics Yearbook 2003, 2004, p. 21)   Generally, port city belongs to a city with developed economy, trade, and finance, which provides strongly supporting service for a great deal of forming and developing logistics.   World Bank's experts said, "To build a container terminal, the local economy can get 92% benefits while 8% benefit belongs to terminal and shipping companies."   Therefore, having a powerful port will get an amplification effect that one port drives fully situation to one city developing modern logistics industry and promoting competitiveness.

3   The analysis of the status quo of port logistics of Fangcheng Port

3.1   Briefly introduction to Fangcheng Port

Fangcheng Port built in March of 1968, and completed in the end of 1969. Nowadays, port has 29 berths, of which 24 productive berths, 15 over 10,000-ton berths and one specialized container terminal.   The maximum design berthing capacity is 200,000 tons.   The shoreline of dock is 4098m long.   6.1 nautical miles navigation channel, bottom breadth is 125m and bottom mark is -9.5m, is in use. 30,000 dwt ships with laden can safety pass in and out port.   50,000 dwt ships with laden can take the tide pass in and out port.   The storage area is over 1.8 million sq.m.   Furthermore, Fangcheng Port has large specialized storage facilities for bulk grain, cement, sulfur, etc.   Port has approximately 600 special discharging and transportation machines, of which 31 gantry type cranes, 2 container cranes, and 11 ships for port's working.   The length of port's railway is 25 km, of which 11 lines, 11.2 km, are in switchyard and 19 lines, 13.8 km, are discharging special lines.   Port builds infrastructures of water and power supply, communication, navigation, etc. 3000 program-control switches connect with local telecommunication system in port. Port also has VHFRT station, laser and satellite-aided navigation systems.

Since operating, Fangcheng Port, at present, has covered Southeast Asia, Northeast Asia, Middle East, Europe, West and East America, Australia and Hong Kong areas in ocean going liner services, including direct and transshipping services.   Additionally,

common shuttle barge services to Shekou/Chiwan Container Terminals for global range services.　　Now there are forming a liner service network with the core at offshore trunk liner services to Southeast and Northeast Asia and the focus at common shuttle barge services serving American, European and Middle Eastern ocean going liners.　　Since operating in 1987, the port's throughput has been increasing with 25% every year.　　In 2005, it reached 20,060,000 tons, of which the throughput of container is 101860TEUs.　　It showed in figure 2 and table 1 that the cargoes and container throughput of Fangcheng Port of 1995-2005.

Figure 2 - 1995－2005 Cargoes throughput of Fangcheng Port

Source: Figure with an author:

　　　Fangcheng Port (Group) Co., Ltd. (2006). Proportion figure of throughput of Fangcheng Port.
　　　　Retrieved March 7, 2006 from the World Wide Web:
　　　　http://www.fcport.com/fcpunder/Treed.htm

Table 1 - 1995－2005 Fangcheng Port's container throughput[1]

Year	Container(TEU)	Growth rate %
1995	4966	－
1996	4240	-14.62%
1997	2859	-32.57%
1998	3442	20.39%
1999	4859	41.17%
2000	15952	228.30%
2001	20136	26.23%
2002	46285	129.86%
2003	52280	12.95%
2004	80168	53.34%
2005	101860	27.06%

Nowadays, Fangcheng Port has possessed the discharging capability for assorted general and bulk cargoes, container, and petroleum chemical products. It also has functions of storage, transshipment, and multimodal transport. The annual tonnage capacity is 25 million tons, of which container is 250,000 TEUs. In 2005, the throughput of Fangcheng Port reaches 20.06 million tons, of which cargoes from southwestern areas account for 90.5% of the whole transshipment cargoes. During the tenth five years (2001-2005 year), on the basis of the quicken pace of finishing the construction of 11# and 12# berth, port has started to build 200,000 tons-class ore quay and the third phase project of 13# ~ 17# berth, to extend navigation channel that 140m width and -16.5m depth, and to expand warehouses and stackyards 50,000sq.m. At the same time, port adds the second switchyard and improves the discharging techniques to suit cargoes, from southwest area, which can conveniently pass in and out Fangcheng Port, and to meet the requirement of developing local maritime industry.

3.2 Fangcheng Port's advantages

Fangcheng Port has exceptional advantages on developing port logistics because

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[1] Data source: Collected all by author.

port's navigation channel is short with little siltation, utilizable coastlines are long, and sea-land communications are convenient. It located in two fanlike junctions of China's the great southwestern regions and the Southeast Asia, which exerts an important role in implementing the strategy of the greatly developing the western regions and open-up. Fangcheng Port has the following six major advantages.

1. Environment. In recent years, China builds Guangxi as the big ocean channel of the great southwestern regions. And Guangxi constructs Fangcheng Port as the position that is coastal leading port and main door. And Guangxi wants to develop City Fangchenggang as a coastal big port, channel, trade, and industry city in a short time.

2. Position. Fangcheng Port enjoys exceptional advantages on geographical position and situation. With neighboring Guizhou and Sichuan to the north, Yunnan to the west, Guangdong, Hainan, Hong Kong and Macao to the east and Beibu Gulf to the south, Fangcheng Port is located at the center of the Great Southwest China, with rich natural resources, and the Southeast Asia, brisk in economy as the joint hub. It is the most convenient big shipping channel of southwest provinces of China. It is also the bridgehead of CAFTA.

3. Resource. Fangcheng Port has abundant port's shoreline resource. The established sector is a natural deep slot with majority of depth is -2 ~ -7m and some are -10 ~ -12m. The depth of the south water area of Niutou Mountain is majority of below -5m, which is a good navigation channel for ships entering and leaving port and anchoring area. Water area of Anbu estuary, around 6km of the east, is approximately 8km long with -10 ~ -14m depth, which can extend 40 ~ 50 specialized docks with 50,000 ~ 100,000 tons. Experts turn out that Fangcheng Port can build 115 berths with 10,000 ~ 300,000 tons, and has preponderant conditions for being a big international trade port.

4. Gathering and distribution.　Fangcheng Port's traffic is very convenient, which railway and freeway can directly arrive at port.

　　Road connection：Freeways directly connect with quays.　The situation is a few in China's ports.　Fangcheng-Guilin freeway is 505km long, which almost crosses the whole Guangxi.　At the same time, southwestern provinces can arrive at port via Guihai Freeway.

　　Railway connection：Fancheng Port links with Nan-Gun, Nei-Gun, Xiang-Gui, Qian-Gui, Li-Zhan, Li-Qin, and Zhi-Liu Line via Nan-Fang Line.　Railways can directly arrive at docks and CFS, which makes Fangcheng Port become the south bridgehead of southern regions' shipping.

　　Airway connection：The distance between Fangcheng Port and Nanning International, Beihai International, Liuzhou, and Guilin Liangjiang International Airport is 140km, 160km, 320km, and 500km respectively.

5. Service.　The port's function of Fangcheng Port is comparatively sound.　Port's soft surrounding is being improved.　Customs clearance speed is continuously increasing.　The customs clearance of exporting cargoes usually can be done in 24 hours.　H986, a container electro-inspection system that invested and made by Bureau of customs, has been used in July of 2003, which further improves the inspection efficiency of customs clearance.　Furthermore, customs has devoted more effort to fleetly inspection and pass, since September 20, 2003.　Ships can be declared before it will arrive at port in 5 workdays.　The administration system of container terminal has connected with the customs supervision system.　Carrying on EDI in a whole day will achieve customs clearance with no paper.　As one of eleven trial points of the fleetly inspection system of imports and exports of the whole country, Fangcheng Port's fleetly inspection and pass system has came into effect on December 3, 2003.　All these measures improve port's big surrounding and enhance port's service advantage.

6. Demand. With carrying on the developing strategy of the western 12 provinces of China and the construction of CAFTA, Guangxi has already stepped into the fast traffic lane with fast-developing economy. At recent，lots of Chinese and foreign enterprises doing business in City Fangchenggang one after another, which will generate the enormous demands to port shipping industry.

3.3　Fangcheng Port's existent problems

Fangcheng Port's development is rapid, but there are still many problems should be solved.

3.3.1　Problem of rail transport

Guangxi coastal railways all belong to local railway, not belong to state railway. Therefore, Bureau of railway firstly considers state railways at operational plan, train wagon dispatching, carriage calculation, and other aspects whereas ignores Guangxi's local railways. Therefore, "Nowadays, rail transport has been a bottleneck for developing Fangcheng Port. A lot of cargoes, from Yunnan, Guizhou, Sichuan, and Chongqing, don't arrive at Fangcheng Port, can but to seek far and neglect what lies close at hand. And it is a serious phenomenon that cargoes detention at port." The design capacity of Fangcheng Port's loading yard is 1 million tons. However, the volume of ore detention at port reaches 1.48 million tons at May, 2004, as shown in table 2. The first half year of 2004, the volume of cargoes detention at port reaches 3.5 million tons, which break the historical record of Fangcheng Port.

Table 2 - Fangcheng Port's volume of ore detention at port of May, 2004

Indicator	May（10,000 tons）	Growth %	Jan. ~ May （10,000 tons）	Accumulated growth %
Fangcheng Port's volume of ore detention at port	148	_	_	_

Source：Table with an author:

Internet newsroom of *China Navigational Affairs*. (2004). The transport situation of coal and
ore of our country of May, 2004. Retrieved April, 2006 from the World Wide Web:
http://www.snet.com.cn/19/2005_9_14/2_19_3395_165_0_1126666708356.html

3.3.2 Throughput capacity is inadequate

"Nowadays, throughput of Qinzhou Port, Fangcheng Port, and Beihai Port only has 30 million tons in all, which maybe lower than one working region of some large ports in China. All in all, ports have the problem that throughput capacity is inadequate in Beibu Gulf." The generated volume of container, a main kind of transporting cargo in modern port logistics, is still not high in Fangcheng Port. It is an inevitable fact that the southwestern regions of China, as Fangcheng port's hinterlands, are one of the most impoverished regions. The economy of these regions is in the main of elementary industry and endogenous-type agriculture，which can not provide sufficient source of cargo activities to Fangcheng Port in a short time. And that, Fangcheng Port only shares a limited portion even in current limited source of cargo activities.

3.3.3 Port's water depth is insufficient

Nowadays, Fangcheng Port's shipping depth is -9.5m, and the deepest berthing depth is only -13m. Some large ships with draft over -13m and 100,000 dwt will have to use barges to carrier reduced or take the tide passing in port if want to berth and discharge. For that reason, it increases cost as well as prolongs the detention so as to a lot of shippers change route to other large ports.

3.3.4   The cycle of cargoes leaving port is long

Fangcheng Port, in recent years, has great efforts on ocean going liner services that directly arrived at a few ports of Southeast Asia.   Many cargoes have to be transhipped in Hong Kong or Singapore due to Fangcheng Port does not have liner shipping that directly arrive at some major European and American ports, which significantly increases customers' costs.   Therefore, many customers choose Huangpu Port, Guangzhou, or Shekou Port as loading port.   For these reasons, Fangcheng Port suffers great loss at source of cargo activities.

3.3.5   Port's orientation is ambiguous

According to the initial layout, Fangcheng Port is oriented as a port with mainly transshipping a mass of cargoes, Qinzhou Port is positioned as maritime industrial port, and Beihai Port is oriented as business tour port.   Under the market economy, however, these three ports all develop maritime industry.   Fangcheng Port ignores specialization and coordination while putting emphasis on competition.   Fangcheng Port has little competitiveness because it has not specialization and collaboration in accordance with the requirement of regional economic integration.   Therefore, Fangcheng Port can not apply limited funds into its preponderant projects.   In other words, Fangcheng Port can not make full use of its advantages.

3.3.6   Logistics level is not high

At presents, City Fangchenggang's logistics industry is still at the elementary stage of shifting from traditional logistics to modern logistics.   There still has a big gap compared with the development trend of international logistics industry and economy. A lot of logistics enterprises just only provide simply transport and storage service. It is not all-round way development in valued-add, designing logistics plan, and other logistics service aspects.

3.4   The importance of developing port logistics of Fangcheng Port

3.4.1   Promoting the position that main shipping passage of the southwestern regions of China

City Fangchenggang insists on building a big passage and servicing the Greatly West as its own duty.   It accelerates the pace of building infrastructures of port, communication, and city.   Fangcheng Port continually strengthens the development of port logistics.   Fangcheng Port has taken on importing, exporting, and transshipping a mass of cargoes from the southwest and Mid-south regions of China, and further upgrades the position of the main shipping passage that the southwestern regions of China.

3.4.2   The development of port logistics industry will promote adjustment of City Fangchenggang's industrial structure to enhance competitiveness

"From the view of economic development, if the proportion of the tertiary industry increases and occupies the leading position, it is the important manifestation that the rationalization of modernized port city's economy development and industrial structure."   The typical example like as Hong Kong and Singapore, the two large ports' industrial structure has obviously demonstrated the tertiary industry occupies a leading position.   City Fangchenggang continuously promotes the industrial structure in the process of developing economy, but still has a big gap in the proportion of the tertiary industry compared with some large ports of our country.   The gap will be reflected on the city's service function, which will weaken City Fangchenggang's competitiveness.   At this moment, Fangcheng Port vigorously develops port logistics, which will attract massive source of cargo activities.   It also can promote the upgrade of City Fangchenggang's industrial structure and can soundly improve the urban service function.   It will enhance City Fangchenggang's competitiveness in all-round way.

3.4.3 Port logistics will be another pillar industry that impulses the growth of City Fangchenggang's national economy

The contribution of developing port logistics to City Fangchenggang's national economy can be separated into direct and indirect economic contribution. The direct economic contribution of port logistics industry is that port logistics and its correlative industries have initial or the first around influence on local and national economy, which includes GDP, opportunities of employment, revenue, etc as well as the new around of economic increased value achieved by its forward relation 一 industry, trade, and other departments provide correlative service and backward relation 一 consumption industry, trade, finance, etc. The indirect economic contribution of port logistics industry is the sum of the second round and later each round influence by port logistics industry and its relevant industry on local economy. This is because the earning, produced by port logistics industry, of which as least some will be spent on local products and services. E.g. employees that employed by port logistics enterprises will spend their incomes on local products and services. These expenditures will form another enterprises' earning, and produce new added-value.

