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An Empirical Study of Container Terminal's Service Attributes

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ABSTRACT

This paper empirically evaluates container terminal service attributes from shipping lines and shipping agencies' perspective. Some methods are applied for study, such as Internal-Consistency Reliability, Factor Analysis, Cluster Analysis, Importance-Satisfaction Analysis and analysis of variance. The results suggest that customers perceive reliability of the agreed vessel sailing time to be the most important container terminal service attribute followed by custom declaration efficiency, loading and discharging efficiency, port cost and berth availability. While quality of port facility is the most satisfactory service attribute. Based on the concept of market segmentation, we employed cluster analysis to classify customers of container terminal into three segments, namely port cost oriented firms, port facilities and equipments oriented firms, and service efficiency and IT service oriented firms. Theoretical and practical implications of the research findings are discussed.

Keywords*: *Cluster Analysis*, *Container Terminals*, *Market Segmentation

1. Introduction

Thanks to the great performance of its container terminals, China has now reached a world-class position for container traffic. All the ports are experiencing a great increase in container throughput, which aiming at developing not only the infrastructures but also the container terminal service. However, this led to high competitiveness of container terminals across the country, due to a large number of new ones entering this market.

The importance of customer service in competitive strategy has long been recognized [1,2]. There is a realization that markets should be segmented based on customer service requirements [3-5]. If container terminals are able to identify the exact service needs of their target customers, it is possible to segment the user groups on the basis of their differing service requirements. To do so, distinctly different service requirements must first be understood. To this end, the paper presents a methodology for evaluating the importance and satisfaction that container terminal customers in Shenzhen, PRC attach to service attributes, both in aggregate and by service dimensions. Further, it develops market segments for container terminals based on shipping lines and shipping agencies' attitudes, and addresses their implications for container terminals operators' marketing activities. The container terminal service variables were extracted from the previous relevant research and studies in the container terminals industry.

Nowadays, more and more factors of container terminal are considered by shipping lines when they decide the ports to call. And service attributes are the most important factors, such as port facility enlargement measures, modernization of stevedoring equipment, development of feeder route, decreasing tariffs, providing enough storage hours, optimizing line-haul truck operations, speedy and safe handling of special cargoes, etc.

The following are some reviews of previous foreign studies on the extraction of the container terminal service attributes. French [6] suggested terminal facilities, tariffs, port congestion, service level, and port operators as important components. Peters [7] put emphasis on the service level, available facility capacity, status of the facility, and port operation. In Kim's [8] study, important service attributes contained navigation facilities and equipment holding status, port productivity, price competition, and port service quality. Gi-Tae YEO and Dong-Wook SONG [9] investigated Korean ports and listed several container terminal service attributes: application of EDI

system, average hours of port congestion, berth/terminal availability, building Port MIS, capacity/status of facilities available, customs clearance system, effectiveness of terminal operations, existence of cargo tracing system, existence of terminal operating system, extent of port EDI, loading time, ability of port personnel, port operation time, port tariff, sufficiency of berth, etc. Based upon literature survey, this study conducted the survey on the container terminal service attributes, and finally decided 29 main items.

Also, the concept of market segmentation is a strategic marketing management tool for resource allocation that is used to enhance customer satisfaction and improve organizational profitability. Market segmentation involves the grouping of customers or prospective customers who may have similar responses to a product/service offering. The process of market segmentation includes an understanding of how or why customers buy, how a company can fit its competencies to the needs of customers, and how to develop strategies and marketing programs to enhance the profits of firms [10,11].

Market segmentation has been used in research related to the fields of maritime studies and logistics. For example, McGinnis [3,12] analyzed freight market segments based on the attitudes of shippers. Collison [4] examined market segments for marine liner services. From a logistics perspective, Gilmour *et al.* [13] investigated differences in customer service by market segment in the scientific instrument and supplies industry. Bonoma and Shapiro [14] and Murphy and Daley [11] suggested a nesting approach that allowed the marketer to choose specific segmentation bases according to the requirements of their target markets. Recently, Lu [15] used the concept of market segmentation to evaluate international distribution centers, Lu and Shang [16] investigated safety climate in container terminal operators, Lu, Lai and Cheng [17] also researched web site services in liner shipping in Taiwan. To the best of our knowledge, this paper is one of the first devoted to evaluating the requirements of container terminal services attributes based on the perspectives of the customers, *i.e.* shipping lines and shipping agencies.

There are five sections in this study. Section 2 provides a review of the literature on container terminal service attributes and market segmentation. Section 3 discusses the methodology employed to address the research issues. Section 4 presents the results in terms of the various analyses and discusses the individual customer groups in details. Section 5 summarizes the conclusions drawn from the analyses and marketing implications of container terminal operators, the limitation of this research are outlined as well.

2. Methodology and Theoretical Considerations

The research is accomplished by questionnaire. We set some hypotheses before the survey, and then verify them. The hypotheses are in the follow, 1) there are significant differences on port's service attributes indices and satisfaction among every cluster; 2) there are significant differences on port's service attributes factors and satisfaction among every cluster; 3) there are significant differences on demand of port's diversity service among every cluster; 4) there are significant differences on perception of port's service attributes indices and factors, and demand of port's diversity service, due to the difference of basic information attributes. The research steps including questionnaire design and research methods are illustrated below.

