An Evaluation of Container Development Strategies in the Port of Taichung

Chin-Shan LU* · Chi-Chang LIN** · Mei-Hui LEE***

Contents

Abstract

The objective of this study is to examine the container development strategies in the port of Taichung from the viewpoints of carriers, port authorities and shipping academics. The six most important strategic attributes from the all respondents perceptions are Enhancing the services of direct shipping with Mainland China, simplified customs procedures, simplified administrative procedures, developing service routes with Hong Kong and Mainland China, improving port information systems, and flexible rate to response market change. Based on a factor analysis, the findings reflect that price and incentive strategic dimension was the most import strategic dimension, followed by marketing and direct shipping with Mainland China as well as reorganization and information service strategic dimensions. In addition, the perceived implemented period for container development strategic attributes for the Taichung Port was also investigated in this study. Results indicated that four development strategies stood out as being short-term need to perform to all respondents were providing one-stop shopping services for carriers, flexible rate to response market change, enhancing employee training and knowledge, and strengthening port marketing and promotion. Theoretical and managerial implications of the research findings are discussed.

Key Words : Taichung Port; Container Development Strategies; Factor Analysis

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I. Introduction

The Taichung Harbor is located on the west coast of central Taiwan, approximately 110 nautical miles to the Keelung Port in North and approximately 120 nautical miles to the Kaohsiung port in South. Taichung Port is one of four international commercial ports in Taiwan, launched its first sail since October 31st, 1976. Its total area up to 3,793 hectare, is the biggest among the others. At present, there are 49 wharfs, 17 specialized zones and 3 free trade zones. There are eight container wharves in Taichung Port. Table 1 gives the container throughput (number of movements measured in TEUs) and growth rate for the Port of Taichung between 1998 and 2008. According to the Cargo System (2008) report, the Port of Taichung was ranked the world's 83rd largest container port in 2007. In 2002, the container throughput of the Port of Taichung was 1.19 million TEUs with a 10.4 per cent growth rate dramatically increase compared with previous year. However, the growth rate for container throughput decreased to -0.7 per cent in 2008 from 3.9 per cent in 2007. The significant decrease contributes to the majority of container cargo use other hinterland ports in Taiwan such as Kaohsiung Port and Keelung Port.

< Table 1> Container throughput and growth rate in the Port of Taichung, 1998-2008

Year	Total	GR (%)	Incoming	Outgoing
1998	880,240	--	429,890	450,350
1999	1,106,668	20.5	536,753	569,916
2000	1,130,357	2.1	550,270	580,087
2001	1,069,354	-5.7	516,299	553,055
2002	1,193,657	10.4	576,668	616,989
2003	1,246,027	4.2	597,886	648,142
2004	1,245,186	-0.1	590,601	654,585
2005	1,228,915	-1.3	590,315	638,600
2006	1,198,530	-2.5	571,670	626,860
2007	1,247,750	3.9	596,861	650,889
2008	1,239,412	-0.7	612,669	626,743

Note : GR represents growth rate

According to the statistics from the Directorate General of Customs, Ministry of Finance in Taiwan, near 50% of container cargo volume in Taichung area have

transferred to the ports of Kaohsiung and Keelung. Consequently, the Taichung port not only faces the competitions of hinterland ports such as Kaohsiung Port and Keelung Port but also the developing ports among Mainland China and Asia pacific areas. The strengths, weakness, opportunities, and threats (SWOT) for the Port of Taichung are indicated in the Table 2, Therefore, the Taichung Port Authority is re-evaluating its container development strategies to response the changes of competitive environment and carriers' requirements.

<Table 2> SWOT analysis of Taichung port

Strengths	● Broad land for further development ● Convenient transportation system ● High terminal operation efficiency ● Geographic advantage ● High port administrative efficiency
Weakness	● Violent ocean current and waves ● Monsoon occurred in winter season ● Lack of deep-sea service routes ● Tide range variation ● Lack of integrated information system ● Complicated custom procedures
Opportunities	● Directing shipping with Mainland China ● Developing coastal shipping ● Port privatization ● Establishment of Free trade zone ● Establishment of science park
Threats	● Competition of hinterland ports ● Economic recession ● Competition of neighboring ports from Mainland China

There are five sections in this study. Following this introduction the next section briefly reviews port related research. Section 3 discusses the research methodology, including measures of the surrey, sampling technique, and research methods. Section 4 presents the analytical results of descriptive analysis and exploratory factor analysis from the perspectives of port authorities, shipping academics, and government. Conclusions drawn from the research findings and their implications are discussed in the final section.

II. Literature Review

Strategy was first coined from the Greek word strategos, meaning the art of the general, which indicates its military origins.[1] From the strategic management point of view, Chandler defined strategy as :

> *The determination of the basic long-term goals and the objectives of an enterprise, and the adoption of courses of action and the allocation of resources necessary for carrying out these goals.*[2]

This meaning was amplified by Andrews into the following well-accepted definition:

> *Corporate strategy is the pattern of major objective, purposes or goals and essential policies or plans for achieving those goals, stated in such a way as to define what business the company is in or is to be in and the kind of company it is or is to be.*[3]

Hence, the term 'strategy' refers to that a general concept of operations which guides all activities towards an ultimate goal. McGinnis and LaLonde explored the view that strategic planning is a process of systematically evaluating the firm and its environment, identifying the strategic alternatives, selecting a strategy, implementing and monitoring the selected strategy, and then revising the strategy as needed.[4] Specifically, the strategic planning process begins with a situational analysis of the firm. The situational analysis consists of examining the strengths and weaknesses of all areas of the firm and assessing the threats and opportunities facing the firm in the various external environments.

