Exploring Study on the Effect of Perceived Port Service Quality on Customer Satisfaction and Loyalty.

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Abstract : *Due to the rapid changes in world trade and shipping environment, today's ports face ever-increasing competition, from adjacent competing ports. To this reason, port service quality has been recognized as an important strategy to take competitive advantage for those competition. In general, service quality has effect on customer loyalty, and customer loyalty is the resource to sustain competitive advantage which service providers or service producers. By improving customer loyalty, companies can get more benefits and added value. However, this causality of port service quality has not been clearly identified. Thus, various empirical studies in relation to port service quality are needed.*
The aim of this study is to analyze the effect of perceived port service quality on customer satisfaction and loyalty. To achieve this aim, we established 8 hypotheses based on SERVPERF in order to test correlations of 5 dimensions of port service, port service quality, customer satisfaction, and customer loyalty. From the result of the hypothesis testing, we found that customer satisfaction and port service quality do not affect customer loyalty in spite of high effect of port service on customer satisfaction.

Key words : *Port service quality, Customer satisfaction, Customer loyalty, SERVPERF, Structural equation modeling*

1. Introduction

Due to the rapid changes in world trade and shipping environment, today's ports face ever-increasing competition, from adjacent competing ports. Especially, to be a hub port in Northeast Asia, Chinese government has intensively invested in port development, and has developed various strategies and policies to provide good service for shipping companies. Further, these development projects are significantly big scale, compared with those projects which Korea has. Thus, it is very important to develop marketing strategies for customers, shipping companies. To this reason, port service quality has been recognized as an important marketing strategy to take competitive advantage for this competition.

In general, service quality have effect on customer loyalty, and customer loyalty is the resource to sustain competitive advantage which service providers or service producers. By improving customer loyalty, companies can get more benefits and added value. However, in port, this causality of service quality has not been clearly identified. Thus, various empirical studies in relation to this are needed.

The aim of this study is to analyze the effect of perceived port service quality on customer satisfaction and loyalty. To achieve this objective, through literature review, we define port service quality, customer satisfaction, and customer loyalty. And then, 8 hypotheses of the model are established with conceptual framework. And, to test 8 hypotheses, data collected from shipping companies are analyzed. Finally, we present the results of data analysis and implications based on research findings

2. Literature Reviews

2.1 Service Quality

According to Grönoroos (1982), service quality is the results of evaluation between technical quality and functional quality. In service providing activity, functional quality is more important than technical quality. Technical quality is the results of "What" which consumers can get, on the other hand, functional quality is the process of "How" which consumers can experience or access. Oliver (1980, 1981) insisted that service quality is evaluated by comparison between expectation and performance. Performance supports satisfaction increase as the performance/expectation ratio increase. Likewise, consumers

have expectation of something provided, and estimate service quality after performance which they are provided. When numerous studies for service have been attempted, the characteristic of service is also studied by several researchers. Although options are divergent on characteristic of service, it can be generally categorized by objective quality and perceived quality. Several researchers (Swan and Combs, 1976; Holbrook and Corfman, 1985; Zeithml, 1988) emphasized the difference between perceived quality and objective quality. However, many studies preferred perceived quality rather than objective quality.

On the other hand, experimental service measurements for this service quality called SERVQUAL and gap model was devised by Parasurman, et al.(1985). They proved that there are 10 measurement criteria of SERVQUAL which can be universally applied to service industries. The measurement consists of 10 dimensions. SERVQUAL suggested by Parasurman et al. (1985) give important meaning to service research based on measurement criteria. However, due to disputation of criteria redundancy, SERVQUAL including 5 dimensional scales with 33 items was proposed after assurance and empathy was modified by item-to-total correlations analysis and factor analysis (Parasurman et al., 1988).

Since SERVQUAL was devised, many modified models for service quality have been introduced and discussed. Cronin and Taylor (1992) agreed the 22 variables of 5 dimensions (Parasuraman et al., 1985), but raised the problem of the concept of expectation, and suggested SERVPERF. As they insisted that customer's expectation is included in performance, performance-only scale was used in the model. In order to demonstrate the superiority of SERVPERF, service quality was measured and compared by four different equations, and they showed the performance-based measure is more appropriate for service quality (Cronin and Taylor, 1992).

2.2 Port Service Quality

It is difficult to define port service and determine measurement variables. However, in regard to port service, measurement variables were used to be extracted from the former studies of port selection criteria and port competition. Most of the studies for port selection criteria were conducted mainly through the method of questionnaire or interview with shipping lines, forwarders, shippers, and transport companies.

