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An Empirical Research on Container Terminal Selection Criteria and the Relationship with Shipping Company's Satisfaction: the Case of Korea

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Abstract: As the supply of container terminal facility in the port of Busan is more than the demand of facility, terminal operators have worried about falling handling charge and tried to meet customer requirements for keeping loyalty to them.

This study aims to comprehend what characteristics of quality a shipping company considers important when selecting a port. This study has two goals. The first goal is to confirm select factors of container terminal, and the second one is to confirm the causality with the satisfaction of shipping companies based on the decided select factors. The methodologies used in the study are the principal component analysis used for reducing many variables into small numbers of factors as much as possible. When the results above are bundled by factor and grouped, they are grouped three factors ; the convenience of using container terminal, the amount of cargo and frequency of a call and the cost and the cargo handling speed.

JEL Classifications: M16, M21, M31

Keywords: Port Choice, Port Service Factor, Factor Analysis, Hypothesis, Port Competition

1. Introduction

As the container terminals capacity is increasing in the port of Busan, the operation company recently have experienced low profit or loss financially in line with the recession of shipping industry. Under the imbalance of demand and supply capacity, shipping company easily used to change the calling terminal for reducing port charge or enjoying better service quality.

This study deals with to find the select factors of container terminal and the relationship with

customer satisfaction. The studies regarding the select factors for container terminal have been conducted by many researchers, but each researcher proposes a different opinion respectively, giving confusion in defining a concept for this. Especially, the studies regarding the select factors for port have been progressed at the level of devising strategy by the local government and container port authority in other words, as the prerequisite for being equipped with requirements of transship hub port, which factors help inviting transship cargo has been studied with interests. Since these studies are purpose-oriented, there are points that the results of the studies cannot be objectively proved. This study conducted a survey targeting about 44 shipping companies that choose the Port of Busan as the port of call. The purposes that this study aims can be categorized into two. The first stage is to identify the select factors of container terminal, and the second one is to reveal the causal relationship between the customer satisfaction as dependent variables and the select factors as independent variables. The hypothesis is set as "H0: the select factors of container terminal would give positive influence to the satisfaction of shipping company". As a way to find main factors of port selection, we will use the method of the principal component analysis. In order to test the research hypothesis that is selected based on the research model,

We conducted a survey that targeted shipping companies, which are located in Busan and registered at the Korean Ship Owners Association and Korea Ship Managers' Association, regarding the select factors of container terminal that they recognized and satisfaction of the shipping companies. The methodologies used in the study are correlation coefficient between the revised items and the others, P-Value, irrotation factor analysis, calculation method of Cronbach's α, and rotation factorial analysis, as reliability tests among statistical techniques, using the transshipment port choice model. For the method of testing the hypothesis, the hypothesis testing method of regressive model was used. The first purpose of this study is to identify the service quality factor of ship supply, which customers regard as important. The second purpose is to investigate the relationship among quality factor, customer satisfaction and relationship orientation.

2. Literature Review

The study on the port selection has been discussed by many researchers in terms of finding port select factors or enhancing port competiveness, making port marketing strategy and increasing transshipment cargo etc.

Foster conducted the quality evaluation of port service for the first time. Based on the survey, Foster asserted that when a shipping company chose a port, frequency of service, facilities, and proximity were the important select factors. In the second study, Foster aimed to find the service that the shippers expected from a port and select factors. It showed that cost of the port was the most important and that the other elements of quality such as convenience around the port, frequency of call, availability of various equipment and service, speed of the custom's process or the freight, the period of free installation, safety, and reputation were less important. These two studies are evaluated to be ambiguous because different results were deduced from the same respondents.

Parasuraman, et al.(1985) identified 5 dimensions of service quality - tangibility, reliability, responsiveness, assurance, and empathy - through the different categories of service, such as repair and maintenance, banking, long distance telephone, securities and credit cards. They argue that these 5 dimensions include detailed variables and affect the perceived service quality. For example, tangibility includes physical facilities, equipment, and appearance of personnel. Reliability includes ability to perform the promised service dependably and accurately. Responsiveness includes willingness to help customers and provide prompt service. Assurance includes knowledge and courtesy of employees and their ability to inspire trust and confidence. Finally, empathy includes caring and individualized attention that the firm provides to its customers.