Step 1: questionnaire design and content validity test

The first step was the selection of container terminals service attributes by reviewing the related thesis, followed by the design of the questionnaire, personal interviews with shipping practitioners, and a content validity test. The questionnaire design followed the stages outlined by Churchill [18]. The sought information 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.

In the process of determining the questionnaire items, it is crucial to ensure the validity of their content, which is an important measure of a survey instrument's accuracy. Content validity refers to the extent to which a test does measure what we actually wish to measure [19]. The assessment of content validity typically involves an organized review of the survey's content to ensure that it includes everything it should and does not include anything it should not. It provides a good foundation on which to build a methodologically rigorous assessment of a survey instrument's validity. Thus, the content validity of the questionnaire in this study was tested through a literature review and interviews with practitioners, *i.e.*, questions in the questionnaire were based on previous studies and discussions with a number of liner shipping executives and experts. The questionnaire items were based on previous studies [20,21]. Mearns *et al.* [22] judged as relevant by 15 shipping executives and experts. The interviews resulted in minor modifications to the wording and examples provided in some measurement items, which were finally accepted as possessing content validity. For each item, respondents were asked to indicate the extent to which they agreed with the item described in its prospective content domain. A five-point

rating scale was used for each item (1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, 5 = strongly agree).

Step 2: item-total correlations analysis and factor analysis

In the second step, item-total correlations analysis and factor analysis were conducted in order to identify and summarize a large number of container terminals service attributes into a smaller, manageable set of underlying factors or dimensions, called service factors. A reliability test was conducted to assess whether these container terminals service factors were reliable.

Step 3: cluster analysis

In the third step, a cluster analysis was performed to form clusters of shipping lines groups. Cluster analysis has proved to be an effective method for examining market segmentation in earlier studies. In the present study, through cluster analysis, the formation of market segments was made by grouping customers having similar service requirements. Ward's hierarchical technique using squared Euclidean distances was chosen to form clusters. Respondents were categorized into various segments on the basis of their factor scores.

Step 4: One-way analysis of variance (ANOVA) and Importance-Satisfaction Analysis

The final step was to identify differences in container terminal service attributes and differences in factor scores among the segments. One-way ANOVA was used to identify whether perceived differences in container terminal service dimensions existed among the groups. In addition, a Scheffe test was employed to identify perceived differences among groups based on their perceptions of critical container terminal service dimensions. Importance-Satisfaction Analysis was used to explore the important and satisfactory perceived level to service attributes of each group and the perceived differences among three groups. All analyses were carried out using SPSS 11.0 for Windows and the results of the data analyses are discussed in the next section.

3. Empirical Analyses

3.1. The Sample

This research was based on shipping lines and shipping agencies whose main business is container transportation, specifically in Shenzhen in South China. 96 questionnaires were sent to 38 shipping lines and 10 shipping agencies in March 2006. A total of 42 usable questionnaires were collected, which represented 43.8% of the target sample.

Respondents' profiles and their characteristics are displayed in **Table 1**. Results showed that 76.2% of survey participants were shipping lines, 23.8% were shipping agencies respectively. Many respondents held the positions of director (38.1%) or manager/assistant manager or above (23.8%).

Table 1. Profile of respondents.

Characteristics of respondents		Frequency	%
Nature of Company	Shipping lines	32	76.2%
	Shipping agency	10	23.8%
Job Title	Senior Management Staff	10	23.8%
	Management Staff	16	38.1%
	Employee	4	9.5%
	Operator	11	26.2%
	Others	1	2.4%
Years of working experience in container shipping business	More than 20 years	3	7.1%
	16 ~ 20 years	9	21.5%
	11 ~ 15 years	16	38.1%
	6 ~ 10 years	11	26.2%
	Less than 5 years	3	7.1%

In order to ascertain whether respondents actually understood container terminal service attributes, they were asked to indicate how long they had worked in the shipping business. **Table 1** shows that just about one tenth of respondents (7.1%) had worked in the shipping business less than 5 years, and nearly 67% had worked in the shipping business more than 10 years, suggesting they had abundant practical experience to answer the questions.

3.2. Results and Analyses

1) Perceptions of container terminals service

According to their aggregated scores for agreement with the 29 container terminal service attributes, respondents' perceptions ranged from neutral to strongly agree (their mean scores were all over 3.0). The top five container terminal service attributes in current organizations were: Reliability of the agreed vessel sailing time (ETD), Custom declaration efficiency, Loading and discharging efficiency, Port tariff and Berth availability (see **Table 2**). In contrast, respondents showed lowest agreement with the following: Storage service for special containers and Quality of handling special cargo and special services (their mean scores were below 3.5).

In terms of the satisfaction, respondents' perceptions ranged from weakly to strongly satisfy (their mean scores were all over 3.0). The top five container terminal service

Table 2. Comparison of service attributes among direct customers.