From a port's perspective, there are a majority of previous studies have addressed the strategic planning and competitiveness for the port authority. UNCTAD (1993) identified the source of competitive advantages for ports based on the Porter's[5] study include cost leadership and differentiation strategies. The cost leadership strategic attributes in port operations consist of lower port operating costs, lower cost labor, higher productivity of labor, greater utilization of existing assets, less expensive facilities and equipment, and low port charge, whereas differentiation strategic attributes include location benefit, service

1) Coyle et al. (1992).
2) Chandler (1962), p.13.
3) Andrews (1971), p.28.
4) McGinnis and LaLonde (1983).
5) Porter (1980).

coverage, proximity to major trade routes, connection with road, rail and inland water transport, size of vessels which can be accommodated, dedicated berths or terminals, specialized cargo-handling equipment and storage, cargo consolidation and processing services, services for vessel repair, crewing, provisioning, and fuelling, information services for vessel planning and cargo clearing and tracking, faster vessel turnaround, reduced cargo dwell time, improved customs service, and simplified cargo documentation. Haezendonck and Notteboom provided a comprehensive appraisal by showing that hinterland accessibility, productivity, quality, cargo generating effect, reputation and reliability are factors that proved critical in strengthening a port's competitiveness.[6] Rugman and Verbeke summarized the factors that influence a port's competitiveness.[7] These factors were grouped into six categories, namely, factor conditions (production, labor, infrastructure, etc.), demand conditions, related and supporting industries, firm structure and rivalry, chance, and government intervention.

Tongzon analyzed determinants of port competitiveness, namely, frequency of ship visits, efficiency, adequacy of port infrastructure, location, competitive port charges, quick response to port users' needs and port's reputation for cargo damage.[8] Carbone and Martino adopted a supply chain management approach to analyze how and if port operators can face the challenge of higher integration between the actors of the higher the competitiveness of the whole supply chain.[9]

Bichou and Gray indicated that through conceptualizing ports from a logistics and supply chain management approach to construct a relevant framework of port performance.[10] Competitive attributes influencing on port operation performance were discussed.[11] Notteboom and Winkelmans reflected efficiency oriented ports can achieve competitive advantage by either cost leadership or differentiation.[12]

Key factors in obtaining a competitive advantage were (1) flexibility to adapt quickly to changing opportunities, and (2) an integral approach to logistics issues in transport chains. The strategic suggestions from the port authority and previous studies on port sector are summarized in Table 3.

6) Haezendonck and Notteboom (2002).
7) Rugman and Verbeke (1993).
8) Tongzon (2002).
9) Carbone and Martino (2003).
10) Bichou and Gray (2004).
11) Lam (2005); Brooks and Pallis (2007).
12) Notteboom and Winkelmans (2001).

<Table 3> Critical strategic attributes from previous studies

Strategic attributes	Previous studies								
	A	B	C	D	E	F	G	H	I
Enhancing the services of direct shipping with Mainland China	V								V
Encouraging a long term berth leasing agreement with carriers	V	V			V				V
Developing service routes with Hong Kong and Mainland China	V			V					
Strengthening port marketing and promotion	V	V	V				V		
Simplified customs procedures	V	V	V	V		V	V		
Providing incentives for local cargo to use Taichung Port	V								
Simplified administrative procedures	V	V	V	V	V	V	V	V	
Improving port information systems	V	V	V	V		V	V	V	
Enhancing employee training and knowledge	V	V	V			V			
Enhancing free trade zones marketing and promotion	V	V	V	V	V	V		V	V
Providing one-stop shopping services for carriers	V	V		V	V	V			
Flexible rate to response market change	V	V	V	V		V	V	V	
Encouraging private-sector equity participation in port	V	V	V		V	V	V		
Establishing international distribution centers	V	V	V	V	V		V	V	V
Enhancing offshore shipping function with Mainland China	V	V	V	V					
Dredging channel and berths draft for larger carriers	V	V	V	V					
Encouraging carriers to establish container positioning center	V			V					
Developing transshipment services	V	V		V	V		V		
Management reorganization	V	V	V	V		V	V		V
Improving the image of climate restriction	V			V			V	V	
Developing coastal shipping	V	V	V	V	V				

Note: A: Interview with Taichung Port Authority, B: UNCTAD (1993), C: Song and Yeo (2004), D: Lirn(2004), E: Carbone and Martino, F: Ha (2003), G: Ng (2006), H: Tongzon (2002), I: Bichou and Gray (2004).

While we reviewed the prior studies on port operations and management from the journals of Maritime Economics and Logistics, Maritime Policy & Management or Transportation Research, most studies focused on the port selection or choice or port competitiveness. In addition, although few studies exploring the different aspects of port competitive strategies, there is no consistent focus on the identification of container development strategic dimensions. Hence, this paper aims to use an exploratory analysis to evaluate container development strategies in the Port of Taichung.

