

# An Analysis on the Relationships between Port Selection Factors

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## Abstract

The world economy has come into unlimited competition with globalization since 1990. Opening markets to the world is in progress through the expansion of world free trade and internationalization of multinational enterprises. In the maritime transportation for world trade, shipping companies pursue "Hub & Spoke" strategy so a port which is not able to be located as a hub port is degraded as a feeder port. To attract shipping companies, it is necessary for existing ports to provide differentiated service.

This paper devises marketing strategies for a competitive port after evaluating relation among the factors affecting port selection when a shipping company chooses a port of call.

On the basis of determinants derived from existing researches, we study the relation as well as importance among the factors of port selection.

**KeyWord:** Port competition factors, Competitiveness, Port, Relationship, Shipping Companies

## 1. Introduction

Since 1990s, the world economy has been influenced by unlimitedly competitive surroundings with globalization. This new feature was the results of free trade and multinational enterprises. It is necessary for ports to cope with the situation and have competitiveness by expansion of port facilities and efficient port operation. Especially, in terms of the relation between port service and shipping companies, ports that do not have geographical advantages to be a hub port have no choice but to be feeder ports since shipping companies plan "Hub & Spoke" strategy recently. So, the existing ports have to provide differentiated service to attract customers. It increases the expansion of service routes and frequencies of service through strategic alliances between shipping companies and strategic association so even the existing ports are reduced. Finally, port competition is increasing and competitiveness of service is also increasing.

Therefore, this study evaluates the importance of details among constituents affecting on their choices and establishes marketing strategies for competitive port service when a shipping company selects a port of call. Also, we derive factors of port selection to study the relation between factors of port selection after considering previous researches. Chapter 2 shows determinants for port selection and existing studies are analyzed in Chapter 3. Finally, the relation between factors of port selection is analyzed as a result of survey in Chapter 4.

## 2. Changes of shipping and port environment

This chapter shows the changes of shipping and port environment before considering previous studies about port selection. According to the environmental changes, the subjects and purposes for study are changed as well. For example, port facilities became important factors because of insufficient port development in 1980s. Also, costs and service of port are to be important due to port competition in 1990s.

### 2.1 Large size of containerships and ports

In the early 1990s, since an advent of Post-Panamax, containerships are getting bigger and bigger continuously. Even the service of 9,200TEUs containerships has started. It is expected that this tendency will be continued after 8,000TEUs that is ordered in 2005. The introduction of 12,000TEUs~15,000TEU containerships are also possible in the future.

It is going to reduce the number of ports of call. It is expected to accelerate the competition among ports around the world.

Table 1 Containerships over 8,000TEUs

Type of ships	Order Ship company	Number of ship
10,000TEU	COSCO	4
More than 9,000TEU	MSC and 4 companies	40
More than 8,500TEU	P&O Nedlloyd and 4 compaines	30
More than 8,000TEU	MSC and 3 companies	75
Total	-	149

The number of ship means that most of the cargoes are in major ports in the world. It is a result of reduced ports of call and major ports-centered policies. Therefore, it is expected that the competition to be a major port is going to keep going.

### 2.2 Operation of shipping companies and global terminals

Midore et al.(2005) divided the development process of terminal operators and characteristics into 3 steps. Due to the development of containerization, professional terminal operators or small shipping companies took part in operating global terminals in 1960s~1970s. In 1980s~1990s, total transportation companies joined operating terminals because of the development of multi-modal transportation.

Transshipment cargo had been increased in 1990s~2000s. Terminals became a part of time route service so global shipping

companies operated terminals directly. Currently, global shipping companies are operating about 150 terminals all over the world.

Like this way, global shipping companies directly operate ports and the way of port competition is also changing. Global terminal operators including HPH(Hutchison Port Holding) were operating 143 terminals worldwide in 2001 and handling 868,000,000TEU that was 35.4% of the total container volume over the world. HPH(Hutchison Port Holding) handled 11.0% of the total container volume over the world and PSA(Port of Singapore authority) handled 7.8%. On the other hand, non global operators handled 64.6%.

It is a result of shipping companies' strategy in order to ensure the marine cargo volume when competing with others.