Service Attributes	Importance			Satisfaction		
	Mean	S.D.	Ranking	Mean	S.D.	Ranking
Reliability of the agreed vessel sailing time (ETD)	4.55	0.67	1	3.95	0.65	5
Custom declaration efficiency	4.55	0.59	2	3.65	0.75	15
Loading and discharging efficiency	4.52	0.74	3	4.00	0.82	3
Port tariff	4.50	0.63	4	2.88	0.88	29
Berth availability	4.48	0.55	5	3.86	0.52	7
Information accuracy	4.45	0.67	6	3.79	0.68	8
Quality of port facility (berth, yard, etc)	4.40	0.73	7	4.42	0.70	1
External road infrastructure	4.38	0.66	8	3.65	0.57	12
Professionalism of staff	4.38	0.66	9	3.65	0.65	14
Container tracking and tracing service	4.38	0.70	10	3.98	0.74	4
Keeping customers informed of service issues and new development	4.36	0.76	11	3.63	0.66	17
Depot and gate operation efficiency (truck turnaround time)	4.29	0.67	12	3.63	0.79	16
Reliability and accuracy of operating plan	4.29	0.71	13	3.77	0.65	9
Willingness to negotiate with customers	4.21	0.98	14	3.23	0.68	27
Quality of port equipment (quay crane, yard crane, etc)	4.19	0.71	15	4.14	0.77	2
Pilot and tug boat services	4.19	0.71	16	3.65	0.78	13
Friendliness of staff	4.19	0.55	17	3.58	0.73	22
Safety handling for containers (Low damage or loss rate)	4.14	0.78	18	3.63	0.79	18
Container pre-declaration service	4.14	0.87	19	3.44	0.73	26
Storage service	4.07	0.60	20	3.70	0.71	11
IT management system	4.07	0.81	21	3.91	0.68	6
Training for staff	3.98	0.81	22	3.53	0.63	24
Holding special containers' document	3.93	0.81	23	3.60	0.66	20
Transhipment service	3.79	1.00	24	3.21	0.83	28
Host customer seminars regularly	3.79	1.05	25	3.60	0.88	21
logistics value-added service	3.69	1.05	26	3.47	0.77	25
Container repair and maintenance service	3.52	0.89	27	3.60	0.66	19
Storage service for special containers	3.45	0.83	28	3.53	0.70	23
Quality of handling special cargo and special services	3.38	0.91	29	3.74	0.69	10

attributes in current organizations were: Quality of port facility (berth, yard, etc), Quality of port equipment (quay crane, yard crane, etc), Loading and discharging efficiency, Container tracking and tracing service and Reliability of the agreed vessel sailing time (ETD) (see **Table 2**). In contrast, respondents showed lowest satisfaction in the following: logistics value-added service, Container pre-declaration service, Willingness to negotiate with customers, Transhipment service and Port tariff (their mean scores were below 3.5).

The mean scores are based on a 5 point Likert scales (1 = strongly disagree to 5 = strongly agree); S.D. =

standard deviation.

T test also indicates that shipping lines and shipping agencies do not have obvious difference in the most service attributes' importance and satisfaction except Quality of handling special cargo and special services and Container pre-declaration service. So the research supposes shipping lines and agencies as the same kind of customers of container terminal.

2) Factor analysis

Factor analysis was used to reduce the 29 container terminal service attributes to smaller sets of underlying factors (dimensions). It's used to detect the presence of meaningful patterns among the original variables and to extract the main service factors. Principal components analysis with VARIMAX rotation was employed to identify key container terminal service dimensions as shown in **Table 3**, According to the Kaiser-Meyer-Olkin measure of sampling adequacy value of 0.627 [23], the data were deemed appropriate for analysis. The Bartlett Test of Sphericity was significant [m^2 = 949.067, $P < 0.01$], indicating that correlations existed among some of the response categories. Scree plots and eigenvalues greater than 1 were used to determine the number of factors in each data set [18]. A plot of the size of eigenvalues against the number of factors in their order of extraction is shown in **Figure 1**. The last real factor is considered to be that point before which the first scree begins [23]. Factors with eigenvalues lower than one were not significantly indicated in the first scree plot. The seven key container terminal service dimensions identified accounted for approximately 76.26% of the total variance.

To aid interpretation, only variables with a factor loading greater than 0.50, were extracted, a conservative criterion based on Kim and Muller [24] and Hair *et al.* [23]. The scores on each of the container terminal service dimensions (factors) were calculated for each respondent and submitted to subsequent cluster analysis. Seven service dimensions (factors) were found to underlie the various sets of container terminal service attributes. These were labeled and are described below:

(1) Factor 1, a port facilities and equipments dimension, consisting of 4 items: a) Berth availability, b) Quality of port facility (berth, yard, etc), c) External road infrastructure and d) Quality of port equipment (quay crane, yard crane, etc). External road infrastructure had the highest factor weighing on this factor. This factor accounted for 41.17% of the total variance. Customer's mean agreement is 4.36, α is 0.9018.

(2) Factor 2, a port cost dimension, comprising 2 items: a) Port tariff and b) Willingness to negotiate with customers. Willingness to negotiate with customers had the highest factor weighing on this factor. Factor 2 accounted for 9.97% of the total variance. Customer's mean agreement is 4.39, α is 0.9064.