The measurement of service quality in port industries have been conducted mainly in terms of customer satisfaction. However, due to its subjective characteristics

of evaluation, it is necessary to establish port service criteria and make evaluation model for decision making. Kim(2000) carried out ANOVA analysis in order to estimate the perception difference of importance, expectation, and performance of terminal service quality between users (shipping lines) and providers (container terminals). He used 6 factors (capacity of terminal facility, tariffs competitiveness, productivity, flexible operation, reliability, and additional support service) with collected 104 data from shipping lines and container terminals. Especially, he showed that importance of each factor perceived by shipping lines was not different depending on the characteristics (calling frequency, handling volume, the number of service vessel, etc.) of respondents. In contrary to importance, perceived satisfaction is significant different depending on terms of shipping lines. Su and Bang (2002) used analysis of Structural Equation Modeling (SEM) which has good advantage of factor analysis and regression analysis with error variables. They estimated the effect of perceived logistics service quality on repurchasing intention in port with 3 factors of functional quality, technical quality, and physical quality. The variables of functional quality are convenience, connection, security, growth, and accuracy, but, variables have 18 sub-variables. Technical quality consists of loading, CY, CFS, transport, and information and physical quality includes berth length, depth, crane, reefer plug. The results of their study supported that functional and physical quality is significant determinant of logistics service quality in port.

Song and Song (2004) evaluated perceived port logistics service quality with a focus on the shipping lines calling Busan and Gwangyang port. He used moderated regression analysis for hypothesis testing with 50 acceptable responses from shipping companies. He also used the concepts of functional quality and technical quality. However, variables for functional quality are mostly related to employees'attitude such as kind attitude, faithful attitude, serious attitude, cooperative attitude, and quick response to customers' claim. On the other hand, technical quality factor has facilities and equipment, working accuracy, working reliability, technical handling of equipment, and knowledge for work. Kim and Pak(2006) used 5 dimensions of SERVQUAL model (tangibles, reliability, responsiveness, assurance, empathy) to evaluate the effects of perceived service quality of container terminal on customer satisfaction. They used regression analysis with acceptable 96 responses from shipping lines and shipping agencies in Korea. Their research showed significant positive effects of terminal service on customer satisfaction and customer

loyalty. Kim(2007) developed measuring tool for service evaluation and estimated effects of port service quality on the customer satisfaction and post-behaviors focusing on Incheon and Shanghai port. He defined 3 factors (external quality, internal quality, and interactive quality) and used SEM analysis for evaluation of port service.

2.3 Customer Satisfaction and Loyalty

Customer satisfaction is so psychological that it is not easy to estimate the state with quantitative figures. However, through the efforts to meet customer satisfaction, service providers can get more benefit and added value. Thus, perceived satisfaction by customers makes it possible to improve purchase intention. Regarding customer satisfaction, the concept of customer satisfaction has difficulties in measurement due to the characteristic of redundancy with psychology or behavior studies in social science. However, mainly in the marketing literature, response to evaluation of perceived and expected service has been widely used to define the concept. For instance, Oliver (1981) considered customer satisfaction as the discrepancy of perceived service and expected service.

Customer loyalty is the resource to sustain competitive advantage which service providers or service producers. Thus, by improving customer loyalty, companies can get more benefits and added value. Parasuraman et al.(1994) mentioned that customers' behavioral intentions are influenced by service quality. Cronin and Taylor (1992) evaluate relation between service quality, customer satisfaction, and purchase intention. And they proved that the effect of service quality on customer satisfaction and the effect of customer satisfaction on purchase intention.

3. Conceptual Framework and Research Hypothesis

3.1 Development of Measurement Variables

Port service items were extracted from former studies about port selection criteria, port competitiveness, and port service quality which was discussed in chapter 2. We choose 62 items through pilot test, and after interview with specialist group (professors, researchers, and managers in container terminal and shipping lines), and then we fixed 45 items for this research.

Besides, since 5 dimensions of SERVQUAL and has various potential as application method for service industries (Parasuraman et al., 1988), we gave operational definitions of variables using 5 dimensions (tangibles,

reliability, assurance, empathy, and responsiveness). However, instead of SERVQUAL, we use SERVPERF to focus on performance. That is because the concept of performance includes customer expectation (Cronin and Taylor, 1992), and expectation will not be able to be measured consistently due to the subjective characteristic of service quality. In other words, consumers may not distinguish the level of expectation measurement, and it is possible for consumers to give good score for all the variables.

