Novel 3D model for prioritising the attributes of port service quality: cases involving major container ports in Asia

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Abstract: The evaluation of port service quality (PSQ) has become a critical issue in port management. However, previous studies neglect the difficulties in so doing by relying on the resources and capability available at the shipping companies. This study proposes and reports on the testing of a 3D model for prioritising PSQ attributes by introducing a novel dimension called 'goal difficulty' into the port service contributory improvement index. The index represents the composite satisfaction index derived from Kano's model and the standardised weight derived from IPA. The data for testing the proposed 3D model were collected from the managers of five major container ports in Asia. The test results were compared against those acquired using 2D methods (e.g., IPA), and managerial implications were drawn. The newly developed model is expected to help port managers allocate their limited resources efficiently in their prioritisation of PSQ improvement and in optimising port service user needs.

Keywords: port service quality; PSQ; importance-performance analysis; IPA; Kano's model; goal difficulty; GD; Asian container port.

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1 Introduction

Improving port service quality (PSQ) is a critical issue in port management (Marlow and Casaca, 2003). Several studies have contributed evaluations of port performance or PSQ (e.g., Foster, 1978, 1979; Willingale, 1981; Murphy et al., 1987; Notteboom, 1997; Robinson, 1998; López and Poole, 1998; Fleming and Baird, 1999; Fleming, 2000; Ha, 2003; Yeo, 2003; Cuadrado et al., 2004; Ugboma et al., 2004, 2007; Pantouvakis, 2006; Thantongpaiboon and Wasusri, 2008; Lee and Hu, 2012). Most studies have focused on exploring and prioritising PSQ attributes and measuring PSQ. These studies have also not scrutinised PSQ in detail from the viewpoint of container carriers by conducting a comparison among the major competing ports in Asia. However, Hu and Lee (2011) and Lee and Hu (2012) have applied Kano's model and importance-performance analysis (IPA), respectively, to evaluate the importance level of service attributes and port satisfaction by examining a case study of five major container ports in Asia.

Regarding research tools for analysing customer service requirements, the effectiveness of a 2D quality model proposed by Doctor Kano (i.e., Kano's model) has been widely validated (Löfgren and Witell, 2008). The model can classify service quality attributes under five categories based on the functional and dysfunctional conditions, and it can calculate the degree of satisfaction regarding the attributes (Kano et al., 1984; Matzler et al., 1996). The model has contributed to identifying the categories of service quality attributes, thus providing meaningful information on developing strategies for improving service quality (Löfgren and Witell, 2008). Moreover, IPA can be a useful tool for prioritising service quality attributes in a four-quadrant matrix. In summary, Kano's model and IPA have shown that managers can explore the competitive conditions their firms must address, confirming opportunities for improvement and indicating the firms' strategic direction (Martilla and James, 1977; Hawes and Rao, 1985; Sampson and Showalter, 1999; Myers, 2001; Yeo, 2003; Yang et al., 2011).

Although such studies on PSQ have applied IPA, Kano's model, and SERVQUAL, and they have empirically evaluated the perceived PSQ of port users correctly as well as having identified the priorities of PSQ, port managers could not improve the PSQ easily without considering the constraints of their available resources and capabilities. Both IPA and Kano's model involve a 2D approach, and hence, port managers cannot reach a comprehensive solution to make a decision because improving service quality conflicts with their resources and/or capabilities. In other words, to develop a suitable strategy, port managers must evaluate the perceived service quality of port users correctly, in addition to identifying the priority of service attributes to be subject to improvement under the limitations of the resources available as well as the capabilities. Previous studies have not addressed problems such as what actions managers can adopt with limited resources, the resources and/or capabilities available to managers, and the difficulty in improving all service quality attributes from a managerial perspective. These questions were the motivation for the current study, the objective of which was to develop a more comprehensive model.

Moreover, small-scale studies consider service quality improvement from the perspective of the resources available to port operators. Although port operators can evaluate and are knowledgeable regarding the perceptions of PSQ, and can identify the priorities of port service attributes that require improvement, they are limited in their available resources and capabilities. To fill the research gap, this paper introduces a novel dimension, called, 'goal difficulty' (GD) (Steer, 1976; Kenis, 1979), from the viewpoint of port managers. GD specifies the difficulty experienced by managers in attaining their goals. GD increases when a goal is extremely difficult to attain, even if managers invest time and material resources and exert strenuous effort (Dunbar, 1971; Kenis, 1979). Thus, GD can reflect the level of easiness for port managers in utilising their own resources for improving PSQ attributes.