### 3. Existing studies on the factors of port selection

#### 3.1 Researches in 1980s

To analyze a relation of factors affecting port selection, we have examined previous studies about factors affecting the port selection when a port customer selects a port. First of all, we examined researches about factors affecting the port selection, which had been made in 1980s, an early stage of the port marketing researches. There are typical researches by Willingale(1982), Slack(1985), Murphy(1988, 1989) etc. The researches suggested a standard of port selection through empirical method. They said that main factors affecting port selection are port facilities, frequency of calling port, safely cargo, port service, port cost and so on.

#### 3.2 Researches in 1990s

There had been a lot of researches by UNCTAD(1992), Peter(1990) etc in 1990s. The researches elicited more specific factors than those of existing researches. They said that the factors are ports, politics and social stability, geographical position of port, cargo volumes, processing of non-standard cargo, treatment ability of large quantity freight etc. Like this, quality of service, transport time, fusibility of equipment and freight information as the results of research analysis were the main factors of port selection.

#### 3.3 Researches in 2000s

Unlike existing researches, the recent researches have studied about developments of factors' analysis and details of factors variously in 2000s. The researchers is representatively Cullinane et al.(2000), Lirn et al.(2003, 2004), Song et al.(2004) etc. They considered detailed factors such as geographical position of port, hinterland economy scale and they are currently more important than before.

Table 2 Port Selection Factors of Existing Studies

Period	Researcher	Main factors of port selection
1980s	Willingale(1981) Slack(1985) Murphy(1988, 1989)	Port facilities, Port cost, Port operation and administration, Calling port frequency, Operation load, Back economy scale and back link
1990s	Mruphy(1992) UNCTAD(1992)	Equipment fusibility, Service level, Transport time, Information of freights , Inland haulage charge

2000s	Cullinane(2000) Lirn(2003, 2004) Song(2004)	Port location, Economy scale, Port cost and port facilities, Operation processing ability
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In existing studies, the factors are primarily facilities, services of ports, cargo volume, port costs, geographical condition and factors related to hinterland zone.

### 3.4 Previous studies and limitations

The existing studies on port selection analyzed positively the factors to make a decision for port selection by comparing several samples in detail. Slack(1985) classified port selection and port service and analyzed the order of priority which is important in terms of the feasibility. Murphy(1987, 1991, 1992) made a standard of port selection according to each industry and feature.

French(1979) and Peter(1990) divided factors into inner ports and outer ports. Cullinane and Toy(2000) integrated existing researches and rearranged the factors of port selection. TC Lrindhl(2003, 2004), Song and Yeo(2004), the recent researchers, examined through AHP analysis in detail.

However, existing studies have some limitations. First, there are a number of conflicting factors as well as connected factors.

Second, there are not enough researches targeting shipping companies although shipping companies are direct users, on the other hand, shippers and forwarders are indirect users.

Third, the regional differences are overlooked because they analyzed on the basis of domestic users.

Fourth, most of the researches derived determinants of port selection or authenticated the differences between determinants

### 4. Relation analysis among determinants of port selection.

#### 4.1 Analysis method

Existing studies on main factors of port selection gave more weight according to priority. Also, the relation between main subjects of port selection and determinants was investigated generally. Though surveys are conducted by the main subjects of port selection, this paper simply researches the relation among factors.

#### 4.2 Investigation method

##### 4.2.1 Investigation design

Based on the purpose of this study, a survey was conducted by specialists in the field of shipping or ports. To improve objectivity and validity of data collection, direct interview, fax and mail are used for survey from March to June in 2006. Respondents decided the ranking of the factors collected by existing researches. After all, not only the relation between the first factor and the second factor but also the relation between the second factor and the third factor are derived.

Table 3 Determinants of Port Selection

Groups	Details
Port facilities	Length and the number of berths, Area of CY and terminal, Equipment, Maximum capacity for berthing
Freight	Costs of entrance and clearance, Costs of handling · transfer · warehousing, Inland haulage charge, Incentive or discount system
Port service	Safety of ship and cargo, Speed and flexibility of handling, Berth schedule and reliability, Extra service(water supply, bunkering and ship stores supply), Information service
Geopolitics location	Voyage and maritime transport distance, Trunk routes, Accessibility of port and routes, Distance and accessibility from origination
Social factors	Safety of port labor and management, Safety of politics, Environmental changes of port and society
Economic scale and linkage of hinterland	Volume of cargo, Economic scale of the city, Hinterland and FTZ, scale of trade, Connection with inland, Connection with hinterland

4.2.2 Responses

Before analyzing collected data, we examined responses. First, 100 copies of questionnaire sent out for investigation but the number of collected questionnaires were 67 copies. Therefore, 67% of total questionnaires were analyzed.