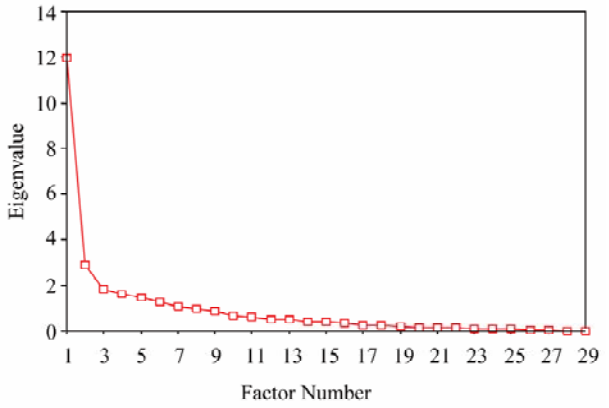

Figure 1. Scree plot of factors.

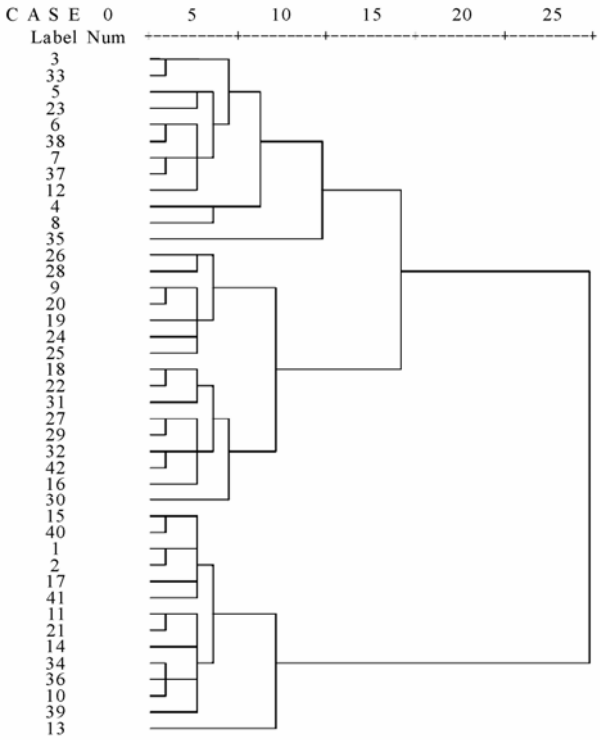

Figure 2. Hierarchical cluster analysis.

(3) Factor 3, a customer orientation dimension, consisting of 4 items: a) Hold special containers' document, b) Host customer seminars regularly, c) Containers pre-declaration service and d) Custom declaration efficiency. Host customer seminars regularly had the highest factor weighing on this factor. Factor 3 accounted for 6.36% of the total variance. Customer's mean agreement is 4.04, α is 0.8916.

(4) Factor 4, an IT service dimension, comprising 3 items: a) Information accuracy, b) Container tracking and

Table 3. Factor Analysis for container terminal service attributes.

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7
Berth availability	0.83	0.01	0.11	−0.02	0.01	0.12	0.08
Quality of port facility (berth, yard, etc)	0.60	0.18	0.14	0.21	0.22	0.17	0.38
External road infrastructure	0.84	0.06	0.04	−0.06	−0.01	0.06	0.19
Quality of port equipment (quay crane, yard crane, etc)	0.69	0.03	0.18	0.10	0.02	0.48	0.13
Storage service	0.51	−0.28	0.12	−0.10	0.03	0.08	0.60
Storage service for special containers	0.06	0.16	−0.04	0.02	0.11	−0.02	0.84
Pilot and tug boat services	−0.11	0.54	0.11	−0.10	−0.19	−0.33	0.57
Quality of handling special cargo and special services	−0.03	0.15	0.28	0.01	-0.10	−0.09	0.83
Transhipment service	0.33	0.19	0.30	-0.19	0.25	−0.38	0.50
Container repair and maintenance service	0.34	0.39	0.29	0.13	0.14	−0.33	−0.53
logistics value-added service	0.20	0.00	−0.02	0.33	−0.02	−0.06	0.87
Port tariff	0.16	0.62	0.16	0.39	−0.15	−0.12	0.13
Willingness to negotiate with customers	0.06	0.80	0.22	0.19	0.18	0.06	0.01
Reliability of the agreed vessel sailing time (ETD)	0.53	0.00	0.14	0.08	0.17	0.65	0.21
Loading and discharging efficiency	0.08	0.08	0.39	0.14	0.19	0.73	0.28
Depot and gate operation efficiency (truck turnaround time)	0.43	0.40	0.31	0.00	0.18	0.52	0.07
Keeping customers informed of service issues and new development	0.22	0.51	0.37	0.08	0.26	0.52	0.13
Reliability and accuracy of operating plan	0.39	0.10	0.41	0.08	0.40	0.55	0.40
Safety handling for containers (Low damage or loss rate)	0.18	0.19	0.07	0.14	0.02	0.82	0.04
Friendliness of staff	0.48	0.08	0.17	0.18	0.60	0.35	−0.15
Professionalism of staff	0.28	0.32	0.17	0.09	0.67	−0.08	0.26
Training for staff	0.32	0.05	0.08	0.16	0.82	0.07	−0.09
Hold special containers' document	0.29	0.44	0.64	0.18	−0.27	0.04	−0.05
Host customer seminars regularly	0.25	0.00	0.77	0.06	0.14	0.00	0.00
Container pre-declaration service	0.32	−0.11	0.51	0.48	0.23	−0.29	−0.18
Custom declaration efficiency	0.39	0.14	0.69	0.17	0.16	−0.08	0.05
Information accuracy	0.46	0.44	0.26	0.50	0.09	−0.03	0.25
Container tracking and tracing service	0.01	0.33	0.17	0.74	0.16	0.16	−0.14
IT management system	0.13	0.53	0.06	0.61	0.10	0.05	0.20
Eigenvalue	11.94	2.89	1.84	1.64	1.48	1.25	1.07
Percentage variance	41.17	9.97	6.36	5.64	5.11	4.33	3.69
Cumulative Percentage variance	41.17	51.14	57.49	63.13	66.24	72.56	76.26