On the first half year of 2004, City Fangchenggang achieved 3.45 billion[2] Yuan, of which the increased value of the tertiary industry is 1.423 billion Yuan, increase 13% compared with the same period of last year. The contribution rate, the tertiary industry to economic growth, is 45.1%, which makes economy grow 5.2 percentage points.[3] Therefore, port logistics, as the tertiary industry, can really become the pillar industry of City Fangchenggang.

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[2] 1 billion = 1000 million

[3] Data source: The economic society of our city achieves fast development. (August, 2004). http://www.fcg.gx.cei.gov.cn/news/dtnews/20040804-1.htm

3.4.4 Prospering city by port to promote city's economic development

The development of port brings along the growing up of maritime industry. Nowadays, some enterprises that are world top 500 enterprises doing business in City Fangchenggang, such as DAHAI Cereals, Oils and Foodstuffs Co., Ltd., YUETAI Feedstuffs Co., Ltd., HONGYUAN Paper Pulp Co., Ltd., and so on. A new industrial base with 4 pillar industries, grain processing, steel, chemical, and energy source industry, has been forming in the southern China.

The constantly increase of port's tonnage capacity and the cultivation of logistics industry make City Fangchenggang's customs revenue and the number of arrival ships achieve big breakthrough. The first half year of this year, City Fangchenggang's customs revenue reaches 1.155 billion Yuan, increases 1.02 times.

3.4.5 Enhancing urban employment

Port not only can create a lot of employment opportunities by itself, but also can provide a large number of employment opportunities through the development of port's relevant industries for urban employment. Therefore, port has an important position in urban employment. "The employment contribution rate of Rotterdam Port and Hong Kong Port, and their relevant industry to Rotterdam and Hong Kong is 21% and 20% respectively." It is obvious that a developed port can provide approximately 20% employment opportunities for a city. So, Fangcheng Port should fully exert the function of port and do the contribution for urban employment.

3.5 The opportunities of developing port logistics of Fangcheng Port

3.5.1 The greatly development of western regions gives an opportunity

Implementing the strategy for greatly developing western regions and accelerating the

pace of developing Midwest areas are the great decision that made by Central Communist Party of China.   To Fangcheng Port, the strategy for developing western regions will make Fangcheng port's economic hinterlands' agriculture and industry grow rapidly so as to increase port's source of cargo activities.   Fangcheng Port also can get many favorable policies for Fangcheng Port's construction and development from nation and province.   All these surroundings bring Fangcheng Port excellent opportunities for developing port logistics.

3.5.2   The construction of CAFTA gives an opportunity

ASEAN established in Bangkok at August, 1967.   At the present time, ASEAN has 10 members.   On the fifth China-ASEAN leaders' summit at November, 2001, two sides have a consensus on building CAFTA (10+1) within 10 years, which put agriculture, information industry, the development of human resources, etc as key fields of cooperation each other.   After completing, CAFTA will have 1.7 billion populations, and over $2 trillion GDP and $1.2 trillion value of trade.   Estimated the exporting value of China to ASEAN will increase 10.6 billion dollars while that of ASEAN to China will increase 13 billion dollars[4].   There is no doubt that the CAFTA has a bright future.

Fangcheng Port located at the junction between China and Vietnam that one member of ASEAN.   In the strategy, its geographic position decides it becomes the bridgehead that our country accesses to ASEAN's market and develops the trade relationship with ASEAN.   Fangcheng Port will get benefits in the rapidly growth of China-ASEAN's trade market as long as Fangcheng Port can catch this natural gift and vigorously quicken the pace of constructing port's transport system.

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[4] Data source: Retrospection of the Southeast's economy of the first half year of this year. (June 11, 2003). http://www.cafta.org.cn/shshshow1.asp?zs_id=8606

3.5.3 Logistics development results in being paid more attention by city's leaders

Developing logistics industry, the first thing is to improve the condition of communication. For improving the traffic condition, City Fangchenggang has invested billions of Yuan in 33 greatly projects' construction, of which the construction of communication's and port's infrastructures account for the majority of the 33 projects. If these crucial projects are completed, it will make the transportation system of Fangcheng Port more improvement and make the position of logistics pivot of Fangcheng Port more prominent.

Furthermore, City Fangchenggang has also strengthened the communication with the railway department so as to reasonably allocate the machinery and manpower, deeply dig the potential, improve the efficiency of train loading and unloading, shorten the time when trains operating at port and accelerate the turnover of railway wagons. Port has further optimized loading and unloading techniques and improved the production efficiency and production benefit through purchasing a batch of new-type equipments, such as automatic sack filling plants, mechanical loaders, excavating machines, self-dumping wagon, and so on. It is efficiently to enhance the quays' tonnage capacity result from rebuilding and building storehouses and storage yards, and expanding area of storehouses and storage yards.

3.5.4 Famous international groups do business in City Fangchenggang one after another

In recent two years, the growth rate of container throughput of Fangcheng Port is several thousands TEUs yearly. The container throughput of Fangcheng Port has had over 100,000 TEUs. Nowadays, there are 8 container transport groups doing business in City Fangchenggang, of which 4 groups are world top 10.

With the increasingly and intimately contact of economy and trade between the southwestern regions and ASEAN, some international container transport groups start the new line to the Southeast Asia to seize new business opportunities. Maersk (China) Line, Shenzhen opens the direct liner service that is from Fangcheng Port to Hiaphong Port; PERKAPALAN DAI ZHUN SDN.BHD. opens Fangcheng Port－Hong Kong－Haiphong Port liner services; AMERICAN PRESIDENT LINES LIMITED (China) establishes a logistics arc that takes City Fangchenggang as center and covers Beihai, Wuzhou, Nanning and Qinzhou.

4 The analysis of port logistics future development of Fangcheng Port

4.1 The analysis of port logistics developing prospect of Fangcheng Port

4.1.1 In the development of port logistics

Since the eighth five years (1991-1995 year), construction and development of Fangcheng Port are constantly accelerating.   The port's throughput only had over 2 million tons in 1990.   In 1996, Fangcheng Port's throughput breaks 5 million tons for the first time.   After then, Fangcheng Port strides forward in a new stage every year.   In 2001, the throughput broke 10 million tons; the throughput was over 20 million tons in 2005.   At present, Fangcheng Port's annual tonnage capacity is over 25 million tons.   The actual annual tonnage capacity of 10# berth, specialized container berth, is 250,000 TEUs.   To further improve service quality, Fangcheng Port upgrades the original container computer administration system, which adds 320 functions.   Furthermore, according to actual production situation, Fangcheng Port introduces into the three-dimensional discharging mode, which effectively improves the efficiency of discharging.   It creates 25 natural cases per hour with "single bridge" discharging[5], which reaches the discharging level of advanced ports in our country.   Meanwhile, the built and building specialized berths for ore, grain, cement, woodchip, fertilizer, sulfur, and coal, which have the specialized quality and

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[5] Data source: The container throughput of Fangcheng Port breaks through 100,000 TEUs. (December 25, 2005). http://www.gxtv.cn/Article/news/gxbd/200512/23531.html

capability which discharging, storage and transportation, and transshipping a mass of bulk cargoes, general cargoes, container, and petrochemical. It is forming its own feature and core competitiveness step by step.

4.1.2 In deepening of reform

In July of 2004, Administration Bureau of Fangcheng Port and Fangcheng Port (Group) Co., LTD. both are established, thus actualizes the division between government and enterprise in order to fit the developing requirement of modernized port. It flips a new page that port administration and service of Fangcheng Port.

4.1.3 In economic development

In 2005, City Fangchenggang obtained tremendous development in foreign trade. At the end of November of last year, the total importing and exporting value of the whole city is up to 788.68 million dollars, increases 22.47% compared with the same period of last year, of which export is 87.61 million dollars that increases 14.96% compared with the same period of last year and import is 701.07 million dollars that increases 23.47%[6]. The whole city appears strong growth tendency in foreign trade. In addition, the total industrial output value of City Fangchenggang achieved 4.535 billion Yuan in the first 8 months of 2005, which increases 26.25%. Nowadays, the total industrial output value of the whole city accomplishes more than 12 billion Yuan, which achieves the historical leap[7].

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[6] Data source: Rapidly development in foreign trade of City Fangchenggang. (January 7, 2006).
http://www.un56.com/news/2006-1-7/news20061791801.htm

[7] Data source: City Fangchenggang accomplished the goal that both over thousand of 2005. (December 31, 2005).
http://Guangxi.mofcom.gov.cn/column/print.shtml?/sjdixiansw/200601/20060101266261

4.1.4 In policies

City Fangchenggang is against frontier as well as against ocean, and located in the West China. It also is one of 14 coastal open-up cities of the whole country. Investing in City Fangchenggang, you can enjoy the relevant investment preferential policies by nation and Guangxi as well as enjoy the relevant favorable policies of greatly developing the western regions and the preferential policies that border area and coastal open-up city should be enjoyed.   "During 2001 and 2010, it reduces 15% cooperation's income tax."   Fangcheng Port should seize the historical opportunity, making full use of a series of preferential policies that given by nation in order that can all-round way implement the strategy that large port, large passage, large open-up, and large development.   Fangcheng Port is becoming the most realistic and convenient bridgehead and shipping exit, which does trade between southwestern regions of China and the Southeast Asia and world every nations.

4.1.5 In communications

City Fangchenggang's freeway can directly arrive at port; railway can reaches every place of the whole nation.   It is the main door that the southwestern regions' shipping and the most convenient landway that our country goes to Vietnam and the Southeast Asia.

1．Marine conveyance

Nowadays, Fangcheng Port is the largest port in Guangxi as well as the third largest port in the South China. It is also one of 20 main pivot ports of our country. Fangcheng Port has navigation with 220 ports of 71 countries (regions).   There are 25 ocean-going liner services in total weekly, forming a liner services network with world ports.   Domestic trunk liner services have extended to the north and east China and feeder services to Huangpu and Shekou to transship to the north China, totally 3-5

services weekly.

2．Railway transportation

Railway transportation accounts for 73.4% of the total transport volume of City Fangchenggang. (Zhang Lijun, 2005, p. 276)   Nan-Fang Line, the total length is 173km, can directly arrive at Fangcheng Port.   The southwestern regions' iron ore, sulfur, steel, cement, and other a mass of cargoes are exported and imported via Nan-Fang Line.   In the passed years, its annual tonnage capacity of Nan-Fang Line is 6.6 million tons, but now the annual tonnage capacity is over 17.5 tons after carrying on electrified reconstruction.   Nan-Fang Line with other railway networks of Guangxi can link with Nan-Kun Line, Jing-Guang Line, Jiao-Zhi Line, and Li-Zhan Line, etc.   It also can link with rail lines of Vietnam.   The Nan-Kun Line coming into operation indicates that the large passage, with strategic value, of the southwestern regions of our country can cover Yunnan, Guizhou, and Sichuan province and make them cargoes directly arrive at Fangcheng Port's quays.

3．Road transportation

Main and branch roads connect with each other.   A communication network, can reach every place of the whole country, has been roughly formed.   Nan-Fang Freeway can directly arrive at Fangcheng Port.   The whole city has 117 roads, and the mileage is 1526km, of which freeways are 44.2km, arterials highway and secondary roads are 136km.

4.1.6   In port's economic hinterlands

Relying on communication network of sea-land gathering and distribution, Fangcheng Port's range of economic coverage is quietly wide.   Its direct hinterlands are City Fangchenggang, Qinzhou, Baise, Nanning, Southwest Nanning areas in the Guangxi.

Its indirect hinterlands are Guangxi's other areas, Yunnan, Guizhou, Sichuan, southwestern areas of Chongqing, and the western areas of Hunan, Hubei, Henan, and other central China's provinces. The economic hinterlands' area is 2 million square kilometers, and populations are up to 0.2 billion. There are abundant resources in the hinterlands. Mining industry, metallurgical industry, petrochemical industry, cement manufacturing industry, and so on has solid foundation. Phosphorus-chemical products, non-ferrous metals, ferrous metals, energy sources, cement, mechanical products, sugar, etc has important position in the domestic market.

Guangxi, as the port's direct and indirect economic hinterland, plays an important role in the port's development. National economy and every social business unceasingly gain progress through actively implementing a series of policies and measures which enlarges domestic demands, adjusts structures, deepens reform, increases export, and so on. It basically achieves the anticipated goal that set up at the beginning of the year. The outputs of some industrial products break the highest historical record of Guangxi, such as steel, automobile, electric energy generated, cement, and alumina. The export fast increases. Both the total value of import and export create the highest record. In addition, the situation, exporting to major countries and districts, is good, which achieved 406.33 billion Yuan gross domestic product in the whole 2005, increase 12.7% compared with that of last year, and the increasing scale creates the highest level since 1995[8].

There are abundant mineral resources in Fangcheng Port's indirect hinterlands, of which more than 50 kinds of mineral resources' reserves are the top 10 in our country. Development, transportation, and utilization of hinterlands' resources will offer sufficient source of cargo activities for Fangcheng Port. "It is over 500,000 TEUs

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[8] Data source: Bureau of Statistics of Guangxi. (2006). *Statistical communique of national economy and social development of Guangxi of 2005*. Retrieved March 18, 2006 from the World Wide Web: http://www.stats.gov.cn/tjgb/ndtjgb/dfndtjgb/t20060320_402311900.htm

generated volume that foreign trade cargoes which are fit for container. And it will increase at the speed of over 20% annually."

4.1.7   Summary

According to the comprehensive analysis of above six aspects, the dissertation considers that Fangcheng Port has large potential in developing port logistics and obtains an exceptional opportunity.