Table 4 General Special Quality of Respondent

Selection	Sent questionnaires	Answers	Rate of answers	Unavailable questionnaires.
	100	67	67	-
Research industry	30	18	60	-
Terminal	5	5	100	-
Shipping business company	20	16	80	-
Shipping company	15	12	80	-
Port authority or government	4	4	100	
Other related companies	26	12	47	

4.3 Analysis results

We gave each factor weight from 1 to 5. Derived values express the average of various respondents of each item. First, respondents selected each one item from 6 groups of Table 3. Second, they selected 3 items related to each item which is selected at the first step. As before, each item of the selected 3 items has related 3 items. Finally, each item of groups selected at the first step has related 9 items.

4.3.1 Port facilities

According to the results of survey, equipment is the most important factor in the first group. Maximum capacity for berthing, area of CY and terminal and length and the number of berths are important in turn.

Table 5 Weight of each factor

Length and the number of berths	Area of CY and terminal	Equipment	Maximum capacity for berthing
18%	25%	30%	27%

The items which are highly related to equipment are extra service(water supply, bunkering and ship stress supply), port time and waiting time of ship, costs of entrance and clearance. Fig 1 shows the final results.

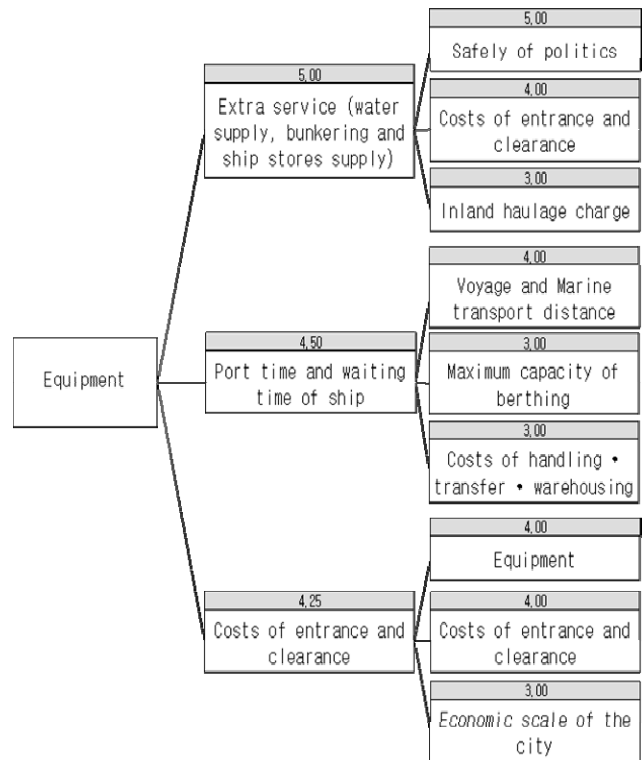


Fig 1. Factor relation of equipment

4.3.2 Freight

The most important factor in freight is Inland haulage charge. Incentive or discount system, costs of handling · transfer · warehousing and costs of entrance and clearance are important in turn.

Table 6 Factor weight of Rate of port

Costs of entrance and clearance	Costs of handling · transfer · warehousing	Inland haulage charge	Incentive or discount system
19%	22%	33%	25%

The items which are highly related to connection with hinterland, hinterland and FTZ, length and the number of berths. Other factors are shown by Fig 2.