tracing service and c) IT management system. Container tracking and tracing service had the highest factor weighing on this dimension. Factor 4 accounted for 5.64 % of the total variance. Customer's mean agreement is 4.25, α is 0.8705.

(5) Factor 5, a staff service ability dimension, consisting of 3 items: a) Friendliness of staff, b) Professionalism of staff and c) Training for staff. Training for staff had the highest factor weighing on this dimension. Factor 5 accounted for 5.11% of the total variance. Customer's mean agreement is 4.09, α is 0.8761.

(6) Factor 6, a service efficiency dimension, comprising 6 items: a) Reliability of the agreed vessel sailing time (ETD), b) Loading and discharging efficiency, c) Depot and gate operation efficiency (truck turnaround time), d) Keeping customers informed of service issues and new development, e) Reliability and accuracy of operating plan and f) Safety handling for containers (Low damage or loss rate). Safety handling for containers (Low damage or loss rate) had the highest factor weighing on this dimension. Factor 6 accounted for 4.33% of the total variance. Customer's mean agreement is 4.31, α is 0.8767.

(7) Factor 7, a general service dimension, consisting of 7 attributes: a) Storage service, b) Storage service for special containers, c) Pilot and tug boat services, d) Quality of handling special cargo and special services, e) Transhipment service, f) Container repair and maintenance service and g) logistics value-added service. Logistics value-added service had the highest factor weighing on this dimension. Factor 7 accounted for 3.69% of the total variance. Customer's mean agreement is 3.63, α is 0.8964.

(3) Reliability test

A reliability test based on a Cronbach Alpha statistic was used to test whether these factors were consistent and reliable in measuring the research variables. Cronbach Alpha values for each dimension are shown in **Table 4**. The reliability value of each factor was well above 0.87, indicating adequate internal consistency [18,25,26].

Table 4 also shows shipping lines' agreement level as to the importance of each container terminal service dimension in the current situation. The results indicate that they considered Port cost dimension as the most important one (factor 2), followed by Port facilities and equipments dimension (factor 1), Service efficiency dimension (factor 6), IT service dimension (factor 4), Staff service ability dimension (factor 5), Customer orientation dimension (factor 3), and General service dimension (factor 7).

4) Cluster analysis results

In addition to identifying whether perceived differences existed among groups based on respondents' characteristics, the 42 respondents were categorized into three groups on the basis of their factor scores in container terminal service dimensions. Twelve were assigned to Group 1, sixteen to Group 2, and fourteen to Group 3. **Figure 2** presents the centroids of the three segments to visually illustrate their differences.

Table 4. Cronbach alpha values for each service dimension.

Service factor	Mean	S.D.	Crobach Alpha
1. Port facilities and equipments	4.36	0.50	0.90
2. Port cost	4.39	0.74	0.91
3. Customer orientation	4.04	0.66	0.89
4. IT service	4.25	0.69	0.87
5. Staff service ability	4.09	0.62	0.88
6. Service efficiency	4.31	0.65	0.88
7. General service	3.63	0.60	0.90

Dendrogram used the Ward Method Rescaled Distance Cluster Combine.

5) Discriminant analysis results

A classification matrix was used to test the accuracy of the classification. **Table 5** shows the percentage of correct classifications and the number of incorrect predictions. The overall classification accuracy is approximately 92.86% (sum of correct predictions, 39, divided by total predictions of 'known' cases, 42). The errors stemmed from one case of Group 1 having been incorrectly assigned to Group 2, two cases of Group 2 incorrectly assigned to Group 1. More details about wrong grouping items can be found in **Table 6**.

6) One-way analysis of variance (ANOVA) results

A one-way analysis of variance (ANOVA) was used to test the differences in a specific strategic dimension among strategic groups. **Table 7** shows the results of ANOVA in the terms of factor scores. All seven strategic dimensions were significantly different among the three groups.

A comparison of the factor scores shows that Group 1 has its highest mean score on factor 2 (port cost), but it has a much lower score on factor 7 (general service). Group 2 particularly emphasizes factor 1 (port facilities and equipments), followed by factor 2 (port cost) and factor 6 (service efficiency). Group 3 displays high scores for most strategic dimensions, exhibiting the highest mean score for the factor 6 (service efficiency) and factor 4 (IT service).

In addition, ANOVA analysis was used to test the differences of service dimension among different job titles and shipping experience groups. Unfortunately, the result

Table 5. Classification matrix.