Murphy, et al. (1994) attempted multivariate analysis in order to find port select factors. The respondents who participated in the survey were the Port Authority, ocean shipping companies, international sea freight forwarders, large shippers, and small shippers, and it aimed to find the select factors that all of them had in mind. As a analysis result, it showed that sufficient amount of freight, cheap cost for loading and unloading, safety of the freight, sufficient facilities, serviceability of the time of loading and unloading, degree of providing information of the freight, degree of support for required loading and unloading, and capacity for handling special cargo were important factors.

Lee, et al. (1995) dealt with finding marketing strategy to improve container terminal competiveness in the port of Busan. In a study, they proposed main factors are the construction of a large terminal, the fair calculation of tariff, the improvement of port service, the privatization of terminal management, and the reinforcement of port marketing. Thus, not only domestic and international studies regarding improvement of port competiveness, but also many studies centering on the Port of Busan were conducted.

Bae (1999) proposed main factors to increase the volume of transshipment cargo at the Port of Busan. He suggested that the expansion of the facilities at the container terminal, expansion and modernization of equipment for loading and unloading at the container terminal, establishment of a system as a distribution hub port, establishment of the EDI system among terminals and ports, special treatment for terminal charges and extension of the allowed period of free installation, establishment of the strategy for inviting main shipping companies, reinforcement of port marketing, and hosting events regarding the port are important factors.

Kwon, et al.(1999) proposed main factors to enhance competitiveness of the Port of Busan Container Terminal. They suggested the main factors are the size of the facilities, fees for using the port facilities, hinterland transport facilities, and the management skill and business ability of the terminal manager as the strategic factors for improving the competitiveness of the Port of Busan.

In the analysis of the Port of Busan that considered strategies of building hub port, Yang (1999) proposed the expansion of port facilities at the level of the nation for the long-term, the methods for reduction of port distribution costs, enhancement of the quality of distribution service, and flexibility of management and operation for the short-term.

Yeo (2002) suggested main factors for improving competiveness of the port of Busan are the

quantity of goods transported, port facilities, position of port, and service quality. Especially, as a method for improving the competitiveness of port, he proposed the improvement of port facilities and service quality through investment by the nation's policy and effectiveness of management.

Jung, et al.(2002) suggested that the most important factors for inviting transshipment cargo in the strategy to invite transshipment cargo among competing ports in Northeast Asia were tariff and period of free time.

Ugboma, et al.(2004) investigated the quality of port service of the Port of Nigeria through a survey. He found out that there was a difference between the quality of the recognized port service and expected port quality and that, especially, the quality of the recognized port service was lower than the expected quality of the service. Also, it received high scores on responsiveness and tangibility among the quality factors of port service and low scores on empathy. Since this study has insufficient number of respondents, it has a problem in the SERVQUAL model applicability.

Ng (2006) asserted that, targeting the container ports in Northern Europe, shipping company considered the effectiveness of port, geographical location, and service quality more important than the cost of port. Also, Ng proposed that individual groups of port users showed different priority ranks for the importance of the select factors. This study's limit is that the reliability of the data is doubtful because the number of examples is insufficient. Besides this, this study points out the fact that the select factors for port depend on the qualitative factors such as reliability, proximity, frequency, security, and reputation and cost factors.

Panayides and So (2007) examined empirically the influence of relationship orientation in third-party logistics and its impact on logistics service quality and performance. The findings suggest that relational exchange can have a positive effect on logistics service quality and performance in third-party logistics.

Park, et al. (2005, 2009) studied the select factors of a port of call of transshipment cargo on the request from the Busan Port Authority. As a result of analysis, it pointed out the 'handing charges of the port' as the most important factor, and it showed that the second important factors were 'the capacity for loading and unloading of the dock,' 'berthing capacity,' and 'capacity of linkup transportation' in order, targeting these factors, Park used the multiple regression analysis based on the Logit Model and found the select factors of transshipment port of call. The basic model applied in this study was the Logit Model that is generally used for a port selecting model. As the factors that decided the amount of transshipment of the Port of Busan in the model, they deduced five explainable variables such as 'local quantity as attractiveness for selecting a port,' 'the paid amount of incentive,' 'deviation expenses of mother ship,' 'the total expenses of the mother ship and feeder container ship,' and 'the total quantity as the proxy parameters of service.'