4.2   Throughput forecast of Fangcheng Port

At present, there are many methods and ideas about forecasting ports' throughput, and characteristics of various kinds of methods and scope of application are not the same. Due to the limitation of author's knowledge and time, the dissertation use unitary regression model, three times exponential smoothing method, and combined forecast method which combines the former two methods to predict the future throughput of Fangcheng Port.

4.2.1   Throughput forecast based on influence factors

We know there are a lot of factors that influence on port throughput, such as the development level of national economy and economic hinterlands, the development of international trade, and other influence factors. Generally speaking, the development of transport industry and national economy are interdependent and influencing each other. Under the background that increases steadily in national economy and the domestic and foreign trade demands are increasingly vigorous, it is in particularly close relationship that between ports' development and economic development. (Cai Tao, 2005, pp. 12-14)   And with the limitation of knowledge and the dissertation's length, this dissertation just uses Fangcheng Port's hinterlands' GDP as the main factor that influences the forecast of port throughput, which set up unitary

regression model between Guangxi's GDP and throughput of Fangcheng Port. Calculation results and regression analysis are shown in table 3 and table 4.

Table 3 - Regression model of throughput and GDP[9]

Year	Guangxi GDP (100 million yuan)	Throughput (10,000 tons)	Forecasting value （10，000 tons）
1995	1497.56	464	513.3985104
1996	1697.9	609	634.1214356
1997	1817.25	660	706.0405788
1998	1903.04	707	757.736794
1999	1953.27	808	788.0049009
2000	2050.15	922	846.3838417
2001	2231.19	1003	955.4767757
2002	2455.36	1116	1090.559426
2003	2735.13	1319	1259.146093
2004	3320.1	1608	1611.643295
2005	4063.3	2006	2059.488349

The unitary regression model is:

$y = 0.6026x - 389.02$

$R^2 = 0.9893$

Table 4 - Analysis of regression (Analyzing results from Excel)

SUMMARY OUTPUT							
Regression Stat.							
Multiple R	0.99465						
R Square	0.98932						
Adjusted R Square	0.98814						
Standard Deviation	50.8214						
Observation values	11						
Analysis of							

[9] Data source: Collected by author

variance							
	df	SS	MS	F	Significance F		
Analysis of regression	1	2E+06	2E+06	833.9	3.5E-10		
Residual error	9	23245	2582.8				
Total	10	2E+06					
	Coefficients	Standard Deviation	t Stat	P-value	Lower 95%	Upper 95%	Lower limit 95.0%	Upper limit 95.0%
Intercept	-389.02	51.15	-7.606	3E-05	-504.72	-273.3	-505	-273
Guangxi GDP(100 million)	0.60259	0.021	28.877	3E-10	0.55538	0.6498	0.555	0.65

From table 4, we can see R Square is 0.98932, which shows the explanation ability is very high.   Statistic F of regression indicates whether or not the variance of regression is greater than the variance of residual value.   When F value is significant, it is a better effect that the regression line rather than forecasts with using mean.   The Significance F nearly equals zero, 3.5E-10 shown from table 4, which has already reach the checkout criterion of 0.05, so we can say the regression line is effectual. As for the t statistics and p value of the intercept and Guangxi's GDP, p values are 3E-05 and 3E-10 respectively, which already reach the checkout criterion of 0.05.[10]

According to analyzing the increase rate of Guangxi's GDP since 1990, the dissertation finds that annual growth rate of Guangxi's GDP is around 14.02%, and relies on the eleventh five years (2006-2010 year) plan of Guangxi that mentions the main goal of socio-economic development is that GDP increases more than 7.5%

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[10] The book，*The Application of Microsoft Excel in Economic Statistic* that edited by Cui Zhengkun, helps author do the analysis of regression.

every year. So the dissertation adopts 10.85%[11] as the annual growth rate. The estimated GDP of 2010 will be probably $4063.3*(1+0.1085)^5 = 680.07589$ billion RMB, and then try to get forecasted value of port throughput of 2010. Y (2010) = 6800.7589*0.6026-389.02 = 37,090,543 tons, and forecasted value of port throughput of 2015 is 64,699,383 tons.

4.2.2 Throughput forecast based on time series

Forecast method based on time series mainly is exponential smooth technology. The dissertation uses three times exponential smooth method according to identifying and fitting the changing trend of throughput of Fangcheng Port of 1995- 2005 year.

Confirmation of the value of S_0 and α:
Due to data point of the dissertation is less, so choosing S_0 according to general experience, that is $S_0^{(1)} = S_0^{(2)} = S_0^{(3)} = (X_1 + X_2 + X_3)/3$.

In practice, similar to the moving average method, adopting several α values to calculate and choosing one with smallest forecasting deviation. (Bao Fengxian & Chen Hongli, 2004, pp. 116-117) After calculating MSE, when α is 0.4, the forecasting deviation is smallest, so the dissertation chooses 0.4. The calculating process and forecasting value of the three times exponential smooth method is shown in table 5.

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[11] In the range of between 7.5% and 14.02%

Table 5 - Calculating process and forecasting value of the three times exponential smooth method   Units: 10,000 tons

Year	Through put S_t	$S_t^{(1)}$	$S_t^{(2)}$	$S_t^{(3)}$	a_t	b_t	c_t	Y_{t+1}
1995	464	532.2	559.48	570.392	488.552	-43.65	-3.64	
1996	609	562.92	560.856	566.578	572.77	13.487	1.73	441.2667
1997	660	601.752	577.214	570.832	644.445	44.6	4.035	587.9867
1998	707	643.851	603.869	584.047	703.993	58.015	4.48	693.08
1999	808	709.511	646.126	608.879	799.033	82.915	5.808	766.488
2000	922	794.506	705.478	647.518	914.604	107.68	6.904	887.7571
2001	1003	877.904	774.448	698.29	1008.66	111.43	6.066	1029.189
2002	1116	973.142	853.926	760.545	1118.19	119.67	5.741	1126.156
2003	1319	1111.49	956.95	839.107	1302.71	160.1	8.154	1243.6
2004	1608	1310.09	1098.21	942.747	1578.4	229.03	12.54	1470.969
2005	2006	1588.45	1294.31	1083.37	1965.82	325.54	18.49	1819.969

From Table 5, the dissertation gets port throughput of Fangcheng Port of the three times exponential smooth model is:

$$Y(2005+t) = 1965.82+325.54t+18.49t^2$$

Forecasting value of 2010 year: Y(2005+5) = 40,558,280 tons

Forecasting value of 2015 year: 70,704,337 tons

4.2.3 Combined forecast[12]（The detail explanation is shown in Appendix 1）

The rule of combined forecast method is that utilizes two kinds or more than two kinds of different single prediction methods to predict the same prediction object, and then does proper weighted average to each single predicting result.   Finally, getting weighted average value as final prediction value.

Expression of combined forecast model is:

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[12] The method rooted in the article, Research on The Application of Composite Prediction Technology, wrote by Huang Rongfu, Chen Yadong and Pan Jian.

$$F(t) = w_1 f_1(t) + w_2 f_2(t)$$

The dissertation adopts "minimizing the weighted sum of the absolute value of the error" as the optimum criterion of combined forecast model to get the value of w_1 and w_2, and solves it by simplex method.

$$\min S = \sum a_t \left(u_t + v_t \right) \qquad\qquad （3\text{-}1）$$

$$s.t \begin{cases} w_1 e_{1t} + w_2 e_{2t} + ... + w_m e_{mt} = u_t - v_t \\ w_1 + w_2 + ... + w_m = 1 \\ u_t \geq 0 \\ v_t \geq 0 \\ w_i \geq 0 \end{cases}$$

$$(t=1,2, ..., n), \quad (i=1,2, ..., m)$$

In the model, there is no discount coefficient[13] if a_t equals 1.

We can know, as table 6 shows, that the forecasting value and relevant deviation of Fangcheng Port's throughput of 2004 and 2005 year from the results of unitary regression and three times exponential smooth method,

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[13] Discount coefficient: Reflecting different observed points influence on different observed value by the discount coefficient.　Because recent observed values have more influence than that of past long-time on the forecasted results, we should offer different discount coefficient, which offers recent observed values greater weight, and offer the past long-time one smaller weight.

Table 6 - Predicted value and relevant deviation of two single forecast models

<div align="right">Units: 10,000 tons</div>

	Forecasted value		Actual value		Deviation	
	2004	2005	2004	2005	2004	2005
Regression	1612	2059	1608	2006	4	53
Three times exponential smooth	1471	1820	1608	2006	-137	-186

This dissertation orders forecasted value of unitary regression and three times exponential smooth as $f_1(t)$ and $f_2(t)$ respectively at t time to do combined forecast. The dissertation also orders the deviation of unitary regression and three times exponential smooth as e_{1t} and e_{2t} respectively. From Table 6, e_{11}, e_{12}, e_{21}, and e_{22} equals 4, 53, -137, and -186 respectively. The discount coefficient—α adopt 0.8, so $a_t = 0.8^{2-t}$ (t=1,2). After then, we put these data into model 3-1, and will get the following model 3-2:

$$\min S = 0.8u_1 + 0.8v_1 + u_2 + v_2 \tag{3-2}$$

$$s.t \begin{cases} 4w_1 - 137w_2 = u_1 - v_1 \\ 53w_1 - 186w_2 = u_2 - v_2 \\ w_1 + w_2 = 1 \\ u_t \geq 0 \\ v_t \geq 0 \\ w_i \geq 0 \end{cases}$$

<div align="center">(t=1,2)　　(i=1,2)</div>

Changing model 3-2 into standard linear programming, are shown in model 3-3:

$$\max S = -0.8u_1 - u_2 - 0.8v_1 - v_2 \qquad\qquad (3\text{-}3)$$

$$\begin{cases} 4w_1 - 137w_2 - u_1 + v_1 = 0 \\ 53w_1 - 186w_2 - u_2 + v_2 = 0 \\ w_1 + w_2 = 1 \\ u_t \geq 0 \\ v_t \geq 0 \\ w_i \geq 0 \end{cases}$$

$$(t=1,2) \qquad\qquad (i=1,2)$$

Transforming model 3-3 into the following model 3-4

$$\begin{cases} 141w_2 + u_1 - v_1 = 4 \\ 239w_1 + u_2 - v_2 = 53 \\ w_1 + w_2 = 1 \end{cases} \qquad\qquad (3\text{-}4)$$

The simplex method solved process of model 3-4 is shown in the table 7

Table 7 - Solved process of simplex method

C_j		0	0	-0.8	-1	-0.8	-1	
		W_1	W_2	U_1	U_2	V_1	V_2	b
-0.8	U_1	0	[141]	1	0	-1	0	4
-1	U_2	0	239	0	1	0	-1	53
0	W_1	1	1	0	0	0	0	1
$\sigma = Z_j - C_j$		0	-351.8↑	0	0	1.6	2	-56.2
0	W_2	0	1	0.007092	0	-0.0071	0	0.02837
-1	U_2	0	0	-1.69504	1	[1.69504]	-1	46.2199
0	W_1	1	0	-0.00709	0	0.00709	0	0.97163
σ		0	0	2.495035	0	-0.895↑	2	-46.22
0	W_2	0	1	0	0.00418	0	-0.0042	0.22176
-0.8	V_1	0	0	-1	0.58996	1	-0.59	27.2678
0	W_1	1	0	0	-0.0042	0	0.00418	0.77824
σ		0	0	1.6	0.52803	0	1.47197	-21.814

Results as follows：

$w_1 = 0.77824 \qquad w_2 = 0.22176 \qquad u_1 = 0$

$v_1 = 27.2678 \qquad v_2 = 0 \qquad u_2 = 0$

The expression of the model is:

$$F(t) = 0.77824 * f_1(t) + 0.22176 * f_2(t)$$

The throughput forecasting value of Fangcheng Port of 2010 year is:

F(t)= 0.77824×3709.054289+0.22176×4055.828039 = 37,859,539 tons;

The throughput forecasted value of Fangcheng Port of 2010 year is:

F(t)= 0.77824×6469.93834+0.22176×7070.43365 = 66,031,026 tons.