III. Methodology

1. Sampling technique

The samples for this study focus on shipping academics, employees of port authorities, and container shipping managers and executives. The questionnaire survey was sent to 65 shipping academics, 92 employees of port authorities and 325 shipping executives at the mid of September 2007. The container shipping managers' samples were selected from the Directory of the National Association of Shipping Agencies and Companies, whereas the shipping academics were selected based on those who had taught in shipping departments at the university in Taiwan. The total useable responses were 175 out of 482, of which 37 were from shipping academics, 72 were from employees of port authorities, and 66 were from shipping managers and executives. The overall response rate for this study was 36.3 percent. As seen in Figure. 1, the research steps included questionnaire design and various methods of analysis as described below.

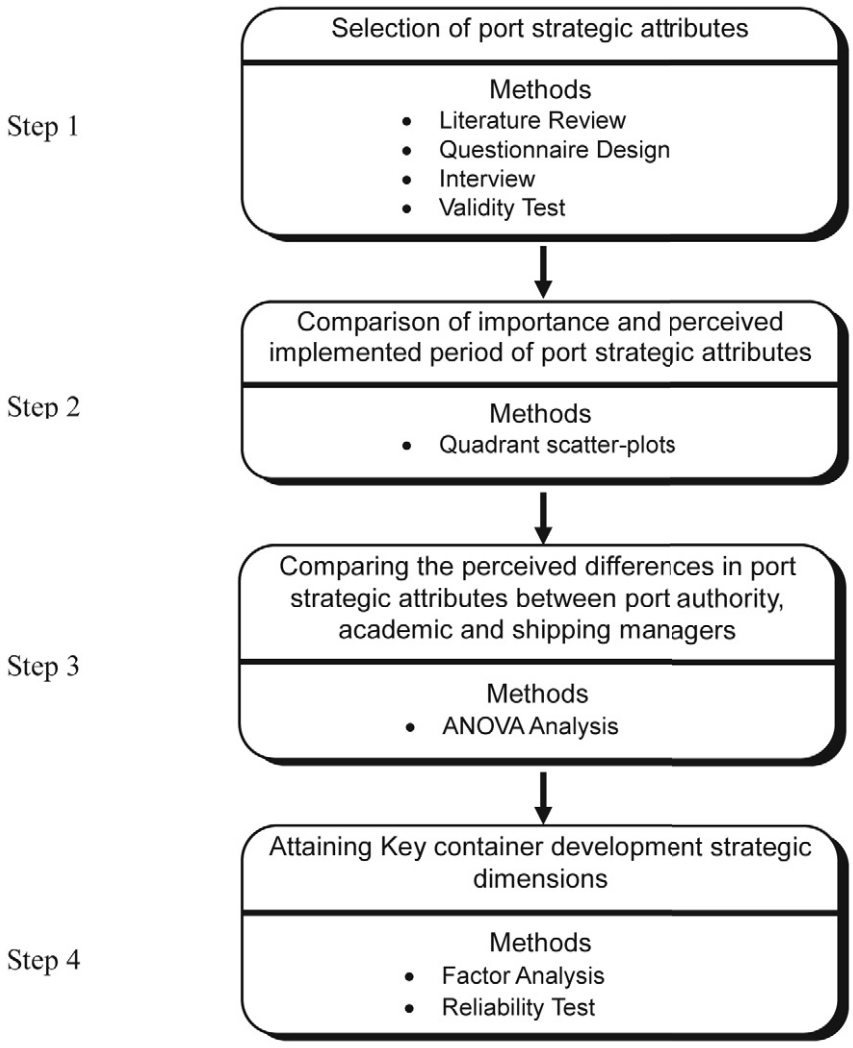
Step 1: questionnaire design and content validity test

The first step was the selection of development strategic attributes by eviewing the literature on competitive strategy research, followed by the design of the questionnaire, personal interviews with shipping academics, employees of port authorities, and container shipping managers and executives, and a content validity test. The questionnaire design followed the stages outlined by Churchill.[13)]

13) Churchill (1991).

Information sought was first specified, and then the following issues were settled: type of questionnaire and its method of administration, contents of individual questions, form of response to and wording of each question, sequence of questions, and physical characteristics of the questionnaire.

<Figure 1> Analytical step



Sept 2: Comparison of the level of importance and perceived implemented period of container development strategic attributes in the Port of Taichung

In the second step, comparison of the level of importance and perceived implemented period of container development strategic attributes in the Port of Taichung was conducted.

By drawing quadrant scatter-plots of container development strategic attributes, these two dimensions were compared to find which strategies should be considered as most priorities to implement.

Step 3: One-way analysis of variance (ANOVA)

In the third step, one-way ANOVA was used to identify whether perceived differences in container development strategic attributes existed between shipping managers, port authority, and shipping academics. A Scheffe test was employed to identify perceived differences among these three categories based on their perceptions of critical safety climate dimensions.