Kolanovic, et al. (2008) intended to suggest qualitative elements for port service that were recognized while targeting the ports in Croatia. The purpose of the study was to bind various qualitative elements with a common factor and represent them in a small number. As a result of testing the hypothesis, reliability and port capacity were selected as qualitative elements for port service.

Saeed Naima (2009) investigated the collecting factor of container terminal in the case of Pakistan with factors of 19 attributes affecting the attractiveness of the container terminals in Parkistani port in her paper. Then the author conduct the regressive analysis with primary data and the result was shown that the cost and the service was the factors of selecting container terminal.

In summarizing the literature review, these studies are classified in Table 1 as follows:

Table 1. The summary of Literature Review

Researcher	Important Service Factor	Research Objective
Foster	Port Cost	Finding port select factors
Parasuraman, et al.	tangibility, reliability, responsiveness, assurance, and empathy	Finding main port service factors
Murphy, P.R. and Daley, J.M.	Sufficient amount of freight, cheap cost for loading and unloading, safety of the freight, sufficient facilities, serviceability of the time of loading and unloading, degree of providing information of the freight, degree of support for required loading and unloading, and capacity for handling special cargo	Finding port select factors
Lee Joo Kwan and Kwak Kyu Seok	The fair calculation of tariff, the improvement of port service, the privatization of terminal management, and the reinforcement of port marketing	Finding port marketing strategies for Enhancement of Container Terminal Competitiveness
Bae Byung Tae	The facility expansion, the modernization of equipment, a system for hub port, the EDI system among terminals and ports, special treatment for terminal charges and extension of the allowed period of free time, the strategy for inviting main shipping companies, reinforcement of port marketing, and hosting events regarding the port.	Fining main factors to increase the volume of transshipment cargo of the Port of Busan Container Terminal.
Kwon, Neung, Jung et al.	The size of facilities, the fees for using the port facilities, hinterland transport facilities, and the management skill and business ability	Finding main factors to enhance port competitiveness
Yeo	The quantity of goods transported, port facilities, position of port, and service quality	Finding main factors to enhance port competitiveness
Jeong, et al.	Tariff and period of free time	Finding main factors to increase the volume of transshipment cargo
Ugboma, et al.	Responsiveness and tangibility	Finding main port service factors
Ng	Effectiveness of port, geographical location, and service quality	Finding main port service factors

Park	Local quantity, the total expenses of the mother ship and feeder container ship	Fining main factors to increase the volume of transshipment cargo
Kolanovic	Reliability and port capacity	Finding main port service factors
Naima	the cost and the service	Finding main port service factors
Panayides and So	relational exchange can have a positive effect on logistics service quality and performance in third-party logistics	Finding main service factors in third-party logistics

3. Methodology

3.1 The Organization of the Survey

3.1 .1 Selection of sample and method of investigation

For the collection of necessary survey data for this study, we conducted a survey targeting the entire shipping companies located at the Port of Busan. The shipping companies, which were the survey target, were members of Korean Ship Owners Association and Korea Ship Managers' Association. Targeting the total number of forty four shipping companies that had business in the regions of Busan and Gyeongnam, where all of shipping companies in Korea have their branches, we distributed 120 surveys by visiting in person from 15 Dec 2011 and 16 Jan 2012, including the purpose of the investigation and the contents of asking for their cooperation. Even though there are total 44 shipping companies to use container terminal in Busan port, the reason why we distributed 120 survey questions, which is answered by three persons who are related to operation and planning job in each company in Busan port. Among the 120 surveys distributed to the shipping companies, 101 were collected, so the rate of collection was 84%. As the prior process of examination for the survey, we conducted a study of literature and interviews in person to confirm the survey's validity, intelligibility, and accuracy of the expression by visiting the executives and heads of the departments of the major shipping companies in Busan. We distributed the surveys that were revised and supplemented in this way by visiting the companies in person, centring on the region of Busan, collected them, and conducted an empirical analysis based on them.