In our study, tangibles are defined as physical ability of port facilities and equipment, and assurance is reliable and believable attitude of port key players (port authority's attitude, workers' attitude or manner, or terminal's attitude, etc.). Reliability is defined as reliable and accurate ability to promise calling schedule of vessel, and empathy is other support activities to enhance customer satisfaction.

Table 1 Port service items

No.	Item
1	Enough handling equipment
2	Enough port facilities and berths
3	Deep water draft
4	24hrs/holiday cargo handling service
5	Incentive policies for high frequency of vessel calling
6	Prompt process of CIQ (Custom Clearance, Immigration and Quarantine)
7	Quick response to customer claims
8	Prompt dangerous cargo handling
9	Immediate information about cargo location
10	High productivity of port equipment to minimize port time
11	Notice about current local marine condition
12	Safe port arrival through vessel passage
13	Communication between yard and control center
14	Flexible and prompt berth allocation
15	Notice about information of port situation
16	Report of local weather forecasts
18	Free time of container freight station
19	Quick decision making process in terminal
20	Port's performance of a contract
21	Prompt cargo handling through check gate
22	Well-skilled port workers
23	Communication with port workers(language)
24	Port workers' supportive and cooperative attribute
25	Stablesupply of workforce
26	Safety awareness training for port workers
27	Low possibility of cargo damage, missing, and pilferage
28	Low failure rates of handling equipment
29	Safety operation of port equipment
30	Efforts for security and safety in port

31	Well-equipped Navigation aids for safe vessel calling
32	Evacuation policy for emergency case
33	Clean port spaces and facilities
34	Periodic inspection for equipment and facilities
35	Restricted entrance
36	Quick ship repair services
37	Convenient arrangement for spare parts and ship's materials delivery
38	Convenience for bunker and water supply
39	Convenience facilities for crews
40	Emergency services for crews
41	Port authority' constant efforts for port development
42	Port authority' positive marketing activity
43	Try to listen to customer request
44	Efficient use in multi-modal transportation
45	Proximity of CY, CFS, and warehouses

In addition, the definition of responsiveness is given as immediate response to customer needs. Moreover, port service quality in this study represents level of overall port service quality, customer satisfaction is appointed as level of perceived satisfaction about facilities, information, development plan, and other support activities. Finally, customer loyalty is defined as customer behavior intentions through service satisfaction.

3.2 Research Framework and Hypothesis

In order to revile causality of port service quality, customer satisfaction, and customer loyalty, we propose the research framework of this study with hypotheses established (See Fig. 1). The framework includes 5 dimensions based on SERVPERF model (tangibles, assurance, reliability, empathy, and responsiveness), port service quality, customer satisfaction, and customer loyalty.
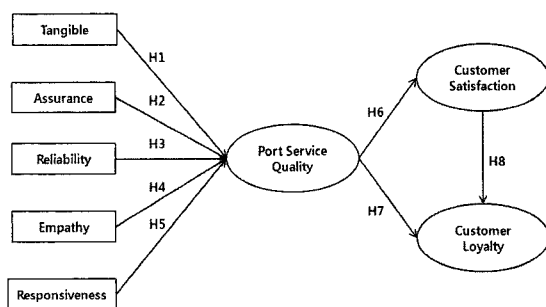

Fig. 1 Research framework

The five research hypotheses regarding paths to port service quality in the suggested model are identified as below

H1 : Tangible perceived by customer is positively related to

Port Service Quality.

H2 : Assurance perceived by customer is positively related to Port Service Quality.

H3 : Reliability perceived by customer is positively related to Port Service Quality.

H4 : Empathy perceived by customer is positively related to Port Service Quality.

H5 : Responsiveness perceived by customer is positively related to Port Service Quality.

From the literature review about port service quality, customer satisfaction, and customer, 3 hypotheses are added for analysis of structural model.

H6 : Port Service Quality is positively related to Customer Satisfaction.

H7 : Port Service Quality is positively related to Customer Loyalty.

H8 : Customer Satisfaction is positively related to Customer Loyalty.

4. Data Collection and Analysis

4.1 Questionnaire Design and Data Collection

Questionnaire described with 5 Likert scales was designed with the final 45 items. The questionnaire used for this study is in consideration of SERVERF Model suggested by Cronin and Taylor (1992), and also significantly takes into account the characteristics of port service. And for the data collection, the questionnaires for this study were distributed to shipping companies calling domestic ports in Korea. Face to face interview and e-mail survey were used, and completed forms were returned by fax, email, or were collected by company visit. This survey conducted for total 6 weeks from the 14th of January to the 22nd of February.