4.2.4   Verification and analysis of forecasting results

The figure 3, figure 4 and figure 5 are Fangcheng Port's historical data (1995-2005 year) that the forecasting value of three kinds of forecast methods compares with the actual value.
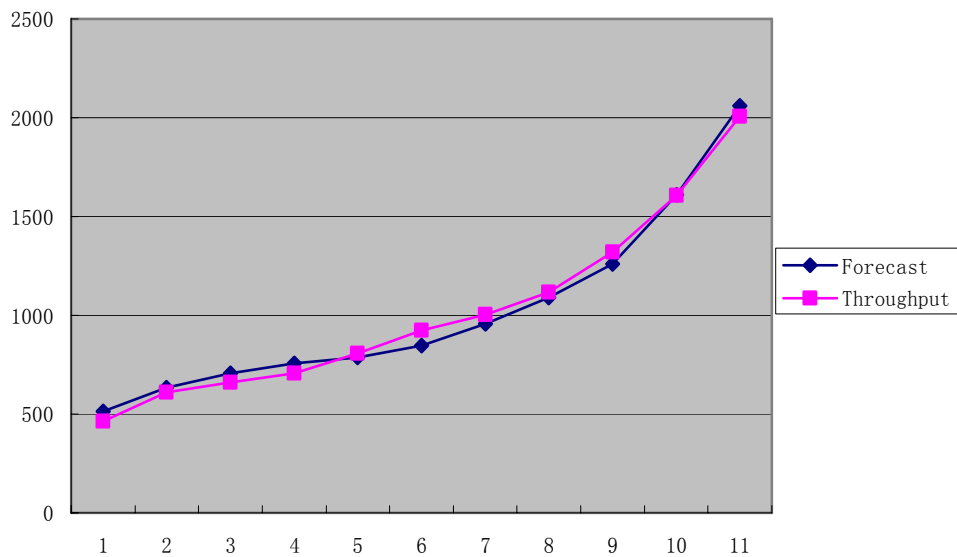
Figure 3 - Fitting graph of regression
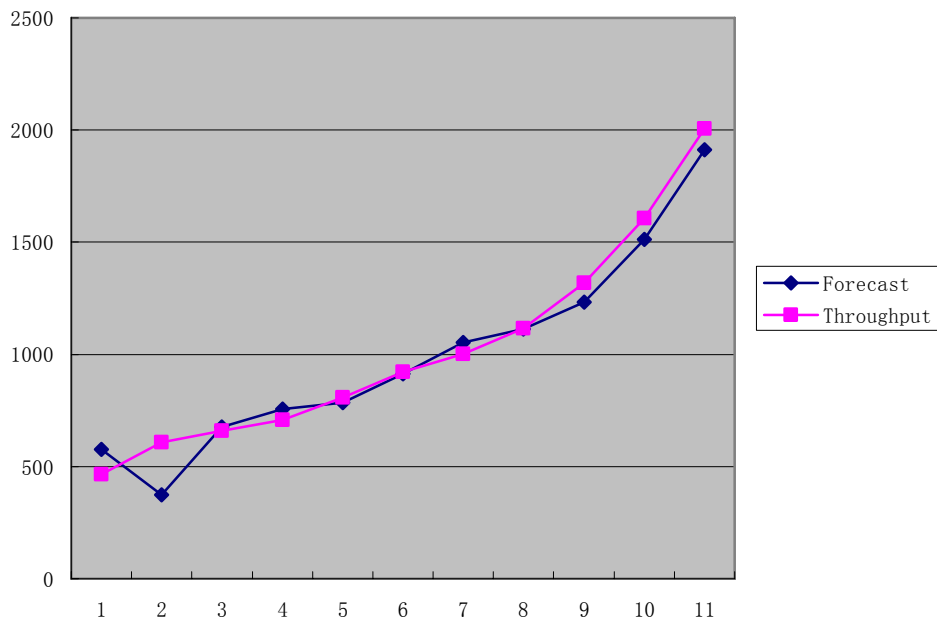
Figure 4 - Fitting graph of exponential smooth
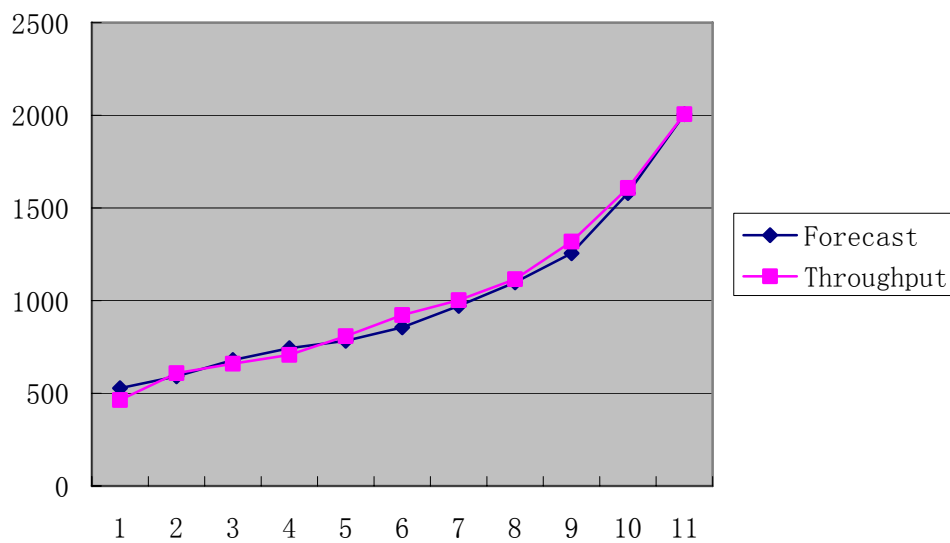
Figure 5 - Fitting graph of combined forecast

The dissertation uses combined forecasting technology on the basis of unitary regression and three times exponential smooth method. From above figures, we can see that the forecasting result of combined forecast is superior to single forecast method. This has indicated that the combined forecasting technology has the effect

which maximizes favorable factors and minimizes unfavorable ones, and improves forecasting precision.　The combined forecast method is fit to applying in actually forecast rather than single forecast methods.

4.3　Application of AHP technology in developing Fangcheng Port

4.3.1　SWOT Analysis based on AHP[14] [15](Detail explanation shown in Appendix 2)

1.　Fangcheng Port's IFE matrix[16]

(1) Confirmation of internal factors

The dissertation lists a series of internal factors according to the status quo of Fangcheng Port.　Then, the dissertation filters these factors in accordance with strengths and weaknesses of Fangcheng Port, which showed in table 8.

(2) Confirmation of weight of each factor

The dissertation confirms weight of each factor through AHP.

(3) Grading each factors

Using Delphi grades each factors.

(4) IFE matrix

The dissertation establishes judgment matrix, as shown in table 9, table 10 and table 11, through above summarizing, and composes Fangcheng Port's IFE matrix, as shown in table 12.

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[14]　The method rooted in two articles, The criterion and SWOT matrix of enterprise strategy wrote by Yang Jianhao and SWOT analysis of Rizhao Port development wrote by Zhao Gang, Feng Xuejun and Zhu Chao.

[15]　All data, used in the method, are collected and calculated by author of the dissertation.

[16] Internal Factors Evaluated matrix.　IFE matrix is an effectual means that analyzes firms' internal strategic conditions.　It can help decision-makers of enterprises carry on overall and comprehensive appraisal to the main strengths and weaknesses of each function field of enterprises internal.

Table 8 - Key internal factors of Fangcheng Port

Strengths B1	C1 Having competitive advantage in foodstuff and cement transportation
	C2 Port has advantageous natural condition and geographic position
	C3 Gained local government's highly attention and support over its neighbor ports which Beihai Port and Qinzhou Port.
	C4 Throughput constantly growing; having a strong capacity for self-development
	C5 The managerial level of infomationization is comparatively higher
Weaknesses B2	D1 Container transportation started comparatively late; throughput and liner shipping have not formed the scale
	D2 The time of building port is short; the maritime industry is at the starting stage, and the commercial function of port is comparatively weak
	D3 Throughput of ore has not formed the scale, and the level of specialization of port's load and unload is not high.
	D4 Lagging on the construction of logistics service system; it is no the management system that is developing logistics
	D5 Economy of port's direct hinterlands is underdeveloping

Table 9 - Judgment matrix of strengths and weaknesses

	B1	B2	W
B1	1	2	0.667
B2	0.5	1	0.333
λmax=2 C.I=0 R.I=0 C.R=0			

Table 10 - Judgment matrix of weight of strengths

B1	C1	C2	C3	C4	C5	W
C1	1	2	0.333	0.2	4	0.118737
C2	0.5	1	0.167	0.111	2	0.060633
C3	3	6	1	0.5	5	0.28829
C4	5	9	2	1	7	0.488714
C5	0.25	0.5	0.2	0.143	1	0.043627
λmax=5.152959 C.I=0.03824 R.I=1.12 C.R=0.034143						

Table 11 - Judgment matrix of weight of weaknesses

B2	D1	D2	D3	D4	D5	W
D1	1	0.333	3	0.167	0.143	0.064253
D2	3	1	5	0.5	0.25	0.153866
D3	0.3333	0.2	1	0.143	0.125	0.035293

D4	6	2	7	1	0.5	0.286545
D5	7	4	8	2	1	0.460043
λmax=5.163542 C.I=0.040885 R.I=1.12 C.R=0.036505						

Table 12 - Fangcheng Port's IFE matrix

Key internal factors			Weight	Grade	Weighted mark
Strengths	1	Having competitive advantage in foodstuff and cement transportation	0.07916	4	0.31663
	2	Port has advantageous natural condition and geographic position	0.04042	3	0.12127
	3	Gained local government's highly attention and support	0.19219	4	0.76877
	4	Throughput constantly growing; having a strong capacity for self-development	0.32581	4	1.30324
	5	The managerial level of infomationization is comparatively higher	0.02908	3	0.08725
Weaknesses	1	Container transportation started comparatively late; throughput and liner shipping have not formed the scale	0.02142	1	0.02142
	2	The time of building port is short; the maritime industry is at the starting stage, and the commercial function of port is comparatively weak	0.05129	1	0.05129
	3	The throughput of ore has not formed the scale, and the level of specialization of port's load and unload is not high	0.01176	2	0.02353
	4	Lagging on the construction of logistics service system; it is no the management system that is developing logistics	0.09551	1	0.09551
	5	Economy of port's direct hinterlands is underdeveloping	0.15335	1	0.15335
Total			1		2.94226

According to above tables, the total weighted mark of Fangcheng Port is 2.94226,

more than 2.5 on average[17], which represents the internal status of Fangcheng Port in the green tree.

2. Fangcheng Port EFE matrix[18]

It evaluates external factors relying on the same way of IFE matrix. And then obtains EFE matrix. Fangcheng Port's key external factors and each judgment matrix are shown in from table 13 to table 17.

Table 13 - Fangcheng Port's key external factors

Opportunities B3	E1 Implementation of development strategy of the Great West is favorable to developing hinterlands' economy and increasing source of cargo activities
	E2 There is many new developing opportunities to the logistics industry of China, which China participates into WTO, and will impulse the development of China's ports, especially pivot ports.
	E3 The logistics industry of China is still at the starting stage, so there has a big development space.
	E4 After participating into WTO and E-commerce develops rapidly, which are favorable to innovation of port firms' marketing.
	E5 Railway and road transport network constantly are improved.
Threats B4	F1 The competition is aggravated between ports
	F2 After China be a member of WTO, the logistics industry will face the competitions from the foreign logistics enterprises with having fund, technology and management advantage.
	F3 Fangcheng Port is facing the competitions of Qinzhou, Zhanjiang, and other nearby ports for its direct and indirect hinterlands' source of cargo activities.
	F4 The achievement of coastal ports infrastructures is remarkable; Reasonable transport systems of main cargoes have basically formed.
	F5 The major competitors have more advanced discharging facilities.

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[17] No matter what how many factors included in IFE matrix, the range of total weighted mark is from 1.0 to 4.0, which mean is 2.5.   The firms' internal status is in weakness if the mark is lower than 2.5, vice versa.

[18] External Factors Evaluated matrix.   EFE matrix mainly reflects that industrial prospects and firms face opportunities and threats in this industry.   It can help decision-makers know the external environment factors, and provide reliable basis to firms for formulating and analyzing strategy.

Table 14 - Judgment matrix of opportunities and threats

	B3	B4	W
B3	1	3	0.75
B4	0.33333	1	0.25
λmax=2　C.I=0　R.I=0　C.R=0			

Table 15 - Judgment matrix of weight of opportunities

B3	E1	E2	E3	E4	E5	W
E1	1	2	2	5	3	0.37338
E2	0.5	1	1	4	2	0.21724
E3	0.5	1	1	4	3	0.23559
E4	0.2	0.25	0.25	1	0.25	0.05194
E5	0.33333	0.5	0.333333	4	1	0.12186
λmax=5.1472754　C.I=0.03682　R.I=1.12　C.R=0.032874						

Table 16 - Judgment matrix of weight of threats

B4	F1	F2	F3	F4	F5	W
F1	1	5	0.333333	2	3	0.22104
F2	0.2	1	0.142857	0.3333	0.2	0.03985
F3	3	7	1	5	7	0.52207
F4	0.5	3	0.2	1	2	0.12592
F5	0.33333	5	0.142857	0.5	1	0.09112
λmax=5.2793605　C.I=0.06984　R.I=1.12　C.R=0.062357						

Table 17 - Fangcheng Port's EFE matrix

Key External Factors			Weight	Grade	Weight mark
Opportunities	1	Implementation of development strategy of the Great West is favorable to developing hinterlands' economy and increasing source of cargo activities.	0.28003	4	1.1201
	2	There are many new developing opportunities to the logistics industry of China, which China participates into WTO, and will impulse the development of China's ports, especially pivot ports.	0.16293	3	0.4888
	3	The logistics industry of China is still at the starting stage, so there has a big development space.	0.17669	3	0.5301
	4	After participating into WTO and E-commerce develops rapidly, which are favorable to innovation of port firms' marketing.	0.03895	3	0.1169
	5	Railway and road transport network constantly are improved.	0.09140	4	0.3656
Threats	1	The competition is aggravated between ports	0.05526	1	0.0553
	2	After China becomes a member of WTO, the logistics industry will face the competitions from the foreign logistics enterprises with having fund, technology and management advantage.	0.00996	2	0.0199
	3	Fangcheng Port is facing the competitions of Qinzhou, Zhanjiang, and other nearby ports for its direct and indirect hinterlands' source of cargo activities.	0.13052	1	0.1305
	4	The achievement of coastal ports infrastructures is remarkable; Reasonable transport systems of main cargoes have basically formed.	0.03148	1	0.0315
	5	The major competitors have more advanced discharging facilities.	0.02278	2	0.0456
Total			1		2.9042

The total weighted mark of Fangcheng Port's external factors is 2.9042, which indicates that Fangcheng Port faces opportunities more than threats or challenges[19].