3.1.2 The layout of the survey

In order to accomplish the purpose of this study, the questionnaire was written with fourteen questions for the selection factors of terminal and eleven questions for satisfaction factors of selecting terminal that can be categorized into facilities, cost, service factors, the amount of loading and unloading, and geographical location[1] according to the study result of Park. The detailed

1 According to the study result of Nam Kyu Park, the select factors for container terminal are composed of the amount of cargo, price, service, geographical location, and incentive. But, here, since incentive was dismissed in the hypothesis testing, it was not used, and service factor was

questions as selecting items are based on the precedent studies like Saeed Naima , Park, Bae, Byung Tae, Ugboma, C., Ogwude, I. C., Ugboma, O., and Nnadi, K, Foster, T, A., Jung, Tae Won, Kwak, Kyu Seok, Kim, Kwang Ik, et al, Kolanovic, I., Skenderovic, J. & Zenzerovic Z., Lee, Joo Kwan, Kwak, Kyu Seok, Kwon, Neung Jung, Kim, Sung Kyu, An, Ki Myung and Lee, Hyung Seok.

3.1.3 The method of analysis

For the present condition of the example group and demographical dispersion, frequency analysis was conducted with the collected data. And for testing reliability and validity of the measuring instrument, the process of validating the measuring instrument suggested by Nunnally was conducted. Lastly, multiple regression analysis was conducted in order to test this study's hypothesis about whether the select factors for terminal have influence on the satisfaction of the overall terminal selection. For all the data process of this study, SPSS 12.0 was used.

3.1.4. The result of analysis

3.1.5 Testing reliability and validity of measuring instrument

The sample data can be classified into position and department regarding 101 people described in Table 2.

Table 2. Characteristics of the sample data

	Classification	Number
Position	Employee	20
	Manager/Subsection Chief	7
	Deputy Section Chief/ Section Chief	40
	Deputy Department Head /Department Head	30
	Executive	4
Total		101

In this study, the process of validating a measuring instrument proposed by Nunnally was applied in order to test the reliability and validity of the measuring instrument. First, item analysis was conducted to remove questions that hinder or did not measure a construct through the score purification and test of uni-dimensionality; And next, with the remaining questions, the reliability test that the internal consistency reliability testing was by coefficient was conducted with the questions that were not eliminated, and the validity was tested through exploratory factor analysis.

3.1.6. Score purification

Score purification indicates the correlation between the true value and error value, and the range of error needs to be minimized for it to be a measure with reliability. It is necessary to conduct score purification first in order to secure the reliability of the measuring instrument. Since score purification is done based on the question model, in order to satisfy the basic supposition regarding this, it is to confirm the correlation between the revised questions, whose correlation is

classified into facility factor and quality factor.

between the questions for measuring a specific concept and the rest of the questions, and the entire questions. The correlation value is between -1 and 1, and if this value is low, it means the relevant question item shows abnormality compared to other items. Generally, if it is about 0.15, then it can be recommended, but empirically, it should be more than 0.25. Here, the correlation value between the facility factor and service quality factor was between 0.31~0.61, so no questions were removed, and since price, the amount of loading and unloading, and geographical location were measured by a single question, score purification was not conducted. In the item for terminal selection satisfaction, the correlation value of the SA8 and SA11 items was below 0.25, so they were removed, and nine items passed the reliability test.

3.1.7 Uni-dimensionality

After conducting the score purification, a single factor analysis of the irrotation method is conducted with the measuring questions, which have not been eliminated, and that the measuring questions are bundled by the one common factor per construct is confirmed. Therefore, it is deemed that unidimensionality is guaranteed when it comes up, constructed as a single factor as the result of factor analysis, and when it is not, it eliminates the one that is bundled as other factor.