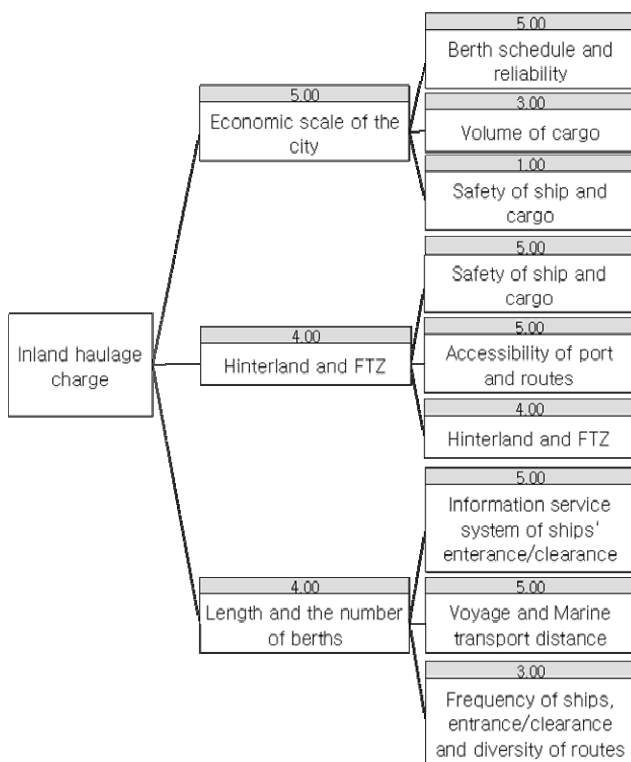


Fig 2. Factor relation of Inland haulage charge

### 4.3.3 Port service

The most important factor in freight is Extra service(water supply, bunkering and ship stores supply). Frequency of ships, entrance/clearance and diversity of routes, port time and waiting time of ship, speed and flexibility of handling are important in turn.

Table 7 Factor weight of Port service

Speed and flexibility of handling	Extra service(water supply, bunkering and ship stores supply)	Frequency of ships, entrance/clearance and diversity of routes	Port time and waiting time of ship
13%	25%	19%	16%

The items which are highly related to connection with hinterland, maximum capacity of berthing, hinterland and FTZ. Other factors are shown by Fig 3.

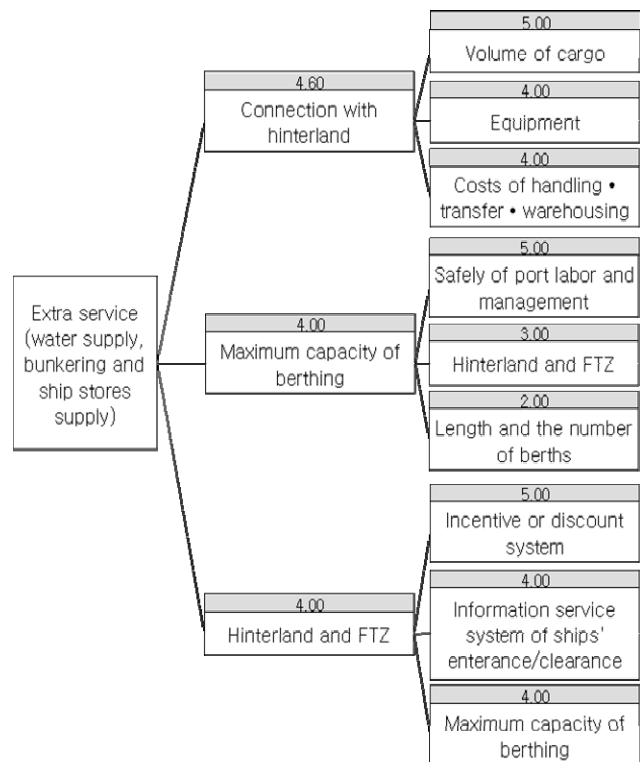


Fig 3. Factor relation of Extra service

### 4.3.4 Geopolitical location

The most important factor in freight is Voyage and maritime transport distance. Accessibility of port and routes, distance and accessibility from origination, trunk routes are important in turn.

Table 8 Factor weight of Geopolitical location

Voyage and maritime transport distance	Trunk routes	Accessibility of port and routes	Distance and accessibility from origination
31%	27%	28%	13%

The items which are highly related to Trunk routes, Speed and flexibility of handling, hinterland and FTZ. Other factors are shown by Fig 4.