Table 2 General characteristics of respondents

Status	Number of respondent (Percent %)	Working period (years)	Number of respondent (Percent %)
Staff	32(23.4%)	Under 2	22(16.1%)
Assistant Manager	38(27.7%)	2 - 4	25(18.2%)
Manager	34(24.8%)	5 - 9	43(31.4%)
Deputy General Manager	16(11.7%)	10 - 14	35(25.5%)
General Manager	15(10.9%)	15 -19	7(5.1%)
Director	2(1.5%)	over 20	5(3.6%)
Total	137(100%)	Total	137(100%)

Due to subjective characteristics of this study, total 185 questionnaires were distributed to each company, and 141 (76%) questionnaires were returned. However, we practically analyzed our study with 137 (74%) forms except 4 inappropriate forms. The general characteristics of respondents are shown as above table 2.

4.2 Reliability and Validity Analysis

Prior reliability test, preliminary analysis is performed to remove items which are not really irrelevant to each factor. Item-to-Total-Correlation analysis was used for the preliminary analysis. This is analysis method to extract acceptable items by analyzing the correlation of each item.

Table 3 The result of reliability analysis

Dimension	Number of Items			Cronbach α
	Initial stage	After preliminary analysis	After reliability analysis	
Tangibles	7	4	3	0.739
Assurance	7	6	6	0.775
Reliability	11	7	5	0.873
Empathy	15	8	6	0.838
Responsiveness	5	4	4	0.823
Customer Satisfaction	4	4	4	0.819
Customer Loyalty	4	4	4	0.829

If one of the items has low correlation Item-Total value (α<0.4) in correlation analysis, we will remove the item one by one and keep analyzing until Corrected Item-Total (CIT) value are all acceptable (α>0.4). Then we finally extracted total 24 service items after exploratory factor analysis as reliability analysis. The result of exploratory factor analysis for reliability is as follow table 3. Although there are many research attempted to discuss the proper Cronbach α value, Cronbach α over 0.7 is generally acceptable.

In this research we used Principle Component Analysis to reduce factors by minimizing loss of information and retaining data. And we choose Varimax from orthogonal rotation which properly separates the characteristics of each factor. Table 4 summarizes the result of exploratory factor analysis based on 24 items. As follow table 4. indicates, Eigen values of each factor are 1.325, 1.995, 2.387, 7.695, and 1.471. Thus, it shows that all the Eigen values about 5 factors are acceptable.

In order to determine collected data appropriate to factor analysis, Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy and Bartlett's test of sphericity inappropriate are

performed.

Table 4 The result of exploratory factor analysis

No.	Measurement variables	Factors				
		F1	F2	F3	F4	F5
1	Enough handling equipment	0.774				
2	Enough port facilities and berths	0.825				
3	Deep water draft	0.711				
4	Port's performance of a contract		0.485			
5	Well-skilled port workers		0.722			
6	Communication with port workers(language)		0.791			
7	Port workers' supportive and cooperative attribute		0.737			
8	Safety awareness training for port workers		0.649			
9	Port authority' constant efforts for port development		0.454			
10	24hrs/holiday cargo handling service			0.720		
11	Prompt dangerous cargo handling			0.716		
12	Prompt cargo handling through check gate			0.782		
13	Stable supply of workforce			0.701		
14	Low possibility of cargo damage, missing, and pilferage			0.747		
15	Incentive policies for high frequency of vessel calling				0.520	
16	Prompt process of CIQ (Custom Clearance, Immigration and Quarantine)				0.780	
17	Notice about information of port situation				0.677	
18	Quick ship repair services				0.510	
19	Convenient arrangement forspare parts and ship's materials delivery				0.817	
20	Convenience for bunker and water supply				0.845	
21	Quick response to customer claims					0.781
22	Immediate information about cargo location					0.774
23	Efficient performance by EDI (Electronic Data Interface)					0.594
24	Quick decision making process in terminal					0.737
Cronbach's α		0.739	0.775	0.873	0.838	0.823
Eigen value		1.325	1.995	2.387	7.695	1.471
% of Variance		5.522	8.144	9.947	32.062	6.128
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.869				
Bartlett's Test of Shphericity		Chi-Square = 1503.878 Sig. = 0.000				

Hair, et al. (1998) suggested a KMO index of higher than 0.6 and Bartlett's P value of less than 0.5 as suitable for factor analysis. The result of this analysis showed that construct validity is significantly acceptable to this factor analysis (KMO index= 0.869, x^2 of Bartlett's test=1503.878, P value of Bartlett's test=.000). Besides, the five factors explain 61.803% of variance.