3. The analysis of results

Internal condition is on the X-axis and external environment is on the Y-axis in the SWOT analyzing figure.   Enterprise located in different quadrants will take different strategies.   The dissertation assures that Fangcheng Port located in quadrant-I relying on evaluation of internal and external factors, as shown in figure 6.   The table 18 is the SWOT analysis results.
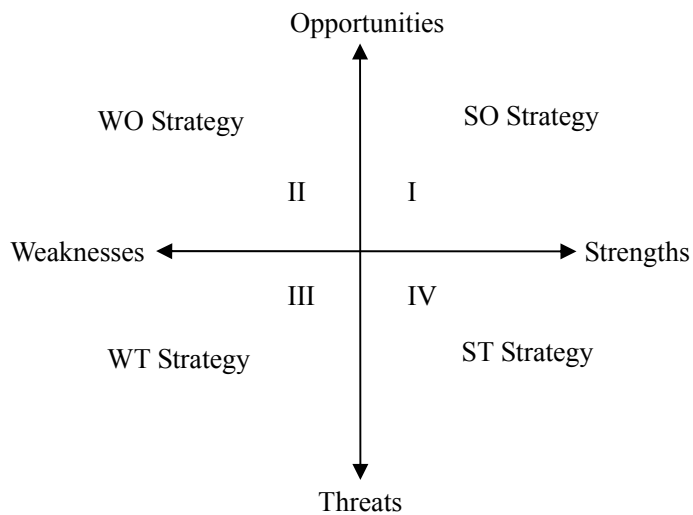

Figure 6 - Evaluated matrix of strategic position

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[19] The maximum and minimum total weighted mark equals 4.0 and 1.0 respectively, which mean is 2.5.   There are lots of opportunities, and firms are in an attractive industry if total weighted mark is 4.0.   If the mark equals 1.0, firms are in a badly prospect industry, which will face many threats.

Table 18 - SWOT analysis results

Strategic position		Status	Total strategy selection
I	SO Strategy	Having good internal condition and lots of external opportunities	Focusing on one business field; vertical integration; relative diversification operation
II	WO Strategy	Facing greatly external opportunities, but restrained by internal weaknesses	Formulating a focusing strategy in one business field; merging with other firms in the industry; vertical integration; diversification operation; Give up
III	WT Strategy	Existing internal weaknesses and facing large external threats	Reformulating a focusing strategy in one business field; merging with competitors to strengthen competitive position; diversification management; divest quickly and harvest.
IV	ST Strategy	Having definitely internal strength, but existing external threats	Diversification management; enter into a new field through joint venture; vertical integration; simplex focusing management.

Source: Decision-making science professional committee of China's System Engineering Academy. (2003). *The theory and practice of decision-making science* (pp. 291-296: Yang Jianhao. The criterion and SWOT matrix of enterprise strategy). Beijing: Ocean Press.

According to above analysis, Fangcheng Port's strengths are more than weaknesses, and opportunities more than threats for developing, so adopting SO Strategy. Foodstuff, cement, etc are still main source of cargo activities to Fangcheng Port, so Fangcheng Port should enhance port infrastructures and improve port's gathering and distribution conditions to reduce the transport cost of mass of bulk cargoes. While enhancing port infrastructures, Fangcheng Port should increase funds into info-technology in order to make the degree of port's informationization keep at a higher level and to shift port management from traditional to modern. Fangcheng Port should set a goal that builds container feeder port, which pays equal attention to domestic and foreign trade's container transportation; vigorously develop short-sea

and coastal feeder service; develop ocean truck line in a suitable time.   Fangcheng Port should achieve the strategy goal with planned and step by step through overall development.

4.3.2　BCG matrix based on AHP[20]　[21](Detail explanation shown in Appendix 3)

In the dissertation, BCG matrix based on AHP does the segmentation to measure the indicator of each business unit, which external attraction indicator replaces the industry growth rate and internal capability replaces the relative market share.   First, the dissertation sets up external attraction and internal capability indicator system, and quantifies them by AHP.   Second, the dissertation calculates the weighted value that each port logistics businesses are relative to the internal and external indicators. Third, the dissertation builds BCG matrix of port logistics business that includes these indicators' weighted value.   Finally, the dissertation analyzes results.

In the process of choosing port logistics business strategy, besides considering the market's potential, in the view of external attraction, we should consider the impact on regional economy and social environment.   In the view of internal capability, besides considering market share, we also should consider the proportion of throughput, earning, managerial and technical capacity. (Detail explanation of each factors shown in Appendix 4)   The indicator system is shown in figure 7.

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[20] The method rooted in the article, BCG matrix analysis of port logistics based on AHP wrote by Gu Yazhu and Zhou Xizhao.

[21] All data, used in the method, are collected and calculated by author of the dissertation.

Indicator System

Internal capability indicator

External attraction indicator

Market Share

Proportion of throughput

Earning Capacity

Managerial Capacity

Technical Capacity

Market Growth Rate

Influence on Local Economy

Influence on Social Environment
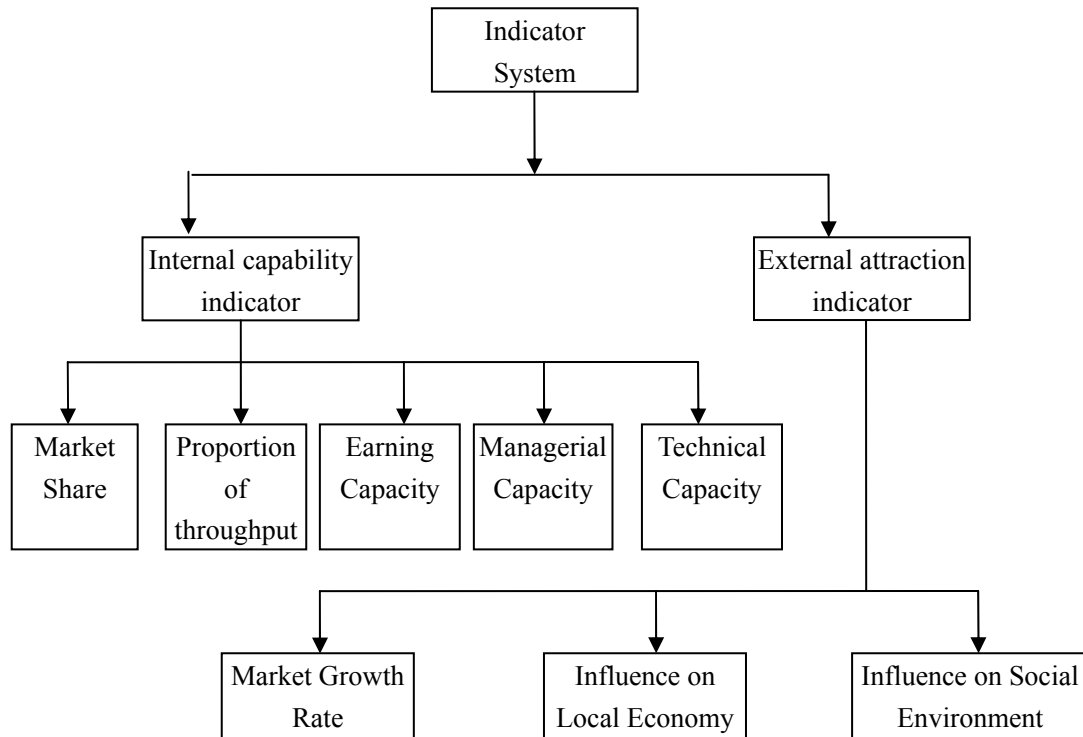
Figure 7 - Indicator system

After investigation, to simply and convenient reason, the dissertation unfolds that the main cargoes in Fangcheng Port are ore, coal, foodstuff, cement, container and sulfur. The dissertation sets up hierarchy structure and judgment matrix at first.   And then try to get integrated weighted value of each business units of external attraction and internal capability.   Third, it draws BCG matrix figure according to the integrated weighted value of internal and external indicators.   Finally, the dissertation does analysis about the results.

1.   Hierarchy structure of internal capability and external attraction are shown in figure 8 and figure 9.

Figure 8 - Hierarchy structure of Fangcheng Port's internal capability
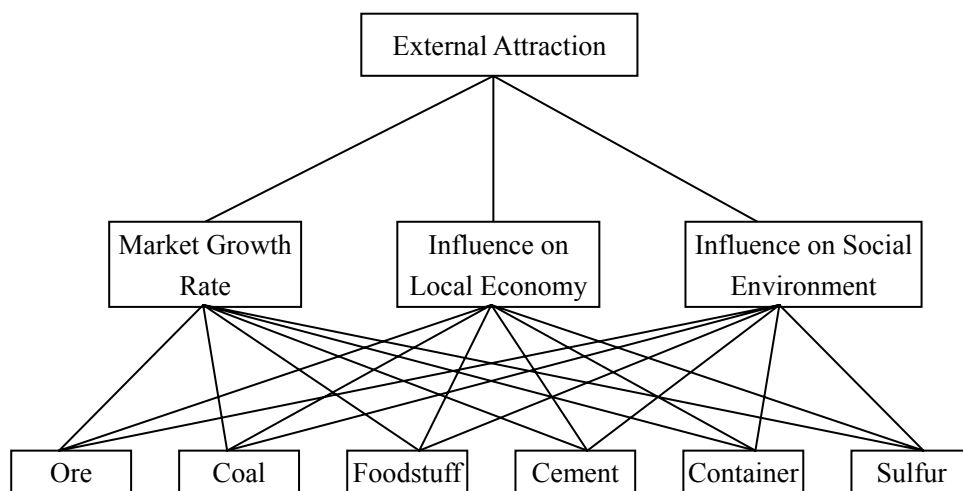
Figure 9 - Hierarchy structure of Fangcheng Port's external attraction

2. The total array and consistency test of hierarchy of internal capability and external attraction are shown in table 19 and table 20. (The results of each single matrix are shown in Appendix 5)

Table 19 - Internal capability's integrated weight

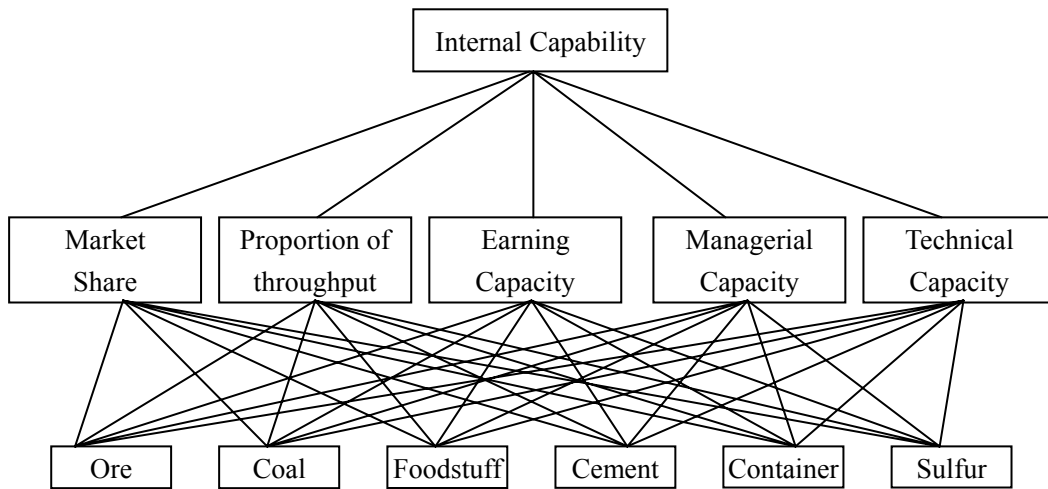| Criterion layer	Market Share	Proportion of throughput	Earning capacity	Managerial capacity	Technical capacity	Internal capability integrated weighted value
Scheme layer	0.3253	0.2096	0.241	0.128	0.0967	
Ore	0.0415	0.0385	0.171	0.07	0.0907	0.080367
Coal	0.1396	0.0975	0.079	0.165	0.1979	0.125031
Foodstuff	0.1354	0.2024	0.054	0.255	0.1979	0.151158
Cement	0.2632	0.2024	0.032	0.381	0.2799	0.211479
Container	0.0481	0.0553	0.409	0.024	0.0571	0.134207
Sulfur	0.3722	0.4038	0.255	0.106	0.1763	0.297758
C.R=0.046						

Table 20 - External attraction integrated weight

Criterion layer	Market growth rate	Influence on local economy	Influence on social environment	External attraction integrated weighted value
Scheme layer	0.5584245	0.31962	0.12196	
Ore	0.2227391	0.14896	0.17709	0.19359
Coal	0.1547587	0.08542	0.08153	0.12367
Foodstuff	0.0651293	0.07037	0.30963	0.09662
Cement	0.0342539	0.44085	0.02365	0.16292
Container	0.4310123	0.0334	0.34827	0.29384
Sulfur	0.0921067	0.22101	0.05984	0.12937
CR=0.0448038				

3. Fangcheng Port's BCG matrix is shown in figure 10.
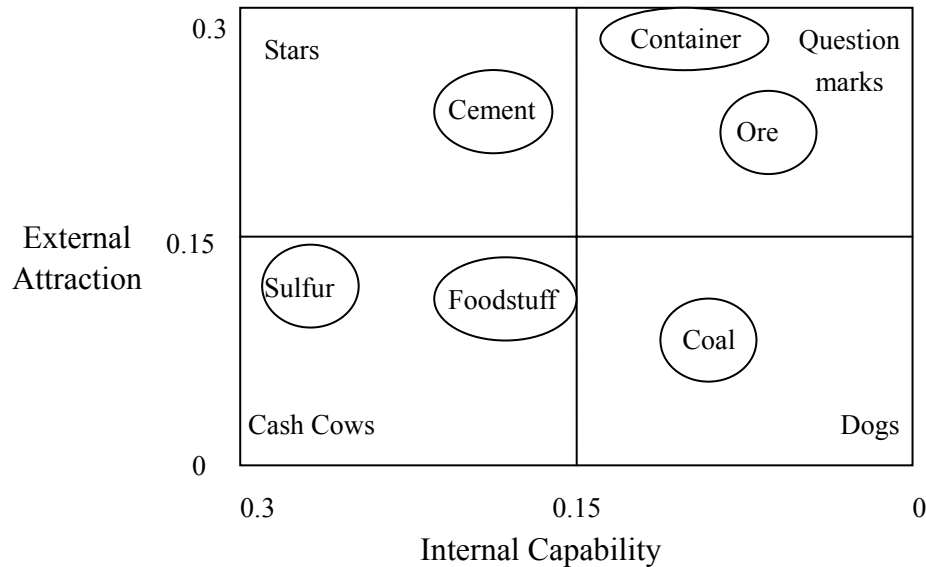
Figure 10 - Fangcheng port's BCG matrix

4. Analysis of results

From the BCG matrix, foodstuff and sulfur business demonstrate the characteristic of "Cash Cows" in Fangcheng Port, which is one of the main capital source of Fangcheng Port in the near future, so should adopt stable developing strategy that maintains its existing business scale and controls cost to enable company continuously getting the required fund for its development. At present, Fangcheng Port has become the biggest port of importing sulfur in China and one of 10 largest port of receiving foodstuff, and with the foodstuff transfer storehouse of Fangcheng Port coming into operation, Fangcheng Port can transship over 1.6 million tons a year. Utilizing advantages of low transport cost and no roll-gates, Fangcheng Port can connect with Beiliang Port, Dalian. Fancheng Port's foodstuff transfer storehouse discharging foodstuff that shipping from Beiliang port, and Fangcheng Port delivers the foodstuff to transfer storehouse in Nanning, Liuzhou, and Guilin by railway or road to serve every places in Guangxi and other southwestern provinces.