Classification Results				
		Predicted Group Membership		
Actual Group	Number of Case	1	2	3
Group 1	12	11	1	0
		91.7%	8.3%	0
Group 2	16	2	14	0
		12.5%	87.5%	0
Group 3	14	0	0	14
		0	0	100.0%

Average percent of "Group" cases correctly classified: 92.86% (=39/42).

Table 6. Wrong grouping items table.

Company No.	Actual Group	Predicted Group
4	1	2
17	2	1
26	2	1

indicated that most importance and satisfaction of service dimension were not significantly different among job titles and shipping experience groups except factor 2 and factor 7 (see **Table 8**). This implies that the job titles and shipping business experience are not the important factors influencing the importance and satisfaction agreement of container terminal service factors.

Three groups were identified by the above analyses.

Strategic Group 1: port cost oriented firms (Twelve responding firms, 28.57% of total). The main distinguishing feature of this group is 'port cost'. As it is showed in **Table 7**, members of this group consider the 'port cost' to be more important factor influencing them whether choose the container terminal than do the other responding firms. Additionally, firms in this group were composed of small size companies.

Strategic Group 2: port facilities and equipments oriented firms (Sixteen responding firms, 38.10% of total). Group 2 appears to consist of a group of firms emphasizing port facilities. Thus, this group was defined as port facilities and equipments oriented firms. Additionally, firms in this group were composed of middle size companies.

Strategic Group 3: service efficiency and IT service oriented firms (Fourteen responding firms, 33.33% of total). Upon inspection of the attitudes in this group, as shown in **Table 7**, most strategic dimensions were found to be significantly more important. Based on the mean scores, this group particularly emphasizes factor 6 (service efficiency) and factor 4 (IT service). Hence, this group is identified as service efficiency and IT service oriented firms. Additionally, this group includes large size shipping companies and terminal's VIP customers.

About satisfaction ANOVA, three groups show consistent agreement to port facilities and equipments (factor 1), port cost (factor 2), IT service (factor 4) and general service (factor 7). Three groups' most dissatisfied dimension is port cost, while group 1 displays less satisfaction to all seven service dimensions than other two groups (see **Table 9**).

7) Importance-Satisfaction Analysis results

The Importance-Satisfaction Analysis results also indicate that group 1 shows lower apperception in most of container terminals service attributes, while group 2 and group 3 show more satisfaction in the service attributes (**Figures 3-5**).

4. Conclusions

This study emphasizes the importance and satisfaction of identifying market segments of container terminal based

Table 7. AVOVA analysis between importance agreement of service dimensions and groups.

Service Factor	Group (Mean)			F ratio	Duncan test
	1	2	3		
1. Port facilities and equipments	3.75	4.53	4.59	24.056	(1), (2,3)
2. Port cost	3.83	4.41	4.57	3.988	(1), (2,3)
3. Customer orientation	3.54	4.02	4.46	8.575	(1), (2), (3)
4. IT service	3.53	4.21	4.86	27.076	(1), (2), (3)
5. Staff service ability	3.56	4.02	4.69	22.509	(1), (2), (3)
6. Service efficiency	3.53	4.33	4.88	41.626	(1), (2), (3)
7. General service	3.25	3.47	4.24	19.622	(1,2), (3)

Table 8. ANOVA Analysis between service dimensions and job title as well as working years.

Service Factor	Important Agreement (F ratio)		Satisfaction Agreement (F ratio)	
	Job Title	Working Years	Job Title	Working Years
1. Port facilities and equipments	1.76	1.04	2.03	1.15
2. Port cost	0.55	0.16	2.89	2.80
3. Customer orientation	0.98	0.35	1.06	1.00
4. IT service	1.32	0.20	1.52	1.09
5. Staff service ability	1.65	0.24	1.94	2.33
6. Service efficiency	1.95	0.45	1.43	1.08
7. General service	3.23	0.84	2.75	0.30

Table 9. AVOVA analysis between satisfaction agreement of service dimensions and groups.

Service Factor	Group (Mean)			F ratio	Duncan test
	1	2	3		
1. Port facilities and equipments	3.75	4.17	4.07	3.69	(1,2,3)
2. Port cost	2.92	3.25	2.93	1.26	(1,2,3)
3. Customer orientation	3.25	3.70	3.75	4.10	(1),(2,3)
4. IT service	3.36	4.08	4.14	10.46	(1),(2,3)
5. Staff service ability	3.39	3.71	3.67	1.12	(1,2,3)
6. Service efficiency	3.40	3.94	3.83	3.93	(1),(2,3)
7. General service	3.23	3.52	3.84	5.23	(1,2,3)

on the service requirements of customers (shipping lines and shipping agencies). The main findings of this study based on a survey conducted in Shenzhen, PRC are summarized below.

The five most important container terminal service attributes from the perception of the shipping lines and shipping agencies are Reliability of the agreed vessel sailing time (ETD), Custom declaration efficiency, Loading and discharging efficiency, Port tariff and Berth availability. This is consistent with previous studies on the service attributes of container terminal [4,5,27-30]. Meanwhile, the five most important container terminal service attributes are quality of port facility (berth, yard, etc), quality of port equipment (quay crane, yard crane, etc), Loading and discharging efficiency, container tracking and tracing service and Reliability of the agreed vessel sailing time (ETD). The present research indicates that container terminal need to especially consider about shipping lines and shipping agencies' perceptions of these service attributes when developing their services offerings.