Step 4: Factor analysis

In the final step, a factor analysis was conducted in order to identify and summarize a large number of container development strategic attributes into a smaller, manageable set of underlying factors, called dimensions. A reliability test was conducted to assess whether these strategic dimensions were adequate.

IV. Results of Empirical Analyses

Results indicted that nearly 83.8% of shipping academics survey participants had worked in their universities for more than 5 years, whereas only 16.2 percent of them had worked for less than 5 years. Nearly 90 percent of the shipping academics respondents had Ph.D. degree. Twenty one percent of shipping academic respondents had job title professor, whereas 27.0 percent and 45.9 were associate professor and assistant professor, respectively. For the port authority respondents, 1.4 percent of respondents are director or deputy

director and 4.2 percent of respondents are harbor master/chief secretary/chief engineer. The remaining respondents are team leader/director (11.1%), supervisor (30.6%), and general employee (51.3%) respectively. On the other hand, for the shipping manager respondents, nearly 83 percent of participants in the survey were 'president or above' and 'manager/assistant manager'. This finding is important since managers are involved in and anchor strategy development in their businesses. Thus, the high percentage of responses from managers or above confirmed the reliability of the survey's findings. Results also indicated that 86 per cent of respondents had worked in the container shipping industry for more than 10 years, suggesting that respondents had abundant practical experience to answer questions. Over half of shipping manager respondents (56.1%) was from shipping agencies. Remaining respondents were from container shipping companies (19.7%), freight forwarders (19.7%), and container terminal operators (4.5%). The results also shows 31.9 percent of shipping responding firms had employees between 51 and 500 employees, while 13.7% of them had over 501 employees. Around 86% had been in business for more than 10 years. Shipping manager respondents were also asked to provide information concerning their firms' annual revenues in 2006. The results indicated that 45.5% of respondents reported annual revenues between NT $ 10 million and NT $ 1 billion, 4.5% revealed annual revenues between NT $ 5 billion and NT $ 50 billion, and 9.1% had annual revenues of NT $ 50 billion or more.

This survey also sought to identify the most important container development strategy for the Port of Taichung. Responses' assessment of each of the container development strategy used in the questionnaire was determined using a five-point Likert scale, anchored by the level of importance '1 = very unimportant' to '5 = very important'. Table 4 shows the importance of each container development strategic attributes as perceived by respondents in descending order. Results indicated that six development strategies stood out as being very important to all respondents (their mean scores were over 3.71): Enhancing the services of direct shipping with Mainland China, simplified customs procedures, simplified administrative procedures, development service routes with Hong Kong and Mainland Chain, improving port information systems, and flexible rate to

response market change. In contrast, the least important container development strategies attribute to respondents were: Improving the image of climate restriction, encouraging carriers to establish container positioning center, and developing coastal shipping (their mean scores were below 3.3).

<Table 4> Importance of container development strategic attributes in the Port of Taichung

Container development strategic attributes	Mean	S.D.	Rank
Enhancing the services of direct shipping with Mainland China	4.09	1.06	1
Simplified customs procedures	3.78	0.90	2
Simplified administrative procedures	3.76	0.93	3
Developing service routes with Hong Kong and Mainland China	3.74	0.92	4
Improving port information systems	3.71	0.79	5
Flexible rate to response market change	3.71	0.89	5
Enhancing employee training and knowledge	3.68	0.92	7
Enhancing free trade zones marketing and promotion	3.68	0.86	7
Encouraging a long term berth leasing agreement with carriers	3.66	1.00	9
Providing incentives for local cargo to use Taichung Port	3.64	0.88	10
Strengthening port marketing and promotion	3.57	0.89	11
Providing one-stop shopping services for carriers	3.53	0.84	12
Encouraging private-sector equity participation in port	3.52	0.97	13
Management reorganization	3.49	0.98	14
Dredging channel and berths draft for larger carriers	3.46	0.90	15
Enhancing offshore shipping function with Mainland	3.39	1.02	16
Establishing international distribution centers	3.35	0.87	17
Developing transshipment services	3.34	1.08	18
Improving the image of climate restriction	3.29	1.00	19
Encouraging carriers to establish container positioning center	3.16	0.94	20
Developing coastal shipping	3.02	1.09	21

Note: The mean scores are based on a 5-point Linkert scale (1=very unimportant 5= very important); S.D. =standard deviation

In addition, the perceived implemented period for container development strategic attributes for the Taichung Port was also investigated in the questionnaire, anchored by 1=below one year, 2= one to three years, 3= three to

five years, and 4=over 5 years. Table 5 shows the perceived implemented period for each container development strategic attributes as perceived by respondents in descending order. Results indicated that four development strategies stood out as being short-term need to perform to all respondents (their mean scores were below 2.0).