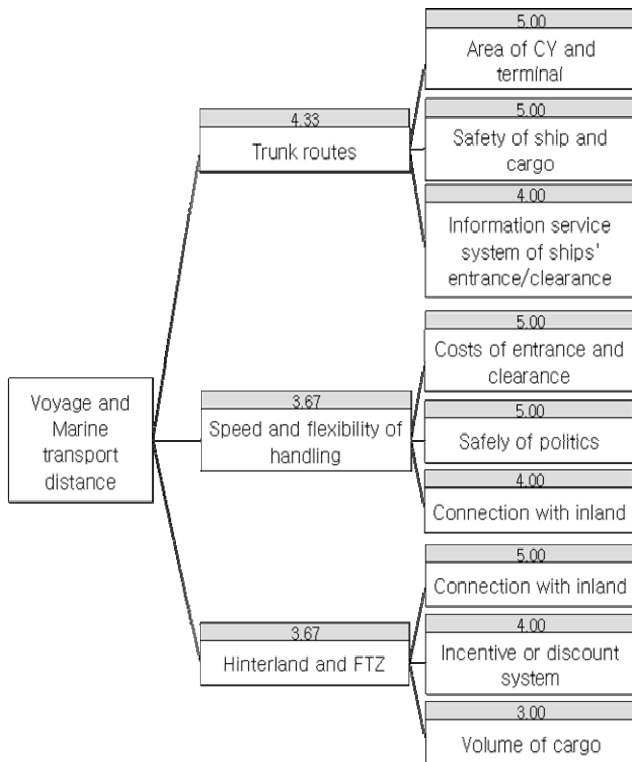


Fig 4. Factor relation of Voyage and Maritime transport distance

### 4.3.5 Social factors

Safety of port labor and management is the most important factor in social factors. Safety of politics and environmental changes of port are important in turn.

Table 9 Factor weight of Social factors

Safety of port labor and management	Safety of politics	Environmental changes of port and society
42%	31%	27%

The items which are highly related to Information service system of ships entrance/clearance. Other factors are shown by Fig 5.

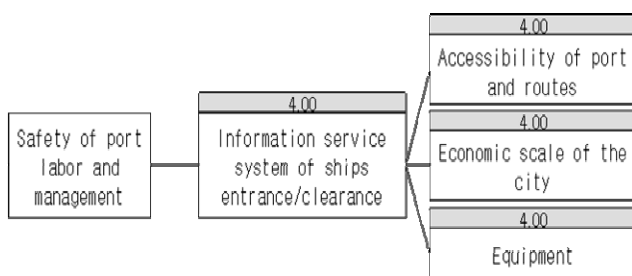


Fig 5. Factor relation of safety of port labor and management

### 4.3.6 Economic scale and linkage of hinterland

According to the results, scale of trade is the most important factor in economic scale and linkage of hinterland. Economic scale of the city, hinterland and FTZ and volume of cargo are important in turn.

Table 10 Factor weight of economic scale and linkage of hinterland

Volume of cargo	Economic scale of the city	Hinterland and FTZ	Scale of trade
21%	24%	22%	33%

The items which are highly related to accessibility of port and routes, incentive or discount system, environmental changes of port and society. Other factors are shown by Fig 6.

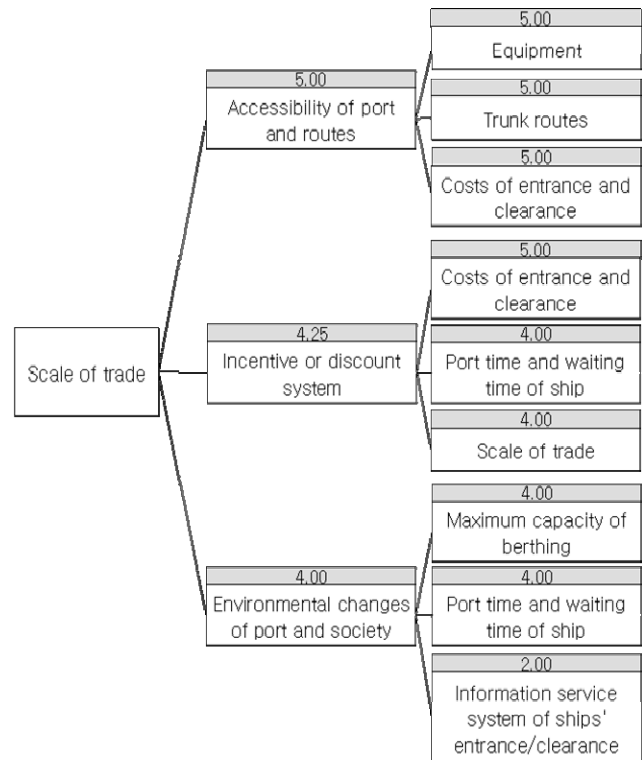


Fig.6. Factor relation of Scale of trade

### 4.4 Analysis

Research was conducted based on port facilities, freight, port service, geopolitical location and economic scale and linkage of hinterland which are categorized into five groups except social factors. It was ruled out because of the lack of association and omission.