A factor analysis was conducted to classify the identified container terminal service attributes into seven critical service factors. These seven container terminal service factors are labeled as Port facilities and equipments dimension, Port cost dimension, Customer orientation dimension, IT service dimension, Staff service ability dimension, Service efficiency dimension, and General service dimension. The results indicate that Port cost dimension is the most important factor (factor 2), followed by Port facilities and equipments dimension (factor 1), Service efficiency dimension (factor 6), IT service dimension (factor 4), Staff service ability dimension (factor 5), Customer orientation dimension (factor 3), and General service dimension (factor 7).

Cluster analysis subsequently assigned respondents into three groups: (a) port cost oriented firms, (b) port facilities and equipments oriented firms, and (c) service efficiency and IT service oriented firms, based on their factor scores in seven container terminal service dimensions. All seven container terminal service dimensions differed significantly among the three groups.

Subsequent ANOVA analysis and Importance-Satisfaction analysis revealed service efficiency and IT ser-

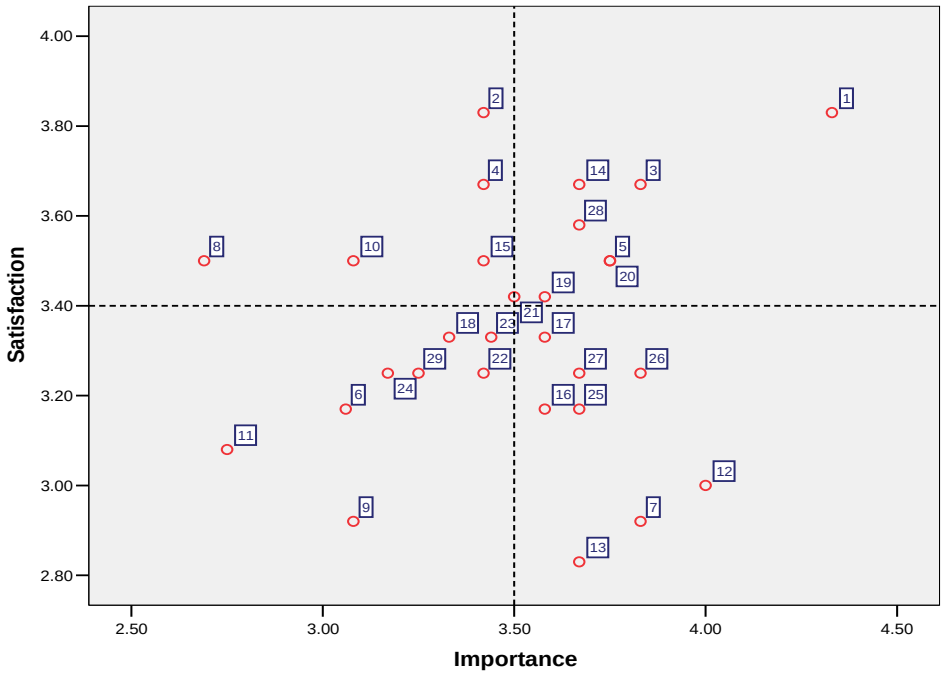

Figure 3. Importance-satisfaction chart of Group 1.

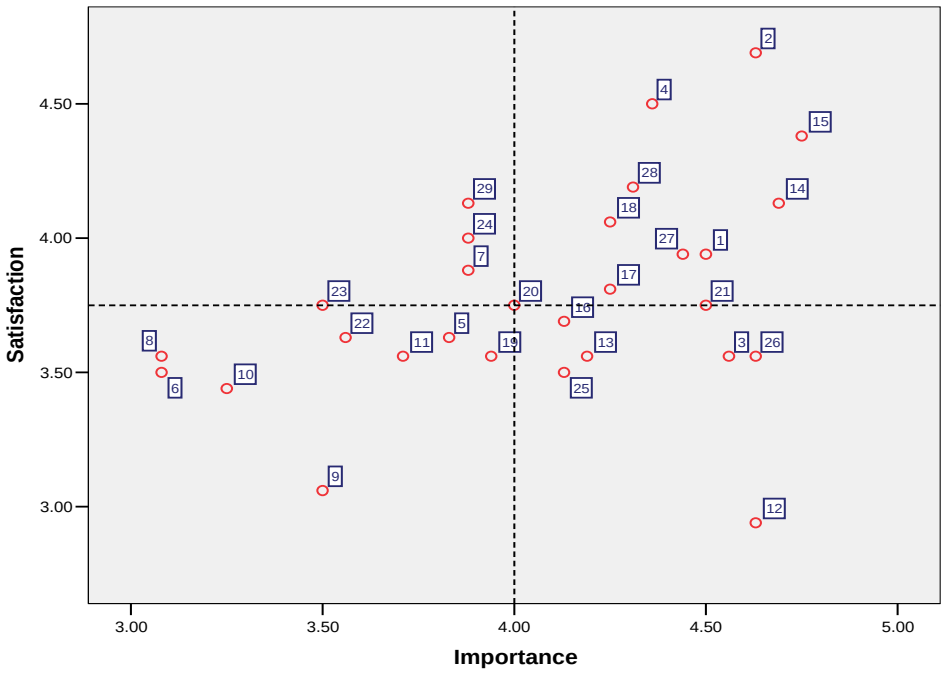

Figure 4. Importance-satisfaction chart of Group 2.

vice oriented firms (group 3) had highest perception in container terminal service from importance and satisfaction aspects, followed by port facilities and equipments oriented firms (group 2), and port cost oriented firms (group 1). Further research revealed that the most of companies in group 3 are VIP and biggest customers of the container terminal, while the companies in group 1 are much smaller ones.