For this, unidimensionality can be tested with the size of the loading, which is a factor for each variable, by conducting the single factor analysis of the irrotational method to the measuring questions per each construct. It is a factor analysis method that confirms whether it is extracted as a single factor by conducting a separate factor analysis after the measuring questions, which construct the factor, are reverted to each factor.

When looking at result, the irrotation factor loading showed to be more than 0.4, the general standard, so it could be concluded that the dimension of the measuring questions that construct each concept exists in unidimensionality. Also, as the basic supposition for factor analysis, each question within the identical factor must have individual correlation of a certain level. In order to test this supposition, the value of KMO (Kaiser-Meyer-Olkin measure of sampling adequacy) and the value of Bartlett’s Test of Sphericity can be examined. If the value of KMO is more than 0.7, it is considerably good, indicating that, as the analysis result of this study, the correlation between variable couples is well explained by the other variable.

Bartlett’s Test of Sphericity is to test the null hypothesis that ‘the population of relation matrix is unit,’ and if the null hypothesis is not dismissed, the factor analysis model cannot be used. As the result of this study, the result of Bartlett’s Test of Sphericity was shown to be significant, showing that ‘the population of relation matrix is not unit’. Testing reliability is the process of examining how much internal consistency reliability is shown among the questions of the measuring instrument, and here, the Cronbach's α coefficient is calculated. In the general standard, the reliability of the measuring instrument is guaranteed only when the value of α is more than 0.7, but in the case of newly developed question and in the case when the question is included, they often allow the lowest limit of 0.6. After the analysis of this study, the result showed to be 0.839 for the Cronbach's α coefficient in regards to the service quality 5 dimension and terminal selecting factor, except for the reliability, thus satisfying the general thresholds of 0.7.

3.1.8 Validity test

Testing validity is consisted of content validity and construct validity. Content validity, which subjectively evaluates the attribute or concept for measurement is measured properly, already considered the opinions of experts at the time of writing the survey questions, it was strived to be reflected the most. Construct validity is for confirming whether the abstract concept for measurement is properly measured by the measuring instrument in reality, and factor analysis is utilized. In other words, it evaluates whether the extracted factors can represent the concept that has been originally intended when the factory analysis regarding questions is conducted. This method establishes a factor with the ones that have high correlation among the questions, thus enabling mutual independence among the factors that are different from each other.

Therefore, in this study, the principal component analysis used for reducing many variables into small numbers of factors as much as possible, while decreasing the loss of information as much as possible, and the varimax, which is the method of orthogonal rotation that rotates while maintaining mutual independence of the factors, were applied in order to test the construct validity of the measuring instrument for service quality. As a result of the rotation factor analysis, it showed that eight final questions remained after excluding those questions whose factor loading was below 0.4 and that were overloaded.

When the results are bundled by factor and grouped, they are like the following table 3. The first factor is grouped as convenience of using container terminal; the second factor is grouped as the amount of loading and unloading and frequency of a call; the third factor is grouped as cost and the speed of loading and unloading. These factors are named as convenience factor, amount of loading and unloading factor, and cost factor.

Table 3. The result of extracting factors

Construct (Factor)	Questions	Factor Loadage	Eigenvalue	Accumulated Explained Variance	Cronbach alpha
Convenience	S4	0.948	2.592	32.396	0.804
	I4	0.948			
	I3	0.679			
	S1	0.492			
Amount of Loading and Unloading	S7	0.858	1.626	52.722	0.644
	V1	0.829			
Cost	C1	0.84	1.387	70.060	0.486
	S2	0.746			

The factor loadage was distributed between 0.492~0.948 in the convenience factor, and the reliability and amount of loading and unloading between 0.858~0.829, the cost and efficiency factors between 0.46~0.840, showing the favorable factor loadage. The eigenvalue was 2.592 for the convenience factor, 1.626 for the cargo demand factor, 1.387 for the cost factor, showing that it exceeded the standard value 1.