Equipment, Extra service(water supply, bunkering and ship stores supply)(5.00), Safety of politics(5.00) sequentially be connected in Port facilities. Inland haulage charge, Economic scale of the city(5.00), Length and the number of berths(5.00) sequentially be connected in Freight. Extra service(water supply, bunkering and ship stores supply), Connection with hinterland(4.60), Volume of cargo(5.00) sequentially be connected in Port service. Voyage and Marine transport distance, Trunk routes(4.33), Area of CY or terminal(5.00) and Safety of ship and cargo(5.00) sequentially be connected in Geopolitical location. Scale of trade, Accessibility of port and routes(5.00), Equipment(5.00) or Trunk routes(5.00) or Costs of entrance and clearance(5.00) sequentially be connected in Economic scale and linkage of hinterland.

Numbers which appear in picture expresses frequency that respondent select. Width express each factor relation. We know that the relation of many factors connected with Scale of trade

and Equipment is high. That is, If Scale of trade becomes important factors at port selection, It must consider Equipment. and Extra service(water supply, bunkering and ship stores supply) and Connection with inland work on very important factors, too. In case of Volume of cargo connected with Extra service, that is the relation of Economic scale of the city in Connection with inland, too

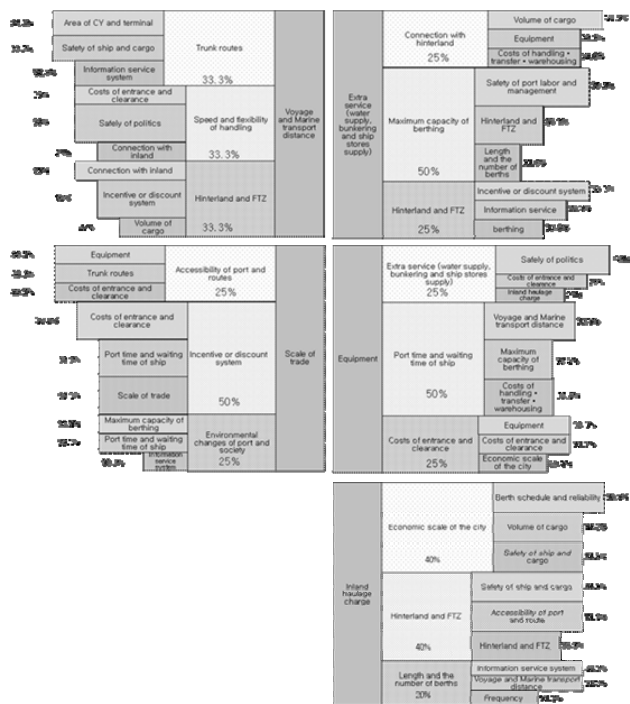


Fig 7. Factor relation of analysis

## 5. Conclusions

This research deduced the factors affecting the choice of a port examined the relevance of each factor. Based on the results, we have focused on factors which are needed to consider when we make marketing strategies. It shows that many factors should be considered when a port is chosen. The number of right facilities and trading amount between countries also has high relevance. The participation of shipping companies in a terminal would be an alternative plan to improve port competitiveness. In other words, it means shipping companies are able to have port facilities, service, expenses and cargo factors. Somewhat, the factors such as handled cargo and geographical location have high relevance. These results should be a marketing strategy to improve the port system. Also, the marketing has to be conducted with complemented and specialized strategy.

The purpose of this research is to make strategies and consider factors for to be a hub port when customers choose a port. It is focused on relevance but not importance between factors

Therefore, the detailed examination of the various port organizations has not conducted yet. To complement the weak points, it is suggested to study the details based on main port groups in the future.

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