The market of container transport develops rapidly, which has a good market prospect. However, Fangcheng Port's container throughput is comparatively lower compared with its major competitor－Zhanjiang port. So, Fangcheng Port should adopt developing strategy, which invests container business, and goes into hinterlands to visit shippers, introduce route and propagandize the advantage of container transport to look forward to make container business into "Stars" and get competitive advantage in the future. Compared with Zhanjiang port, Fangcheng Port has much gap in ore business. However, the demand of ore enlarges continually. There are PANSTEEL, ZHONGSTEEL, LIUSTEEL, etc in the Fangcheng Port's hinterlands, which 28.8 million tons iron ore need import. It is obvious that Fangcheng Port has a large growth space in ore logistics market. With 200,000 tons-class ore dock, only one in western regions, coming into operation, makes internal capability of Fangcheng Port obtain farther promotion. As long as relative departments can solve railway problem, we assure that ore business can be developed from "Question Marks" into "Stars" even more become "Cash Cows".

Fangcheng Port is one of 4 biggest exporting cement bases of our country. Cement business can bring considerable earning to Fangcheng Port, but cement is a kind of cargo that has high pollution. The cost, for keeping port's cleaning air and good environment, is also high, so the cement logistics, until now, is unable to be "Cash Cows" and bring considerably profit to Fangcheng Port.

Coal is regarded as an important energy, and its market demand is comparatively stable. Coal has low influence on local economy and unit earning capacity is low, and is a cargo with high pollution, so Fangcheng Port adopts harvest strategy step by step rather than makes coal business be one of main kind of cargoes that should be developed for port logistics.

5 The total strategy of port logistics of Fangcheng Port

5.1 The strategic goal

5.1.1 Port logistics of Fangcheng Port

According to above analysis, Fangcheng Port's strengths are more than weaknesses, and opportunities more than threats for developing, so adopting SO Strategy. Foodstuff, cement, etc are still main source of cargo activities to Fangcheng Port, so Fangcheng Port should enhance port infrastructures and improve port's gathering and distribution conditions to reduce the transport cost of mass of bulk cargoes. While enhancing port infrastructures, Fangcheng Port should increase funds into info-technology in order to make the degree of port's informationization keep at a higher level and to shift port management from traditional to modern. Fangcheng Port should set a goal that builds container feeder port, which pays equal attention to domestic and foreign trade's container transportation; vigorously develop short-sea and coastal feeder service; develop ocean truck line in a suitable time. Fangcheng Port should base on the feeder port, makes full use of predominant geographical position and good infrastructures, and connects international and domestic logistics network so as to become the regional pivot port step by step and service the southwestern regions of China. Fangcheng Port should put key point on exploiting its logistics hinterlands, which consolidates its traditional economic hinterlands as well as strengthens economic contact with other districts through soundly improving

the communication network that connects inland hinterlands to actively strive for inland source of cargo activities.   It also should put developing modern logistics into port's development strategy system to achieve the function upgrade which from traditional transshipment to modern logistics and to realize the leap that from feeder port to pivot port.   Through adjusting the function layout of the logistics, optimizing the industrial structure, deepening systematic reform and strengthening technological transformation, Fangcheng Port integrates its assorted factors of production and fully exerts its core competitiveness to provide a sound integrative logistics platform for district's economy and to make port's core functions and relevant industries constantly develop.   Accelerating the pace of constructing distribution center for different kinds of mass of cargoes, transshipment base and modern logistics park makes Fangcheng Port be a port with facing international and domestic market, reasonable operation scale, advanced technology and equipments and higher management level; makes Fangcheng Port achieve leap-style development and become regional international logistics center with sound competitiveness.

5.1.2   The goals of port logistics of Fangcheng Port at different phases

1.   During the eleventh five years (2006－2010 year)

It will step by step make Fangcheng Port become a logistics park that cargoes can be directly delivered to the final consumer market and become an industrial zone with comparatively strong cluster effect.   The emphases are that build Fangcheng Port's logistics park, construct distribution center for ore, steel, sugar, cereal and oil, etc and accelerate the construction of maritime industry.   It principally will build Dongwan maritime industrial area and Fangcheng industrial zone with developing cereal and oil processing, metallurgical, electric power, and chemical industry system to form industrial areas with comparatively strong cluster effect and to increase comprehensive throughput of port.   The integration, industrialization, and scale development of Fangcheng Port's information function will make Fangcheng Port

basically form an information port with a core at comprehensive information service of port's shipping and trade.   Fast developing international large depth bulk docks and 200,000 tons-class ore dock and its associated navigation channel and 13# ~ 17# berths with 50,000 dwt coming into use will form the deep-water transshipment function for mass of ore, cereal and oil, etc.   It advances the rebuilding process of port's urbanization function and step by step enhances the functional transformation of established sectors.

2.   During the twelfth five years (2011－2015 year)

Further developing port's modern logistics function.   Port's logistics park will achieve port-park integration operation.   The volume of transshipping bulk cargoes and container will be fast developing.   Further enhancing modern logistics platform and large passage function of port.   18# ~ 22# berths, associated berth of Qisha steel base, 100,000 tons-class navigation channel of Dongwan and Xiwan, and 300,000 tons-class crude oil quay will be completed and come into use.   Port's information function upgrades to a new stage, which forms a port's information center with integrating shipping, economy and trade, E-commerce and port's comprehensive information.   Port's information network will link with city's comprehensive information network.

5.2   The orientation of port logistics function of Fangcheng Port

The orientation of modern logistics development of Fangcheng Port should put the hinge on the logistics of transshipping containers and bulk cargoes, which supported by regional and urban distribution logistics.   Strengthening in the center of City Fangchenggang and covering southwestern hinterlands builds big port hub function and logistics service system.

On the one hand, Fangcheng Port acts as public logistics platform. On the other hand, it should expand service range and, in an appropriate time, participate in the operation of logistics. The orientation of functions as follows:

1. Container pivot port with the functions of transshipment and distribution;
2. The function of transshipment and distribution of mass of bulk cargoes;
3. The function of five certain, certain place, route, times, carriage and time, inland container train;
4. The function of developing sound international freight forwarder and participating in the whole process of modern logistics operation;
5. The function of the integration of export processing, port-park linkage and industry, trade, and shipping logistics;
6. The function of information service of modern logistics;
7. The function of international commercial trade and financial service.

5.3 Strategic guidelines

1. Taking customer's demand as the direction confirms the cut-in point of developing logistics

According to self-advantages and self-potential, it confirms the position of logistics system of Fangcheng Port. The extending service of distribution, gathering and distribution, transshipment and storage is as the cut-in point, Fangcheng Port should make full use of port's core competitiveness and provide specialization and individualization service to farthest satisfy customers' demands.

2. Planning as a whole and rational arrangement build the running system of port modern logistics

According to developing tendency of the structure of international and domestic

transportation and trade, Fangcheng Port should adjust and optimize the structure of production and operation, carry on the integration of soft and hard condition's advantages and managerial manner and reasonably allocate logistics factors of port to achieve the function reconstruction of port logistics system. According to development strategy of port logistics, Fangcheng Port carries on specialization and collaboration and exerts multi-positivity to form the reasonable arrangement and highly efficient operating system of port modern logistics industry, to establish Fangcheng Port's diversification logistics operation system and to form port modern logistics running system, in the guideline of the development and integration of modern logistics market and in the main of container and mass of bulk cargoes logistics, in order to promote the establishment and development of the regional pivot port.

3. Harmonious development; paying attention to actual effect

Under the circumstance, lacking of building capital, Fangcheng Port should well deal with the relationship between new-building and rebuilding. At the start step, Fangcheng Port takes advantage of existent equipments and capitals to minimize the investment while get handsome returns. After having a foothold in the market, Fangcheng Port should insist on benefit combined with constructing speed, and develops appropriately beyond normal speed in order to have the initiative in the future competition.

4. Constantly innovation and promoting competitiveness

Logistics, per se is an innovation of a kind of form of circulating organization. If wanting to win market share and expand operation field, Fangcheng Port must use innovation as competitive measure, and applies technical, systematic, and service innovation to win the market.

5. Strengthening collaboration and harmonious development to enlarge the logistics nodes and extend port logistics coverage

Shipping companies is a dominant power in the logistics system. The future container terminals will face the liner ship pooling. Cooperation between port and shipping companies will synchronously improve competitiveness of two sides and be favorable to forming pivot port. Port-shipping cooperation has a bright future. Port-railway cooperation can enlarge inland hinterlands' range. In addition, Fangcheng Port can also form strategic alliance with other logistics service providers and neighboring ports to form high-quality service system and promote logistics development's breakthrough.

5.4 Measures and suggestions

1. Establishing leading group for logistics project

Fangcheng Port's modern logistics service starts comparatively late, there is a lot of work to be done. Developing logistics needs a whole idea. If wants unified command and coordinate action, Fangcheng Port must set up an effective organization leading system to impel it. Fangcheng Port must establish a leading coordination organization that constituted by harbor office's leaders, relevant function offices and relative units that participates in logistics operation, and defines the each correspondingly responsibility that should be taken on to lead, organize and coordinate the operation and development of Fangcheng Port's logistics industry.

2. Improving administration of railway as soon as possible

Dealing with Nan-Fang Line's relation soundly and the problem of uptight train wagons will greatly increase Fangcheng Port's throughput. The dissertation suggests that relative departments deal with the relation of Nan-Fang Line as soon as

possible, which puts it into unified administers under state railway. Meanwhile, Nan-Kun Line's current capacity has reached saturation, which can not synchronously satisfy more transport demands of Fangcheng, Qinzhou and Beihai Port, so relative departments should consider that carries on reconstruction of enlarging capacity of Nan-Kun Line.

3. Primarily developing bulk cargoes transport and secondarily developing container transport

In the bulk cargoes transport, Fangcheng Port's foodstuff and sulfur have enough freight demands and good service foundation. Our country's southwestern regions import a mass of foodstuff every year due to the problem of its own resource structure. As the main door of southwest corridor of importing foodstuff, Fangcheng Port has a great deal of potential in transporting foodstuff. Meanwhile, our country's western regions have stridden into industrialization era, which the demand for steel will increase sharply. As an important port of southwestern regions in the iron ore import system, Fangcheng Port will play more and more important role in transporting iron ore. Therefore, Fangcheng Port should build depth berths quickly and establish comprehensive transferring center for foodstuff and ore, accelerate the process of rebuilding established sectors, which integrates resources and updates equipments combined with technical renovation of the established sectors, purchase mechanical appliances combined with extending and technical renovation of new harbor districts to improve production efficiency. It is appropriately beyond the normal speed that in constructing quays. Fangcheng Port should accelerating the pace of building 200,000 tons-class berth and its associated navigation channel, and 13# ~ 17# berths with over 50,000 dwt meanwhile starting to build 18# ~ 22#, 501, and 502 berths, City Fangchenggang electricity plant dock, associated berth of Qisha steel base, and Dongwan and Xiwan 100,000 dwt navigation channels.

In developing container transportation, Fangcheng Port should suit the developing

requirement of its own conditions and economic hinterlands. According to the industrial structure of southwestern regions of our country and the trade logistics structure of ASEAN and our nation, both generated and freight volume are not too large. Because investing container terminal and its associated facilities needs a lot of capital, Fangcheng Port develops container transportation in accordance with market demand, competitive tendency and enterprise's economic benefit. Due to the geographical position of Fangcheng Port, there are majority of short-shore shipping. So, Fangcheng Port is suitable for building important regional feeder port in developing container transportation at present. In building container terminal, Fangcheng Port should mainly construct middle or small size container terminal that can call at middle and small type ships with below 3000TEU.

4. Deeply going into economic hinterlands to canvass cargoes

Fangcheng Port should implement walk out strategy, establishing wide contact with hinterlands' source of cargo activities and actively participating in the construction of hinterlands' logistics system to achieve hinterlands' space cyberization and to provide stable and enough cargoes to port. Fangcheng Port should publicize port's navigation channels, quays, transportation and other advantages through advertisements and articles in some professional newspapers and journals to continually improve its reputation in hinterlands' governments, enterprises and people.

5. Port-park integration

Vigorously developing port-park integration makes port district and bonded area become inseparate one. In functional development, the function of port and park mutually combine; in management, port and logistics park form one administrative organization and consolidated harmonizes, which presents the situation that port in front and logistics park in the back. On the one hand, the development of processing

industry in the logistics park will bring tremendous the demands of port logistics to impel the boom of industries that are correlative with port logistics. On the other hand, after port-park integration, it can save partial transshipping cost, reducing the logistics cost. Figure 11 shows the comparing port-part cooperation with port-park integration.