Each factor is regarded as 5 dimensions of service

quality according to the operational definition: Tangibles (x01-x03), Assurance (x04-x09), Reliability (x10-x14), Empathy (x15-x20), and Responsiveness (x21-x24).

After exploratory factor analysis and reliability test, confirmatory factor analysis for each dimension was performed in order to estimate construct validity. Confirmatory factor analysis is useful for convergent validity and discriminant validity of construct validity. From the result of analysis presented in table 5, we confirmed convergent validity for all the dimensions (GFI ≥ 0.8, AGFI ≥ 0.8, P value ≥ 0.05, RMR ≤ 0.05, NFI ≥ 0.90). Especially, GFI and AGFI indexes for all dimensions showed higher than 0.90. However, when the number of variables is less than 4, model fit index is definitely perfect. Therefore, in case of tangibles, x^2, GFI, NFI, CFI values showed 1.000.

Table 5 The result of confirmatory factor analysis for each dimension

Dimensions	No. of variables	x^2	P	GFI	AGFI	RMR	NFI	CFI
Tangibles	3	0.000		1.000		0.000	1.000	1.000
Assurance	6	14.675	0.100	0.964	0.916	0.049	0.760	0.877
Reliability	5	7.609	0.179	0.978	0.933	0.023	0.877	0.950
Empathy	6	13.268	0.151	0.967	0.924	0.035	0.805	0.919
Responsiveness	4	0.663	0.718	0.998	0.988	0.009	0.986	1.000
Customer Satisfaction	4	4.503	0.105	0.983	0.917	0.020	0.919	0.949
Customer Loyalty	4	2.777	0.249	0.990	0.949	0.012	0.945	0.983

4.3 Hypothesis Testing

We will perform hypothesis test with the proposed Structural Equation Model(SEM) in Chapter 3 using AMOS 7.0. From below figure 2, the estimated structural model shows path coefficients, relative effect relation, for hypothesis testing. Concretely, assurance (0.51), reliability (0.68), and responsiveness (0.44) have high path coefficients to port service quality. Besides, it shows port service quality (0.99) to customer satisfaction, and customer satisfaction (0.73) to customer loyalty. Although there are low coefficients of port service quality to customer loyalty (-0.11), port service quality affected by several service factors, customer satisfaction affected by port service quality, and customer loyalty affected by customer satisfaction represents structural relation. All the coefficients in the path diagram were calculated by standardized estimates.
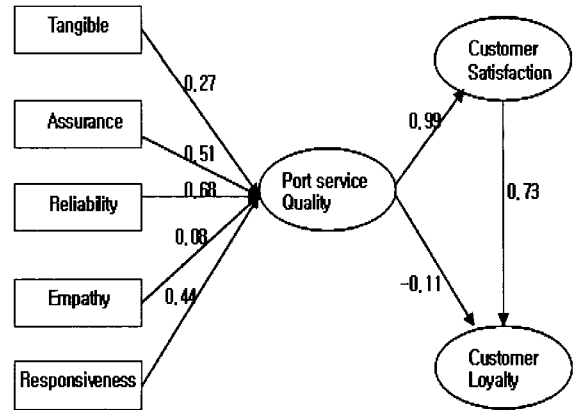

Fig. 2 The result of SEM analysis

The following table 6 summarizes the test results of hypotheses established in the previous chapter.

Table 6 The result of Hypothesis Paths

Hypothesis	Hypothesis path	Estimate (a)	S.E. (b)	t	P	Result
H1	Tangibles → Port Service Quality	0.266	0.092	2.310	0.021	Accepted
H2	Assurance → Port Service Quality	0.515	0.236	3.124	0.002	Accepted
H3	Reliability → Port Service Quality	0.684	0.180	3.925	***	Accepted
H4	Empathy → Port Service Quality	0.076	0.081	0.731	0.465	Rejected
H5	Responsiveness → Port Service Quality	0.437	0.166	2.888	0.004	Accepted
H6	Port Service Quality→ Customer Satisfaction	0.988	0.139	8.053	***	Accepted
H7	Customer Satisfaction → Customer Loyalty	0.727	2.873	0.222	0.824	Rejected
H8	Port Service Quality → Customer Loyalty	-0.108	3.278	-0.033	0.974	Rejected