<Table 5> The perceived implemented period of container development strategic attributes in the Port of Taichung

Container development strategic attributes	Mean	S.D.	Ranking
Providing one-stop shopping services for carriers	1.66	0.84	1
Flexible rate to response market change	1.66	0.79	1
Enhancing employee training and knowledge	1.78	0.83	3
Strengthening port marketing and promotion	1.80	0.90	4
Simplified customs procedures	2.01	0.92	5
Improving port information systems	2.09	0.84	6
Enhancing free trade zones marketing and promotion	2.09	0.84	6
Simplified administrative procedures	2.11	0.95	8
Enhancing offshore shipping function with Mainland	2.22	0.87	9
Encouraging private-sector equity participation in port	2.25	0.90	10
Improving the image of climate restriction	2.25	0.97	10
Developing transshipment services	2.26	0.92	12
Providing incentives for local cargo to use Taichung Port	2.27	0.95	13
Encouraging carriers to establish container positioning center	2.29	0.91	14
Developing coastal shipping	2.30	0.92	15
Encouraging a long term berth leasing agreement with carriers	2.38	0.95	16
Developing service routes with Hong Kong and Mainland China	2.38	0.87	16
Enhancing the services of direct shipping with Mainland China	2.52	1.07	18
Establishing international distribution centers	2.54	0.85	19
Management reorganization	2.60	0.98	20
Dredging channel and berths draft for larger carriers	2.86	0.95	21

Note: Mean 1 represents below one year; 2 represents between one and three years; 3 represents between three to five years; 4 represents over 5 years; S.D.=standard deviation

They were providing one-stop shopping services for carriers, flexible rate to response market change, enhancing employee training and knowledge, and strengthening port marketing and promotion. In contrast, the medium term development strategies (their mean scores were over 2.50) attribute to respondents were: Enhancing the services of direct shipping with Mainland China, establishing international distribution centers, management reorgani-zation, and dredging channel and berths draft for larger carriers.

The lower the standard deviation, the more consistency is the attitude among the respondents.

If the standard deviation value of each of attributes is between 1.1 to 1.4 Churchill and Iacobucci.[14] In Table 4 and 5, standard deviation in each of attributes is of blow 1.1, which means that respondents have the equivalent awareness for all the strategy attributes

Moreover, this research seeks to compare the level of importance and perceived implemented period of container development strategic attributes based on a quadrant scatter-plot. In this scatter-plot, the development strategy attributes which mean scores above 3.64 are identified at relatively high level of importance. Similarly, means between 3.39 to 3.64 are classified as medium level of importance and those under 3.36 are at the level of less importance. As for perceived implemented period, which mean scores above 2.3 are seen as long term implemented strategies. Means between 2.11 to 2.4 are classified as medium term to implement strategies. Finally, means below 2.11 are sorted to the short term to implement strategies. Figure 2 shows the quadrant scatter-plot by respondents. By cross analyzing these two dimensions, three separate areas, namely, area A, B and C were drawn in the plot.

Nine container development strategic attributes were identified in the A area in which the situated variables were characterized in terms of relatively high level of importance with short term to implement according to the opinions of respondents. The intervening items were:

(1) Providing incentives for local cargo to use Taichung Port
(2) Providing one-stop shopping services for carriers
(3) Enhancing free trade zones marketing and promotion

14) Churchill and Iacobucci (2005).

(4) Strengthening port marketing and promotion
(5) Flexible rate to response market change
(6) Simplified customs procedures
(7) Simplified administrative procedures
(8) Enhancing employee training and knowledge
(9) Improving port information systems

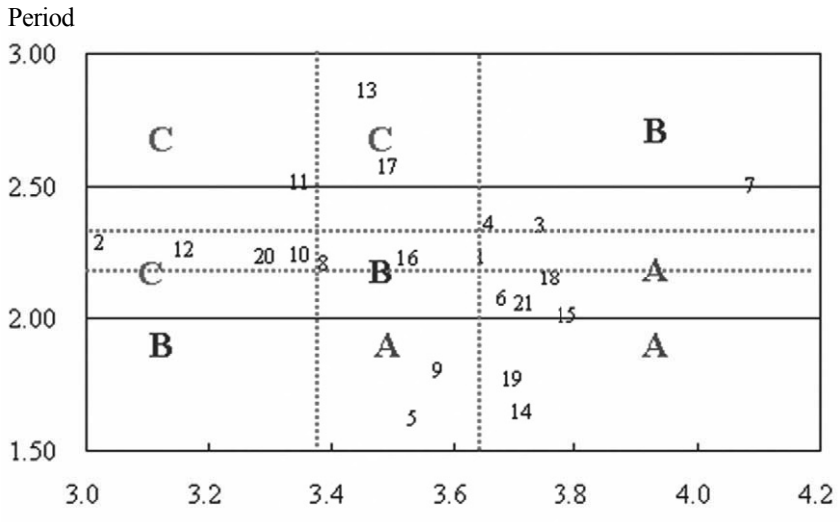
Five container development strategic attributes are in the B area, were they are perceived as being high in terms of importance with long term to implement, average important level with medium term to implement, and low important level with short term to implement. These intervening items were:

(1) Developing service routes with Hong Kong and Mainland China
(2) Encouraging a long term berth leasing agreement with carriers
(3) Enhancing the services of direct shipping with Mainland China
(4) Enhancing offshore shipping function with Mainland China
(5) Encouraging private-sector equity participation in port

Figure 2 also indicates seven container development strategic attributes which lies in C area, in terms of the relative lower important level with short term to implement. These intervening items were:

(1) Developing coastal shipping
(2) Developing transshipment services
(3) Establishing international distribution centers
(4) Encouraging carriers to establish container positioning center
(5) Dredging channel and berths draft for larger carriers
(6) Management reorganization
(7) Improving the image of climate restriction

<Figure 2> Quadrant scatter-plots of container development strategic attributes



Note : 1. Providing incentives for local cargo to use Taichung Port
2. Developing coastal shipping
3. Developing service routes with Hong Kong and Mainland China
4. Encouraging a long term berth leasing agreement with carriers
5. Providing one-stop shopping services for carriers
6. Enhancing free trade zones marketing and promotion
7. Enhancing the services of direct shipping with Mainland China
8. Enhancing offshore shipping function with Mainland
9. Strengthening port marketing and promotion
10. Developing transshipment services
11. Establishing international distribution centers
12. Encouraging carriers to establish container positioning center
13. Dredging channel and berths draft for larger carriers
14. Flexible rate to response market change
15. Simplified customs procedures
16. Encouraging private-sector equity participation in port
17. Management reorganization
18. Simplified administrative procedures
19. Enhancing employee training and knowledge
20. Improving the image of climate restriction
21. Improving port information systems

To evaluate the relationships between the importance of container developing strategy and respondents' characteristics, an ANOVA was performed in this study. As can be seen in Table 6, the result of ANOVA analysis indicated that eight container development strategic attributes differed significantly in terms of importance at the 0.05 statistical level. These are: encouraging a long term berth leasing agreement with carriers, developing service routes with Hong Kong and Mainland China, strengthening port marketing and promotion, providing incentives for local cargo to use Taichung Port, enhancing free trade zones

marketing and promotion, providing one-stop shopping services for carriers, establishing international distribution centers, and encouraging carriers to establish container positioning center. Notably, the largest mean difference between port authority employee and shipping managers was related to enhancing free trade zones marketing and promotion (3.42 and 3.97, respectively). Respondents rated enhancing the services of direct shipping with Mainland China as the most important container developing strategic attribute. Shipping academics and managers rated encouraging a long term berth leasing agreement with carriers as the second and fifth most important container development strategic attribute, where port authority respondents rated it as seventeenth. The mean difference between port authority (mean = 3.23) and shipping managers (mean = 3.76) for the attribute is 0.53.

Table 7 shows the results of perceived implemented period of container development strategic attributes. With the exception of strengthening port marketing and promotion and management reorganization, other strategic attributes did not differed significantly at the 0.05 statistical level. In general, they perceived that providing one-stop shopping services for carriers and flexible rate to response market change could be implemented within one and half year. In contrast, port authority perceived that dredging channel and berths draft for larger carriers (mean = 2.76) was the longest period to implement of strategic attribute, where shipping managers perceived management reorganization (mean = 2.95) as well as dredging channel and berths draft for larger carriers (mean 2.89), respectively.

<Table 6> Importance of container development strategic attributes for the Port of Taichung according to shipping academics, port authorities, and shipping managers

Container development strategic attributes	Respondents						F value	Scheffe
	Shipping academics		port authorities		Shipping managers			
	N=72		N=66		N=37			
	M	R	M	R	M	R		
Enhancing the services of direct shipping with Mainland China	4.26	1	3.83	1	4.19	1	2.29	N/A
Encouraging a long term berth leasing agreement with carriers	3.99	2	3.23	17	3.76	5	9.76*	(1,2),(3,2)
Developing service routes with Hong Kong and Mainland China	3.94	3	3.45	10	3.84	3	5.59*	(1,2)
Strengthening port marketing and promotion	3.86	4	3.36	13	3.38	17	7.24*	(1,2),(1,3)
Simplified customs procedures	3.86	4	3.68	4	3.81	4	0.37	N/A
Providing incentives for local cargo to use Taichung Port	3.85	6	3.53	8	3.44	13	5.42*	(1,2),(1,3)
Simplified administrative procedures	3.81	7	3.76	2	3.68	8	0.17	N/A
Improving port information systems	3.81	7	3.62	5	3.70	7	1.23	N/A
Enhancing employee training and knowledge	3.80	9	3.59	6	3.62	10	1.21	N/A
Enhancing free trade zones marketing and promotion	3.76	10	3.42	12	3.97	2	4.70*	(3,2)
Providing one-stop shopping services for carriers	3.75	11	3.29	15	3.54	11	4.65*	(1,2)
Flexible rate to response market change	3.68	12	3.73	3	3.73	6	0.11	N/A
Encouraging private-sector equity participation in port	3.65	13	3.42	11	3.46	12	1.43	N/A
Establishing international distribution centers	3.63	14	3.20	19	3.09	18	5.39*	(1,2),(1,3)
Enhancing offshore shipping function with Mainland China	3.50	15	3.26	16	3.43	14	1.98	N/A
Dredging channel and berths draft for larger carriers	3.47	16	3.47	9	3.41	16	0.31	N/A
Encouraging carriers to establish container positioning center	3.44	17	2.92	21	3.05	20	5.25*	(1,2)
Developing transshipment services	3.41	18	3.23	18	3.43	14	0.94	N/A
Management reorganization	3.36	19	3.53	7	3.68	8	1.15	N/A
Improving the image of climate restriction	3.33	20	3.35	14	3.08	19	1.13	N/A
Developing coastal shipping	3.21	21	2.95	20	2.76	21	3.14	N/A