Port-park Cooperation

Port-park Integration
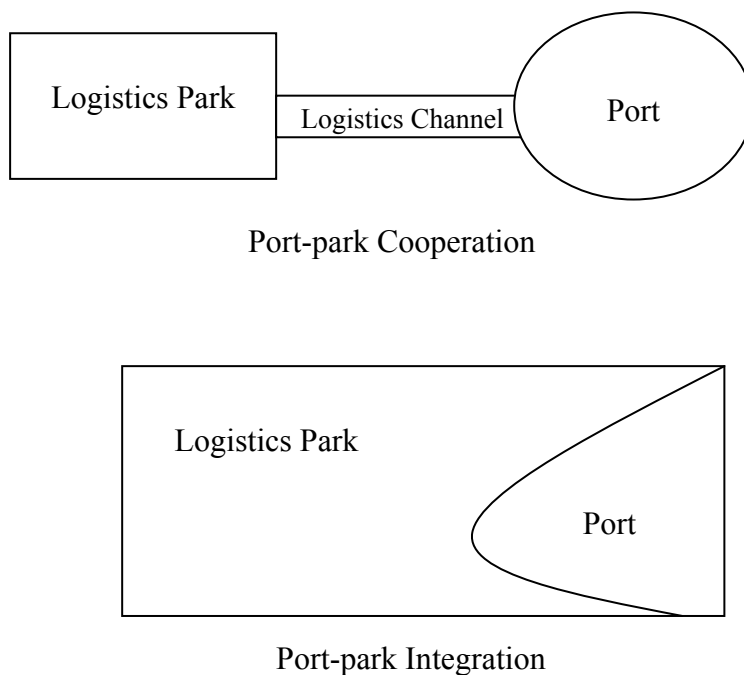
Figure 11 - Comparing port-part cooperation with port-park integration

6. Establishing Fangcheng Port own fleet for ocean shipping in an appropriate time

Fangcheng Port locates Beibu Gulf, having long coastline, which has exceptional advantages on developing ocean transportation. We can see that Fangcheng Port's shipping market is tremendous. Fangcheng Port establishes own ocean shipping fleet, which is profitable. If Fangcheng Port has own ocean shipping fleet, many cargoes can directly arrive at destinations and the cycle of cargoes transport will be shrunk. If that, Fangcheng Port can never be the passer[22] and the cargoes that arrived at port are involuntarily increased. Having own ocean shipping fleet can give Fangcheng Port solid foundation for establishing Fangcheng Port regional pivot

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[22] The people pass the ball to his/her teammates to attack in volleyball game

port.

7. Port and shipping companies allied development for logistics industry

Port's logistics companies associated with shipping companies can build shipping companies' appropriated wharf, like as Hong Kong, Rotterdam, Long Beach, etc. These ports all use the method that leases land to attract investment and operation of regular ship companies. Associated docks of shipping companies can improve efficiency as well as meet the individualization requirements of regular ship companies. Attracting shipping companies enter into port logistics center through merchant and attracting investment. For that, Fangcheng Port not only solves the capital problem in building logistics center, but also introduces advanced technology and management experience.

8. Coordinated development with nearby ports

The advantages of resource integration between ports are resources shared and utilizing reasonably. It is favorable to exactly and objectively deal with ports' rational specialization and functional orientation, favorable to coastline's reasonable layout with deep water for deep using and shallow water for shallow using, and favorable to fair competition and mutually complement of advantages. It can realize win-win. To container transportation, it also can furthest decrease mobilization cost of empty container.

Fangcheng, Beihai, and Qinzhou Port's economic hinterlands are overlapping, just same as the situation of N.Y./N.J[23]. The dissertation considers that Fangcheng Port

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[23] N.Y./N.J. is the biggest container port in the east bank of U.S.A. Its foreign trade accounts for 40% of whole country. According to the need of market competition at forties of the 20th century, NewYork and New Jersey port are willingly to ally, which becomes N.Y./N.J. Port. After combining, N.Y./N.J. fully exerts each harbor district's advantages and forms united competitive entity. It gets initiative position in competition relatively to other ports in North

can imitate the integrative operation mode of N.Y./N.J., and adopts tightness type[24] port integrative method.

9. Paying more attention to fetch in and cultivate brains

Establishing a high quality professional team for logistics is a key for the success of developing port logistics. According to the present situation, Fangcheng Port lacks talents with the ability of professional management for logistics. The situation is unfavorable to develop port logistics to Fangcheng Port. So, Fangcheng Port must change this situation. Fangcheng Port can set up an operation team of compound-type brains with freight forwarder as head and on the basis of port, trade, finance, and storage. They should be familiar with objects', serviced by them, produce, operation, and sales. They also hold the knowledge of computer, network, and so on. Modern logistics enterprises are talent-intensive and skill-intensive enterprises. Therefore, Fangcheng Port should strengthen the cultivation of brains, and recruit all kinds of qualified personal. Fangcheng Port need strengthen logistics professional talents training. Fangcheng Port should carry on vocational trainings and lectures of logistics to cultivate logistics professional brains.

At the same time, according to Fangcheng Port's actual situation and the status quo of brains, the development of brain resources of Fangcheng Port can fetch in brains from other places, construct brain plateau, and establish brain resources shared platform of coastal economic belt for constructing Fangcheng Port's constant brain resources flow. Brain resources development is a long-term system engineering, which needs government's effectively support, and common collaboration and effort by every aspect. It also needs assorted associated promoting systems. If has not a highly efficiency team with production, organization and management, Fangcheng Port will

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Atlantic, which exerts strongly hub function.

[24] Different ports are regarded as one port with formulating development strategy together, sharing profit, and bearing risks.

face a great problem in sustainable development of Fangcheng Port. So, Fangcheng Port should retain current brains, and makes them exert energy and more contribution for developing Fangcheng Port.

10. Carrying on storage coordination reasonably

With the development of economy, the land price will be more and more expensive; especially the urban land seems more precious. So, the port only depending on expanding the land area is uneconomical as well as do not accord with the idea of sustainable development. For this reason, circulation of cargoes at the port should fully utilize the existing land resources, especially the warehouses. Fangcheng Port should use forward-yards as many as possible to improve the turnover of front-yards. At the same time, Fangcheng Port reduces cargoes transporting to rear-yards from front-yards as much as possible and reduces operation's steps to decrease the cost of production and to achieve the aim of optimizing cost. Dock's front-yards are a place where every inch of land is an inch of gold, so Fangcheng Port must fully utilize front-yards and furthest improve the usage rate of them.

11. Accelerating the development of the logistics industry

As the southwestern regions' big route that shipping to other places and the tie that binds China and ASEAN, Fangcheng Port accelerating the development of modern logistics industry is especially obvious and important. Therefore, Fangcheng Port must suit new phasic developing demand to greatly develop modern logistics industry, is suitable for big port, big channel, big industry, big trade, and open-up, and then establishes regional logistics center that faces southwestern regions and CAFTA. At the same time, City Fangchenggang should actively foster a batch of logistics companies with outstanding core business and strong competitiveness. City

Fangchenggang encourages the development of the third party logistics companies to enhance socialization, specialization and modernization level of logistics industry, and actively improves technical rebuilding of modern logistics to promote the change that traditional logistics industry transforms into modern logistics industry.

Optimized and integrating railway, road and sea transportation mode establishes great communication structure that integrative developing port, road and rail, and forms three-dimension network type logistics passage. City Fangchenggang should vigorously quicken the establishment of company's logistics information platform to realize public basic information and logistics information shared among logistics parks, distribution centers and logistics companies. Fangcheng Port forms, as soon as possible, integrative transport network, sound storage and distribution appliances and sophisticated information network platform to provide important basic condition for developing Fangcheng Port's modern logistics industry.

City Fangchenggang should quicken the construction of professional market. Innovating the investment main body, City Fangchenggang should put emphasis on the construction of a batch of professional wholesale markets, such as marine products, building materials, timber, mass of industrial raw materials, spare parts of mining, etc, and step by step forms the professional network system of wholesale market with reasonable layout so as to provide the effective carrier for the development of logistics industry.

12. Strengthening the construction of informationization infrastructures

City Fangchenggang puts emphasis on establishing municipal E-government project. It also strengthens the building of municipal departments' and port enterprises' professional network to achieve quickly exchanging information and sharing resources between government's horizontal business net and vertical professional net. City Fangchenggang also should promote its public network exchanging platform and

the construct of multimedia network that based on satellite and radio communication technology to form modernization information network that mutually links domestic and international communication network step by step.

6   Summary and conclusion

The dissertation, from many aspects, expounds the practical meaning and importance of developing port logistics of Fangcheng Port, Guangxi.   The dissertation also does a lot of analysis, in theory, to offer comparatively overall and systematic basis for the future development of port logistics of Fangcheng Port.   Under the basis, the dissertation brings forward the development strategy for port logistics of Fangcheng Port.   The total strategy of Fangcheng Port developing port logistics is that bases on the feeder port, makes full use of predominant geographical position and good infrastructures, and connects international and domestic logistics network so as to become the regional pivot port step by step and service the southwestern regions of China.   It should put key point on exploiting logistics hinterlands, which consolidates its traditional economic hinterlands as well as strengthens economic contact with other districts through soundly improving the communication network that connects inland hinterlands to actively strive for inland source of cargo activities. It also should put developing modern logistics into port's development strategy system to achieve the function upgrade which from traditional transshipment to modern logistics, and to realize the leap that from feeder port to pivot port.

Here, the dissertation need point that achievement of strategic goals and implementation of strategic key points need correspondingly strategic protecting measures.   To Fangcheng Port, the most important strategic protecting measures are that establish and improve supervisory system and strategic control system.   And

with elapsing, the international and domestic shipping tendency may be changed. So, it will influence on implementing the strategy that propounded by the dissertation. At that time, the dissertation hopes the relative departments of Fangcheng Port can change with changing of the situation to do appropriately adjustment in order to meet the developing trend of era.

The followings present the main efforts that did by the dissertation:

1. Trough researching, the dissertation collects a great deal of information about Fangcheng Port, which provides important evidence for analyzing the development of port logistics of Fangcheng Port;

2. The dissertation successfully applies AHP into SWOT and BCG matrix analysis through constant study;

3. The dissertation applies regression, exponential smooth and combined forecast into predicting Fangcheng Port's future throughput;

4. The dissertation brings forward strategy ideas for the future development of Fangcheng Port's port logistics.

Due to the limitation of author's acknowledge, data and time, the dissertation does the roughly research on developing port logistics of Fangcheng Port. The dissertation considers some contents still need further discuss, develop, and improve. It is unavoidable that the negligence and insufficiency in the dissertation. Please every expert criticizes and rectifies.

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Appendices

Appendix 1   Combined forecast

1. Bringing forward the theory of combined forecast

We can usually adopt all kinds of prediction methods to the prediction of a certain question. Because the application ranges of each kind of prediction method are no the same, it will produce different prediction results and the forecasting precision is often different.   These single forecasting methods have distinctive aspect in data processing and different criterions, which can deduce from different angles, their predicting results have a certain value.

Due to complexity of the forecasted system, it is one-sidedness to utilize a kind of specific prediction method to forecast in many situations.   A kind of more scientific method is that carrying on a certain way to composite different prediction methods. It is being combined forecasting method that integratedly utilizes information that offered by various kinds of prediction methods to improve the precision of predicting as much as possible.

The rule of combined forecasting method is that utilizes two kinds or more than two kinds of different single prediction methods to predict the same prediction object, and then makes proper weighted average to each single prediction result.   Finally, getting weighted average value as final prediction value.   Now, making the following explanation:

Supposing, in a certain period, the actual value of a certain prediction question is y_t ($t=1,2,\ldots,n$).   There are m kinds of feasible single prediction methods to this

question.   Its predicted value or the model fitting value is f_{it} (i =1,2,…, m ; t =1,2,…, n).   Supposing again, the weighted vector of m kinds of single forecasting methods is $W = (w_1, w_2, \ldots w_m)^T$, and meet the normalized and not negative restraining conditions, namely:

$$R_n^T W = 1 \qquad\qquad （1）$$

$$W \geq 0$$

Of which $R_n = (1,1,\ldots,1)^T$ is n-dimensional column vector that all factors equal

Obviously, the key of combined forecast is how to appropriately confirm weighted average of each single prediction method. Adopting different optimum criterion will have different optimum combined forecasting model, and different methods that get weighted.   Usually, we take predicting precision as a guideline that measures well or bad of one certain combined forecasting model.   This dissertation will adopt "minimizing the weighted sum of the absolute value of the error" as the optimum criterion of combined forecasting model, and set up the model.

2. The combined forecasting model with minimizing the weighted sum of the absolute value of the error

The optimum criterion of setting up the combined model is to minimize the weighted sum of the absolute value of the error.   At the same time, reflecting different observation spots influence on different observed value by the discount coefficient. Because considering the purpose of the model is to predict future, and recent observed value have more influence than the long-time on the forecasting results, when it concerns about error that set up the model, we should offer different discount coefficient, which offers recent observed value to count with greater weight, and offer the long-time one to count with smaller weight.   So, the expression of the objective function－S of the combined forecasting model is as follows:

$$\min S = \sum a_t |e_t|$$

$$= \sum a_t |w_1 e_{1t} + w_2 e_{2t} + ... + w_m e_{mt}| \tag{2}$$

Of which a_t is discount coefficient and m is the number of single forecasting method that composite the combined forecasting model. If want to get the weighted vector $-W$ of objective function $-S$, we should solve the following combined forecasting model:

$$\min S = \sum a_t |w_1 e_{1t} + w_2 e_{2t} + ... + w_m e_{mt}| \tag{3}$$

$$s.t \begin{cases} w_1 + w_2 + ... + w_m = 1 \\ w_i \geq 0 \end{cases} \quad \text{(i=1,2, …,m)}$$

Because there is absolute value in the expression of objective function$-$S, it is inconvenient to solve the model if solving directly, but we can turn the model into a linear programming problem. If order:

$$u_t = \frac{1}{2} |w_1 e_{1t} + w_2 e_{2t} + ... + w_m e_{mt}| + \frac{1}{2} (w_1 e_{1t} + w_2 e_{2t} + ... + w_m e_{mt}) \geq 0 \quad (4)$$

$$v_t = \frac{1}{2} |w_1 e_{1t} + w_2 e_{2t} + ... + w_m e_{mt}| - \frac{1}{2} (w_1 e_{1t} + w_2 e_{2t} + ... + w_m e_{mt}) \geq 0 \quad (5)$$

$$\text{(t=1,2, …,n)}$$

The model can be turned into a following model:

$$\min S = \sum a_t (u_t + v_t) \tag{6}$$

$$s.t \begin{cases} w_1 e_{1t} + w_2 e_{2t} + ... + w_m e_{mt} = u_t - v_t \\ w_1 + w_2 + ... + w_m = 1 \\ u_t \geq 0 \\ v_t \geq 0 \\ w_i \geq 0 \end{cases}$$

$$(t=1,2, …,n), \quad (i=1,2, …,m)$$

The model can be solved by simplex method.