Several marketing implications are derived from the study results. First, the different characteristics of the

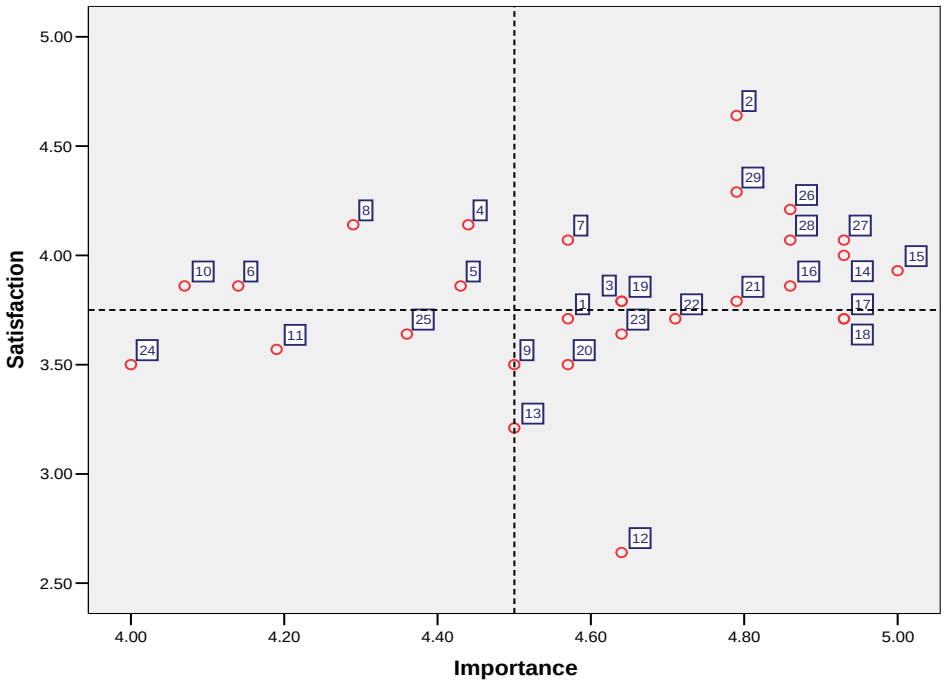

Figure 5. Importance-satisfaction chart of Group 3.

three groups emphasize container terminal to be acquainted with the market. While a strategy of appealing to all customer groups usually results in presenting a fuzzy image in the marketplace, and careful analysis of the various customer groups may enable container terminal to appeal to more than one group if the needs of the various customer groups are not in conflict, and the service can be differentiated to meet the needs of various customer groups. For example, the container terminal might emphasize its ability to satisfy the port facilities and equipments of an account perceived as being in the group of port facilities and equipments oriented firms, while stressing special services to another shipping lines and shipping agencies perceived as being a port cost oriented firms and emphasizing service efficiency and IT service stability to a third customer that is perceived as being service efficiency and IT service oriented firms.

A second implication is that competition among container terminals will vary from customer group to customer group. This means that container terminal should think of competition in terms of their customer markets. Marketing activities for each customer group should emphasize the container terminal advantages relative to the needs of each group, the strengths and weaknesses of likely competitors in each customer group as well. Finally, container terminal should not neglect the usefulness of customer market segmentation and service differentiation in competition. The ability of the container terminal to detect subtle differences between customers and tailor-made services to the needs of each customer should improve its ability to gain competitive advantage in a competitive environment.

One of the major contributions of this study is the use of shipping lines and shipping agencies' perceptions as data for developing container terminal service segments. This approach has the potential to improve the understanding of marketing strategies for developing container terminal services or related studies. From a theoretical perspective, this study is the first of its kind in evaluating service attributes and identifying different customer groups for container terminal services. It provides a framework for understanding container terminal services requirements from the shipping lines and shipping agencies' perspective.

However, it suffers from several limitations. Firstly, this research was limited to examining service attributes within the particular container terminal in PRC. There exists a wide scope for future research on container terminal services issues in a multi-national context.

Secondly, though this study was population based, it was cross-sectional in design. Container terminal operators' perceptions of service attributes were not tested across time. Therefore, future research could usefully identify the levels of importance and the performance of container terminal service attributes from the container terminal operators' point of view, since this could con-

ceivably help the container terminal operators better to identify its market segments, differentiate its services, and gain a competitive advantage.

Thirdly, the study does not address the issue of cause and effect. The analysis of variance was adequate to acknowledge a significant relationship among the various variables. Possibly, the use of 'structural equation modeling' applications will be necessary to determine if there are any cause and effect relationships between the strategic dimensions and performance.

Finally, this study was undertaken within a 1 year period to explore the customer groups. To understand the changes of market groups, it would be helpful to examine a longitudinal period and hence to make comparisons over time.

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