Note: M = mean scores are based on a five-point scale (1=very unimportant to 5=very important); R = ranking

* represents significance level $p < 0.05$

** represents significance level $p < 0.01$

<Table 7> Perceived implemented period of container development strategic attributes in the Port of Taichung

Container development strategic attributes	Respondents						F Value	Scheffe
	Shipping academics N=72		Port authorities N=66		Shipping managers N=37			
	M	R	M	R	M	R		
Providing one-stop shopping services for carriers	1.49	1	1.85	2	1.62	2	1.15	N/A
Flexible rate to response market change	1.60	2	1.74	1	1.62	2	0.26	N/A
Strengthening port marketing and promotion	1.64	3	2.11	7	1.57	1	4.55*	(2,3)
Enhancing employee training and knowledge	1.72	4	1.85	2	1.78	4	0.09	N/A
Enhancing free trade zones marketing and promotion	1.97	5	2.25	13	2.03	5	1.52	N/A
Improving port information systems	2.06	6	1.98	5	2.32	11	1.95	N/A
Simplified customs procedures	2.08	7	1.89	4	2.08	6	0.82	N/A
Improving the image of climate restriction	2.11	8	2.38	16	2.30	8	1.08	N/A
Simplified administrative procedures	2.15	9	2.02	6	2.22	7	0.53	N/A
Providing incentives for local cargo to use Taichung Port	2.19	10	2.26	14	2.43	15	0.60	N/A
Enhancing offshore shipping function with Mainland China	2.20	11	2.20	10	2.30	8	0.11	N/A
Encouraging a long term berth leasing agreement with carriers	2.22	12	2.52	20	2.43	15	1.19	N/A
Developing coastal shipping	2.22	12	2.38	16	2.30	8	0.31	N/A
Developing transshipment services	2.27	14	2.18	9	2.38	12	0.60	N/A
Encouraging private-sector equity participation in port	2.28	15	2.12	8	2.41	13	1.56	N/A
Encouraging carriers to establish container positioning center	2.28	15	2.23	11	2.41	13	0.36	N/A
Developing service routes with Hong Kong and Mainland China	2.32	17	2.35	15	2.57	17	0.99	N/A
Enhancing the services of direct shipping with Mainland China	2.46	18	2.40	18	2.84	19	1.78	N/A
Establishing international distribution centers	2.58	19	2.41	19	2.68	18	1.94	N/A
Management reorganization	2.77	20	2.23	11	2.95	21	8.15*	(1,2),(3,1)
Dredging channel and berths draft for mega carriers	2.93	21	2.76	21	2.89	20	0.31	N/A

Note: M = mean scores (1 represents below one year; 2 represents between one and three years; 3 represents between three to five years; 4 represents over 5 years); R = ranking

** represents significance level $p < 0.01$

<Table 8> Factor analysis for container development strategic attributes in the Port of Taichung

Container development strategic attributes	Factor 1	Factor 2	Factor 3
Simplified administrative procedures	0.828	0.266	0.091
Management reorganization	0.819	0.081	-0.051
Enhancing employee training and knowledge	0.797	0.168	0.147
Encouraging private-sector equity participation in port	0.780	0.176	0.062
Improving port information systems	0.701	0.042	0.356
Simplified customs procedures	0.674	0.158	0.439
Enhancing offshore shipping function with Mainland China	0.165	0.824	0.073
Enhancing the services of direct shipping with Mainland China	0.043	0.722	0.041
Enhancing free trade zones marketing and promotion	0.230	0.587	0.262
Strengthening port marketing and promotion	0.450	0.562	0.331
Encouraging a long term berth leasing agreement with carriers	0.160	0.543	0.373
Providing incentives for local cargo to use Taichung Port	0.104	0.116	0.858
Developing service routes with Hong Kong and Mainland China	0.009	0.449	0.640
Flexible rate to response market change	0.437	0.181	0.564
Eigenvalues	4.063	2.570	2.148
Accumulate percentage variance (%)	29.02	47.38	62.72
Mean	3.672	3.677	3.689
Cronbach's Alpha	0.891	0.771	0.686

Factor analysis was used to reduce the container development strategy attributes to a smaller, manageable set of underlying factors. This was helpful for detecting the presence of meaningful patterns among the original variables and extracting the main service factors. Principal components analysis with VARIMAX rotation was employed to identify key strategic dimensions. In order to aid interpretation, only variables with factor loadings greater than 0.5 were extracted, a conservative criterion based on Hair, Anderson, Tatham, and Black[15] and Kim and Muller.[16]

However, the interpretability of this solution was rendered problematic because items loaded on two factors. Thus, five items were removed from further analysis. These five items were: establishing international distribution centers, developing

15) Hair, Andersn, Tatham, Black (1995).