Appendix 2   SWOT analysis based on AHP

The analytical hierarchy process (AHP) (Saaty, 1994) is a deterministic decision-making approach that allows the incorporation of subjective judgment into the decision process. The decision maker will quantify his or her subjective preferences, feelings, and biases into numerical comparison weights that are used to rand the decision alternatives.   Another advantage of AHP is that the consistency of the decision maker's judgment is also quantified as part of the analysis[25].

SWOT analysis lists internal influence factor and external environmental factor of having great influence on business activities and development of enterprises in a form according to the goals of enterprises.   And then, we distinguish strengths, weaknesses, opportunities, and threats of firms in accordance with evaluating these factors that made sure.   Strengths and weaknesses are internal factors; Opportunity and threats are external factors.   SWOT analysis commonly used method is to give a mark item by item to listed factors.   After then, according to important degree of these factors, we weighted them and calculate their algebraical sum to judge internal strengths and weaknesses, and external opportunities and threats among them. Enterprises confirm and choose a suitable strategy according to the judged result.

1.   Evaluation of internal factors

1.1 Internal Factors Evaluated matrix (IFE matrix)

Internal factors evaluated matrix is an effectual means that analyzes firms' internal strategic conditions.   It can help decision-makers of enterprises carry on overall and comprehensive appraisal to the main strengths and weaknesses of each function field of enterprises' inside.   Followings are the specific analyzing steps:

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(1) Listing 10-20 key internal factors, which include advantage disadvantage aspect;

(2) Giving the relevant weight to each factor.   The scale is from 0(unimportance) to 1(very importance).   No matter what strengths or weaknesses, it should get higher weight if having great influence on enterprises.   The sum of all weight equals 1;

(3) Grading each factors.   Major weakness, general weakness, general strength, and major strength equal 1, 2, 3, and 4 respectively;

(4) Getting each factors' weighted mark, which each factors' weight multiply its grade;

(5) Getting the summation of weighted mark of all factors, and then obtain firms' total weighted mark.

No matter what how many factors included in IFE Matrix, the range of total weighted mark is from 1.0 to 4.0, which mean is 2.5.   The firms' internal status is in weakness if the mark is greatly lower than 2.5, vice versa.

2. Evaluation of external factors

2.1 External Factors Evaluated matrix (EFE matrix)

EFE Matrix mainly reflects that industrial prospects and firms face opportunities and threats in this industry.   It can help decision-makers know the external environment factors, and provide reliable basis to firms for formulating and analyzing strategy.   It is 5 steps to establish EFE Matrix:

(1) Listing 10-20 key external factors that confirmed at the process of external

analysis. These factors include various opportunities and threats which influence on firms and their industry;

(2) Giving the relevant weight to each factor. The scale is from 0(unimportance) to 1(very importance). Weight indicates the factor influences on firms getting achievements big or small in its industry. The sum of all weight equals 1;

(3) Grading each factors. Major threat, general threat, general opportunities, and major opportunities equal 1, 2, 3, and 4 respectively to firms;

(4) Getting each factors' weighted mark, which each factors' weight multiply its grade;

(5) Getting the summation of weighted mark of all external factors, and then obtains firms' total weighted mark of firms' opportunities and threats.

From above the process of evaluation, we know, to firms, the maximum, and minimum total weighted mark equals 4.0, and 1.0 respectively, which mean is 2.5. There are lots of opportunities, and firms are in an attractive industry if total weighted mark is 4.0. If the mark equals 1.0, firms are in a badly prospect industry, which will face many threats.

Appendix 3   BCG matrix based on AHP

Firstly, strategy's analysis and choice should analyze port current status about business portfolio according to advantages of port each business, characteristic and developing stage of corresponding industry.   Secondly, it uses a certain evaluated criterion for each business unit to formulate the development prospect and aim and elicit corresponding strategic choice.   The BCG Matrix, invented by the Boston Consulting Group, was a business portfolio analysis method.   According to the BCG Matrix, the industry growth rate and the relative market share are two basic parameters that decide which strategy should be adopted for one certain business unit in all business portfolio of a company.

BCG Matrix is an available method for analyzing company's strategy, but has some deficiencies:

(1)   It is relative simpleness that just uses the industry growth rate and the relative market share to measure business's condition, which do not consider the market's differentiation and other competitors' means to the influence of operating business units.

(2)   The comprehension and acquirement of market share and growth rate are hard to get uniform attitude and precise data.

The followings are the analyzing steps of BCG matrix of port logistics business based on AHP:

(1)   Dividing different kind of cargoes of port enterprises;

(2)   Establishing external attraction and internal capability indicator system of each logistics business unit;

(3) Quantifying external and internal indicator system by AHP, and calculating weight of each logistics business unit of external and internal indicator system;

(4) External attraction as the Y-axis; internal capability as X-axis to draw the BCG matrix figure.

(5) Evaluating and choosing correspondingly strategy in accordance with the position of each business unit in the BCG matrix figure.

Appendix 4   The indicators of internal capability and external attraction

1．The indicators of port internal capability

(1)   Market share.   The high or low market share reflects port firm's competitive capability relative to its major competitors.   The high market share, in a certain extent, indicates the port has much more strength competitive capability at current stage.

(2)   Proportion of throughput.   The proportion of throughput of port each business in the total throughput reflects the importance and achievement of each kind of cargoes while reflecting self-advantage.   It is important factors that should be considered in choosing strategy.

(3)   Earning capacity.   As to enterprises, profit is a necessary factor that considered by enterprises.   Some logistics items have high earning capacity while have low one, which might not be in direct proportion to market share rate and proportion of throughput.   The total profit is unit profit multiply its throughput.   Some logistics items have high throughput, but their profit is low, so the total profit is not high.   So, the unit earning capacity of port logistics items is an important internal factor in choosing port logistics items' strategy.

(4)   Managerial capacity.   Managerial capacity is managerial capacity of logistics operation of port companies.   It includes facilities, personnel, communication, information, and other managerial capacity.   It has impact on choosing and decision-making strategy of different logistics items.

(5)   Facilities and technical capacity.   It is the basic condition of port's operation, which reflects the capability of port logistics operation.

2．The indicators of port external attraction

(1) Market growth rate.　There is large market developing potential if the market growth rate is high, vice versa.　If the market is in short supply, the market growth rate is relatively great.　If the market demand is in saturation, the market growth rate drops.

(2) Influence on regional economy.　Port has the important effect on communication network, and port logistics is regarded as a growth point of regional economy.

(3) Influence on social environment.　The pollutant ejected into atmosphere and water is a kind of concomitant of economic activity of human society. (Abukhader, S. M., & Jonson, G., 2004.2, pp. 137-150)　Some items in the port logistics benefit to the local economy while at the cost of destroying the environment.　So, when we are to choose port logistics items, should fully consider the impact on local environment by the items.

Appendix 5 Single judgment matrix of internal capability and external attraction

1．Single judgment matrix of internal capability

Table 21 - Criterion layer of internal capability

Internal capability	Market Share	Proportion of Throughput	Earning Capacity	Managerial capacity	Technical capacity	W
Market Share	1	2	1	3	3	0.325337
Proportion of Throughput	0.5	1	1	2	2	0.209645
Earning Capacity	1	1	1	2	2	0.240819
Managerial capacity	0.3333	0.5	0.5	1	2	0.127541
Technical capacity	0.3333	0.5	0.5	0.5	1	0.096658
λmax=5.097438 C.I=0.02436 R.I=1.12 C.R=0.02175						

Table 22 - The judgment matrix of scheme layer to the criterion layer of market share

Market Share	ore	coal	foodstuff	cement	container	sulfur	W
ore	1	0.3333	0.25	0.2	0.5	0.1667	0.041532
coal	3	1	2	0.333	4	0.25	0.139565
foodstuff	4	0.5	1	0.5	5	0.3333	0.135388
cement	5	3	2	1	6	0.5	0.263216
container	2	0.25	0.2	0.167	1	0.2	0.048056
sulfur	6	4	3	2	5	1	0.372243
λmax=6.366228 C.I=0.073246 R.I=1.26 C.R=0.058131							

Table 23 - The judgment matrix of scheme layer to the criterion layer of proportion of throughput

Proportion of throughput	ore	coal	foodstuff	cement	container	sulfur	W
ore	1	0.3333	0.2	0.2	0.5	0.1429	0.038538
coal	3	1	0.333	0.333	3	0.25	0.097516
foodstuff	5	3	1	1	4	0.3333	0.202422
cement	5	3	1	1	4	0.3333	0.202422
container	2	0.3333	0.25	0.25	1	0.2	0.055321
sulfur	7	4	3	3	5	1	0.403782
$\lambda max=6.22887$ C.I=0.045774 R.I=1.26 C.R=0.036329							

Table 24 - The judgment matrix of scheme layer to the criterion layer of earning capacity

Earning capacity	ore	coal	foodstuff	cement	container	sulfur	W
ore	1	3	4	5	0.3333	0.5	0.170568
coal	0.3333	1	2	3	0.2	0.25	0.079171
foodstuff	0.25	0.5	1	3	0.1667	0.1667	0.054307
cement	0.2	0.3333	0.333	1	0.1429	0.1429	0.03221
container	3	5	6	7	1	3	0.40861
sulfur	2	4	6	7	0.3333	1	0.255134
$\lambda max=6.289394$ C.I=0.057879 R.I=1.26 C.R=0.045936							

Table 25 - The judgment matrix of scheme layer to the criterion layer of managerial capacity

Managerial capacity	ore	coal	foodstuff	cement	container	sulfur	W
ore	1	0.3333	0.25	0.2	5	0.5	0.070038
coal	3	1	0.5	0.333	7	2	0.16452
foodstuff	4	2	1	0.5	8	3	0.254535
cement	5	3	2	1	9	4	0.381013
container	0.2	0.1429	0.125	0.111	1	0.1667	0.023921
sulfur	2	0.5	0.333	0.25	6	1	0.105973
$\lambda max=6.21693$ C.I=0.043386 R.I=1.26 C.R=0.034433							

Table 26 - The judgment matrix of scheme layer to the criterion layer of technical capacity

Technical capacity	ore	coal	foodstuff	cement	container	sulfur	W
ore	1	0.5	0.5	0.333	2	0.3333	0.090705
coal	2	1	1	0.5	3	2	0.19794
foodstuff	2	1	1	0.5	3	2	0.19794
cement	3	2	2	1	4	1	0.27993
container	0.5	0.3333	0.333	0.25	1	0.25	0.05714
sulfur	3	0.5	0.5	1	4	1	0.176345
λmax=6.25953 C.I=0.051906 R.I=1.26 C.R=0.041195							

2．Single judgment matrix of external attraction

Table 27 - Criterion layer of external attraction

External attraction	Market growth rate	Influence on economy	Influence on environment	W
Market growth rate	1	2	4	0.55842
Influence on economy	0.5	1	3	0.31962
Influence on environment	0.25	0.333333	1	0.12196
λmax=3.01829 C.I=0.009147 R.I=0.52 C.R=0.017591				

Table 28 - The judgment matrix of scheme layer to the criterion layer of market growth rate

Market growth rate	ore	coal	foodstuff	cement	container	sulfur	W
ore	1	2	4	5	0.333	3	0.22274
coal	0.5	1	3	6	0.25	2	0.15476
foodstuff	0.25	0.333	1	3	0.2	0.5	0.06513
cement	0.2	0.167	0.333	1	0.143	0.333	0.03425
container	3	4	5	7	1	5	0.43101
sulfur	0.333	0.5	2	3	0.2	1	0.09211
λmax=6.25435 C.I=0.05087 R.I=1.26 C.R=0.040373							

Table 29 - The judgment matrix of scheme layer to the criterion layer of influence on economy

Influence on economy	ore	coal	foodstuff	cement	container	sulfur	W
ore	1	3	2	0.25	5	0.5	0.14896
coal	0.333	1	2	0.2	3	0.333	0.08542
foodstuff	0.5	0.5	1	0.167	4	0.25	0.07037
cement	4	5	6	1	7	3	0.44085
container	0.2	0.333	0.25	0.143	1	0.2	0.0334
sulfur	2	3	4	0.333	5	1	0.22101
λmax=6.32533 C.I=0.065066 R.I=1.26 C.R=0.05164							

Table 30 - The judgment matrix of scheme layer to the criterion layer of influence on environment

Influence on environment	ore	coal	foodstuff	cement	container	sulfur	W
ore	1	3	0.5	7	0.333	4	0.17709
coal	0.333	1	0.2	5	0.2	2	0.08153
foodstuff	2	5	1	8	1	5	0.30963
cement	0.143	0.2	0.125	1	0.111	0.2	0.02365
container	3	5	1	9	1	6	0.34827
sulfur	0.25	0.5	0.2	5	0.167	1	0.05984
λmax=6.29722 C.I=0.065066 R.I=1.26 C.R=0.05164							

Appendix 6   The explanation of data resources of SWOT and BCG which used in AHP

Data of SWOT and BCG which used in AHP are collected by author through sending questionnaire.   The author went to Guangxi and sent questionnaire via Guangxi Military Area.   The author does the questionnaires that require exports directly write number into the questionnaires according to the 1-9 rule and the rule that established by author.   After collecting questionnaires, the author uses means of each relative item, and gets the following tables.