(a) : Path coefficient, (b) : Standard error

*** : Significant level p<0.001

In regard to the path from tangibles to port service quality, the estimated path coefficient of 0.266 (t=2.310, p=0.021) showed significant difference so that the hypothesis 1 (H1), which tangibles perceived by customer is positively related to port service quality, was accepted. Hypothesis 2(H2), which assurance perceived by customer is positively related to port service quality, was also accepted with significant difference at the level of p<0.05 (t=3.124, p=0.002). From the results of hypothesis 3 (H3), reliability perceived by customer to port service quality showed statistically significant difference at the level of p<0.001 (t=3.925). In addition, hypothesis 5 (H5), which responsiveness perceived by customer is positively related

to port service quality, was also accepted (t=2.888, p=0.004).

On the contrary, hypothesis 4 (H4), which empathy perceived by customer is positively related to port service quality, was rejected (t=8.053, p=0.465) with low estimate value (0.676). Empathy defined as additional activities to enhance customer satisfaction includes incentive policy, CIQ process, ship repair service, bunker and water supply, etc. However, it seems that empathy as port service is currently not related to port service quality in comparison with the other service factors.

Hypothesis 6 (H6), which port service quality is positively related to customer satisfaction, was accepted with significant difference at the level of p<0.001 (t=8.053). On the other hand, hypothesis 7 (H7) and hypothesis 8 (H8) was rejected since significance level of H7 (t=0.222, p=0.824) and H8 (t=-0.033, p=0.974) do not meet the level of p<0.001 or p<0.05. Thus, it is inferred from this result that customer satisfaction and port service quality are not related to customer loyalty in terms of port service.

5. Conclusion

5.1 Research Findings and Implications

The purpose of this study is to find out causality of port service quality which affect customer satisfaction and loyalty. In this paper, we examined the impact of port service quality on customer satisfaction and customer loyalty based upon suggested research model. From 137 acceptable data from questionnaire survey responded by shipping companies calling to ports in Korea, we carried out factor analysis and Structural Equation Modeling using SPSS 15.0 and AMOS 7.0. We established 8 hypotheses based on SERVPERF in order to test correlation of 5 dimensions of port service, port service quality, customer satisfaction, and customer loyalty. From the result of the hypothesis testing, we accepted 6 hypotheses out of 8 with high Significance level and rejected 2 hypotheses.

From these results of data analysis, we found that reliability that means reliable and accurate ability to promise calling schedule of vessel is the most important factor for enhancing port service quality. Thus, in order to improve port service for customer, 24hrs/holiday cargo handling service, prompt dangerous cargo handling, and stable supply of workforce should be provided. In addition, results of data analysis showed that assurance and responsiveness also are important factors related to port service quality. Therefore, it implies that reliability of port key players including port authority and quick response to customers needs are important for improvement of customer

satisfaction.

In the meantime, from the data analysis we found significantly difference with results of previous studies. previous studies have presented relationship between port service and customer loyalty. However, surprisingly, our result showed that customer satisfaction and port service quality did not affect customer loyalty in spite of high effect of port service on customer satisfaction. In general, customer loyalty means repurchasing intentions through service satisfaction. That is, customer loyalty means re-calling of port intention. Therefore, our results implies that port service quality do not necessarily lead towards re-calling of port. And it indicates that shipping companies do not make decision or strategy only due to satisfaction of port service, in other words, they consider additional factors such as port rate, location, hinterland size, etc. For this reason, it is necessary to identify other factors (port charge, port location, hinterland, etc.) that affect customer loyalty when shipping companies choose ports. And in order to verify above relation, additional analysis and studies are needed.

5.2 Future Research

The limitation of this study and future research are as below.

First of all, the concepts of port service and port service quality are not clearly defined in spite of many attempts. In addition, question about validity of 5 dimensions which are applied to port industries still remains under the unidentified concept of port service. Therefore, future research about service quality, dimensions, and measurement variables for port industries are required basically.

In this study, we used SERVPERF (performance-based method) instead of SERVQUAL in order to focus on performance (perceived customer satisfaction) only. That is because expectation will not be able to be measured consistently due to the subjective characteristic of service quality. In other words, consumers may not distinguish the level of expectation measurement, and it is possible for consumers to give the good score for all the variables. However, as SERVPERF simply uses performance indicator, the limitation of structural causality may be occurred in the result of analysis.

And although the results of this study have different implications with other previous studies, to be general concepts, various case-based studies and additional verification are needed. These remain as an important issue for future research.

Acknowledgements

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