16) Kim and Muller (1978).

transshipment services, improving the image of climate restriction, encouraging carriers to establish container positioning center, and coastal shipping. Three factors were found to underlie the various sets of container development strategies for the port of Taichung based on responses to the survey. They were labeled and are described below:

(1) Factor 1 is a reorganization and information service strategic dimension, comprising six attributes, namely, simplified administrative procedures, management reorganization, enhancing employee training and knowledge, encouraging private-sector equity participation in port, improving port information systems, and simplified customs procedures. This factor accounted for 29.02% of the total variance. Simplified administrative procedures had the highest factor loading on this factor.

(2) Factor 2 is marketing and direct shipping with Mainland related strategic dimension. This dimension consists of five items, namely, enhancing offshore shipping function with Mainland China, Enhancing the services of direct shipping with Mainland China, enhancing free trade zones marketing and promotion, strengthening port marketing and promotion, and encouraging a long term berth leasing agreement with carriers. Enhancing the services of direct shipping with Mainland China had the highest factor loading on this factor. Factor 2 accounted for 2.57% of the total variance.

(3) Factor 3, a price and incentive strategic dimension, comprises three items, namely, providing incentives for local cargo to use Taichung Port, developing service routes with Hong Kong and Mainland China, and flexible rate to response market change. Providing incentives for local cargo to use Taichung Port had the highest factor loading on this factor. Factor 3 accounted for 2.14% of the total variance.

A reliability test based on a Cronbach Alpha statistics was used to determine whether the five factors were consistent and reliable. Cronbach Alpha values for all factors are also shown in Table 8. The values of the other three factors are nearly 0.7, considered a satisfactory level of reliability in basic research.[17] Table 8 also showed the importance of the factors as judged by respondents. Results showed they perceived the most important container development strategic

17) Nunnally (1987); Carmines and Zeller (1979); Sekaran (1992); Churchill (1991); Litwin (1995).

dimension is price and incentive strategic dimension (mean=3.689), followed by marketing and direct shipping with Mainland China (mean=3.677), and reorganization and information service strategic dimensions (mean=3.672).

V. Conclusions and Discussion

Previous studies have explored the importance of competitive strategies in the context of port operations. However, to identify a competitive strategy based on an empirical study was lacking. The objective of this study is to evaluate container development strategies from the perspectives of port authority, shipping managers, and shipping academics. This study has provided an approach for examining the key container development strategies specifically in the Port of Taichung. This study's main findings, derived from a survey conducted in Taiwan, are summarized below.

First, the six most important strategic attributes from the all respondents perceptions are Enhancing the services of direct shipping with Mainland China, simplified customs procedures, simplified administrative procedures, developing service routes with Hong Kong and Mainland China, improving port information systems, and flexible rate to response market change. The present research suggests that port authorities need to be especially concerned with these service attributes when developing their competitive strategies. The research findings were consistent with Song and Yeo's study.[18] The factors of port 'facilities' and 'services' are important dimensions to enhance and sustain a certain level of competitiveness against competing ports.

Second, respondents indicated that perceived short term period of implementation for container development strategic attributes, including providing one-stop shopping services for carriers, flexible rate to response market change, enhancing employee training and knowledge, and strengthening port marketing and promotion

Third, based on a factor analysis, the findings reflect that price and incentive strategic dimension was the most import strategic dimension, followed by

18) Song and Yeo (2005).

marketing and direct shipping with Mainland China as well as reorganization and information service strategic dimensions.

Finally, from a policy implication perspective, it should be noted that strategic dimensions not only involved one strategy (direct shipping strategic dimension) but also covered other key strategic dimensions such as price and incentive related, information management related, organizational related, human resource management related, and logistics and so forth. This implies that port authorities need to consider an overall integrated strategy before they implement any strategic decisions. Hopefully, an understanding of competitive ports' behavior and strategies based on the concept of capability and resources should enable port operators to compete effectively in a competitive market.

This paper makes a meaningful contribution to the existing literature on evaluating the competitive strategies of ports, combining quantitative and qualitative data from the perceptions of container carriers, shipping academics and port authority, using a well-accepted method with the already well-exposed attributes to identify container development strategic dimensions for port authorities. This approach does obviously have a variety of applications to decision- and policy-making processes for port authorities to improve their competitiveness. In addition, this study provides a comprehensive research approach for the implication of academic researchers. This study also considered the port users (i.e. container carriers) to evaluate the port strategies.

However, there are some limitations to this research, and there exists wide scope for future research. First, this research was limited to examining the crucial container development strategies based on an exploratory analysis. Further studies could be conducted to ascertain antecedent and consequent relationships between performance and competitive advantage. Another worthwhile direction for future research could be use of the concept of strategic groups to identify strategic differentiation and competitive advantages in a competitive environment based on resource based view. Strategic groups mapping is beneficial for understanding the situation in a particular industry. Such an approach could investigate strategic and operating differences among various firms within an industry. Additionally, strategic group analysis is a helpful tool for informing companies about significant

differences in competitors' approach to the market-place.

The analysis used in this study was static, i.e. the evaluation of respondents' perceptions was conducted at one point in time. Longitudinal research could be employed to examine how perceptions of key strategic dimensions change over time. In addition, this research was conducted in the Port of Taichung. Future research could undertake the same scope of investigation in other international ports context. *

* Date of Contribution ; Sept. 15, 2009
Date of Acceptance ; Nov. 30, 2009

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