As a result of analyzing the factors of testing validity of measuring instruments in regards to the select factors of container terminal, it tested the construct validity as the questions that measured different concepts were bundled as unidimensional. Thus, the hypothesis test, which is the next stage, is conducted with the final questions whose reliability and validity were tested through the validity process of measuring instrument that Nunnally suggested. For testing hypothesis, the satisfaction of shipping companies and the select factors for container terminal, which were measured with multi-questions, use variables that summed the measuring questions, which composed each factor, averaged by each factor. As we mentioned, we organized 14 items with five criteria that are facility, price, service quality, the amount of loading and unloading containers and geographical location as survey purpose for finding container terminal select factors. The result of factor analysis shows that only three criteria with convenience, the amount of loading and unloading containers and cost are candidates for selecting container terminal.

Comparing the result to Ng, Park, Kolanovic and Saeed Naima study gives us a broad insights to understanding shipping company's behavior. Ng asserts shipping company considers the effectiveness of port, geographical location, and service quality more important than the cost of port. Park's asserted shipping company considers 'local quantity as attractiveness for selecting a port,' and 'the total expenses of the mother ship and feeder container ship' more important than the service, incentive or location of port. In Kolanovic study, reliability and port capacity were selected as qualitative elements for port service. Saeed Naima asserts the cost is the only factor for selection of port in the port of Pakistan. Although we identified the selecting criteria of container terminal, we do not have information of the relationship to shipping company's satisfaction. In next section, we will deal with hypothesis validity for identifying the relationship.

3.2 Testing Research Hypothesis 1

The purpose of this section is to test the hypothesis (Table 4) in regards to the causality between the service quality of container terminal supply business and the satisfaction of customers, which is the first hypothesis of this study, and testing three detailed hypotheses related to this.

Table 4. The contents of hypothesis

Hypothesis	Contents of Hypothesis
Hypothesis 1	The select factors of container terminal would give positive influence to the satisfaction of selecting container terminal.
Detailed Hypothesis 1-1	The convenience of container terminal would give positive influence to shipping companies' satisfaction of selecting container terminal.
Detailed Hypothesis 1-2	The amount of loading and unloading would give positive influence to shipping companies' satisfaction of selecting container terminal.
Detailed Hypothesis 1-3	The cost factor of container terminal would give positive influence to shipping companies' satisfaction of selecting container terminal.

The multiple-regression model for testing the research hypothesis takes convenience, the amount of loading and unloading, and cost, which are the service quality factors, as independent

variables, and composes the multiple regression equation with the customer satisfaction as the dependable variable and conducts the analysis. The testing model for customer satisfaction is specified as

Customer satisfaction in model 1: $=\beta 0+\beta 1X1+\beta 2X2+\beta 3X3+\varepsilon$
where X1 = convenience; X2 = amount of loading and unloading; X3 = cost, and parameters βi (i=0,1,2,3) are parameters (regression coefficients) to be estimated, and ε is the random residual.

3.2.1 The result of regression analysis

Regression analysis between the service quality and the customer satisfaction is shown in Table 5 below. The result shows 0.080 for the standardized coefficient of convenience, 0.456 for the standardized coefficient of the amount of loading and unloading, and 1.012 for the standardized coefficient of cost. It is shown that the coefficient of determination of the regression analysis is 0.3666, F value 5.015, and Durbin Watson value 2.113.

Table 5. The result of regression analysis

Model	Unstandardized Coefficient	Standard Error	Standardized Coefficient (β)	t value	P-Value	Multi-collinearity	
						Tolerance Limit	VIF
Constant	18.793	4.126		4.554	.000		
Convenience	.080	.170	.048	.468	.641	.830	1.204
Amount of Loading and Unloading	.456	.203	.223	2.245	.027	.905	1.105
Cost	1.012	.439	.230	2.302	.023	.893	1.119
R^2=0.366, F=5.015, Sig. = 0.003, D.W. =2.113							

3.2.2 Interpretation of the test results of the hypothesis

Prior to interpreting the results of the regression analysis of Table 5, it must be tested whether the residual of the regression analysis has the autocorrelation or not. In order to test the autocorrelation, Durbin Watson's d-statistic is used. The autocorrelation could be decided by obtaining criticality, dL, and du from Durbin Watson's statistical chart, and then comparing them with this test statistic. It is the method of adopting null hypothesis when the next statistic is included in du~4-du after establishing the null hypothesis as 'there is no autocorrelation.' The statistic of this study is 1.756, and since it converges to 2, it is seen that independence is supposed by Belsley, et al. The P-Value shows to be 0.3% when examining the F value from the regression analysis table of Table 5, so it is shown that the model is significant. And the R^2 value, which shows the goodness of fit in regards to the estimated regression model, is 0.366, so it could be known that the select factors of container terminal explains the shipping companies' satisfaction approximately 37% in general. When it is concretely examined, the P-value of convenience that shows the service of container terminal is 0.64, which is bigger than the criticality value of 0.1, so it could be known that it is not significant. On the contrary, for the container terminal with cheap cost and sufficient cargo amount from the position of shipping companies, the P-value is 0, which is very smaller than the

criticality value 0.1, so it is shown as significant. Therefore, the result can be deducted that, for the select factors of container terminal, only the quantity of goods transported and cost has influence on the satisfaction of shipping companies. When examining the standardized coefficient β in order to comprehend the relative importance within this satisfaction of shipping companies, it could be known that the cost factor is slightly higher than the factor of the amount of loading and unloading. Also, one of the important preconditions that applied to the regression analysis is that the independent variables must be independent, not closely interrelated. But if a very strong linear relation exists among the independent variables, considerable caution is required in the interpretation of the regression coefficient.

When an independent variable becomes a dependable variable of the remaining variables, then the problem of multicollinearity is raised. Especially, serious multicollinearity distorts the result of the regression analysis, so it becomes impossible to measure the independent effect of a particular independent variable on the dependable variable. In general, for the confirmation of multicollinearity, if the limit is below 0.1 or if the variance inflation factor (VIF) is more than 10, it is seen that multicollinearity exists, and especially, if condition index exceeds 30, it could be considered that multicollinearity is serious. When looking at Table 5, since the tolerance limit is more than 0.1 and the variance inflation factor is below 10, multicollinearity is not serious Regarding to the relationship with the satisfaction, when shipping company select container terminal, they are not satisfied with convenience factor if container terminal has the full capacity of equipment (I3) and on-dock facilities (I4), and capacity for loading and unloading of large lengthy cargo (S1), and convenience of container pick-up and delivery (S4). Except first hypothesis 1-1, what shipping company are satisfied with are two kinds of factors, i.e., cost factor and the volume of containers per ship. This result of study shows the same as the result of Park's previous study which is for finding the port select factors of transhipment containers in the port of Busan.

4. Concluding Remarks

When shipping company makes decision of calling container terminal, they has to consider several factors such as port cost, ship waiting ratio, service richness, the accuracy and convenience of the information technology, cargo owners desire, the volume of containers. Identifying the main component to select container terminal is critical issue for container terminal to keep customer loyalty in the mist of tough times finically. This study has two purposes. The first one is to confirm select factors of container terminal, and the second one is to confirm causality with satisfaction of shipping companies based on the decided select factors.

The hypothesis is set as "H0: the select factors of container terminal would give positive influence to the satisfaction of shipping company". As a way to find main factors of port selection, the factor analysis is used. As a result of validity test, convenience, the amount of loading and unloading, and cost among the select factors were chosen as the select factors, and it was confirmed that these factors generally influenced the shipping companies' satisfaction for container terminal. However, as a result of testing the hypothesis for subsections, convenience was rejected statistically,

and it was confirmed that only the amount of loading and unloading and cost were significant to the shipping companies' satisfaction for container terminal. Referring to convenience factor as the rejected hypothesis, although container terminal has the full capacity of equipment (I3) and on-dock facilities (I4), and capacity for loading and unloading of large lengthy cargo (S1), and convenience of container pick-up and delivery (S4), this factor does not impact the decision of container terminal by side of shipping company. If we reject the hypothesis regarding to the convenience factor, cost factor and the container volume factor are remains. This result of study shows the same as Park's previous study which is for finding the port select factors of transhipment containers in the port of Busan. This result will be used to make utility function or demand function which explains the relationship between utility and cost in terms container terminal.

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