Although IPA, Kano's model, and GD can provide information from different viewpoints, managers still cannot make a decision for prioritising PSQ attributes with three separate evaluation results. Thus, aggregating these three dimensions into one index is crucial. Therefore, this study proposes a 3D model for prioritising PSQ attributes through a combination of GD with the IPA and Kano's model. This 3D model integrates customer opinions regarding satisfaction and the importance of service attributes, in addition to the managers' viewpoints concerning whether they have sufficient resources and/or the ability to improve these attributes. This study reports on the testing of the proposed 3D model in five major container ports in Asia. The contribution of this study can enhance the validity and practicability of the 2D methodology to identify the priorities in improving PSQ in tandem with the practicability and feasibility of port managers, who have limited resources and time constraints for determining the priorities of service quality attributes for improvement.

2 Literature review

2.1 Kano's model

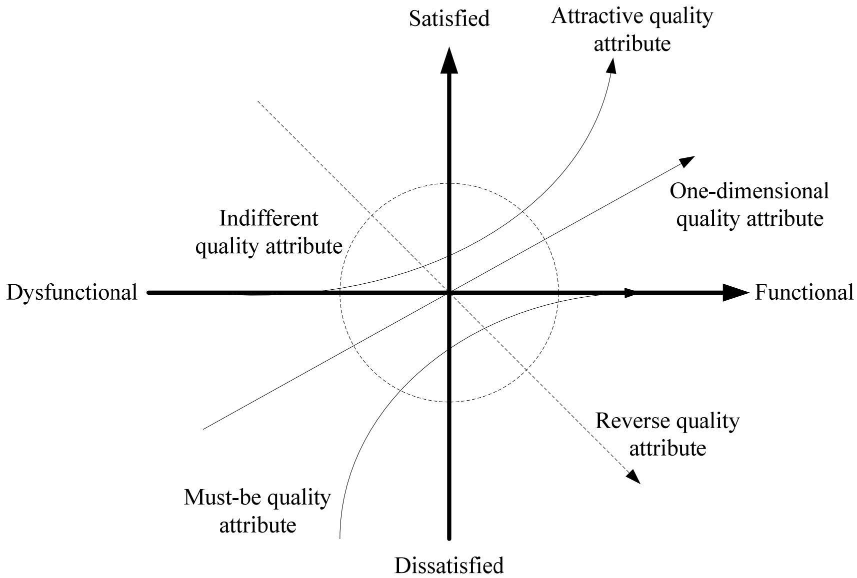
Because of Herzberg et al. (1959), Kano and Takahashi (1979) developed the concept of a 'two-dimensional quality'. Kano et al. (1984) considered the two dimensions of any quality attribute (i.e., the fulfilment of quality and customers' perception of satisfaction), which includes five categories of quality attributes with varying impacts on customer satisfaction and customer dissatisfaction depending on the degree of achievement (Kano et al., 1984; Löfgren and Witell, 2005; Yang, 2005). Many past studies have applied Kano's model for measuring customer satisfaction (Matzler et al., 1996, 2004b; Matzler and Hinterhuber, 1998; Tan et al., 2004; Wassenaar et al., 2005; Rivière et al., 2006; Chen and Chuang, 2008; Chen and Lee, 2006). According to the definition of Kano's model, service quality was divided into attractive quality elements (A), 1D quality elements (O), must-be quality elements (M), indifferent quality elements (I), and reverse quality elements (R) (Figure 1). For a definition of the five attributes, please refer to Kano et al. (1984) and Matzler et al. (1996). In addition to providing a conceptual basis for their theory, Kano et al. (1984) presented a methodology for the application of the theory.

Berger et al. (1993) introduced the customer satisfaction coefficient to analyse whether meeting a customer requirement can raise satisfaction or whether fulfilling this requirement merely prevents the customer from becoming dissatisfied. To calculate the average impact on satisfaction and dissatisfaction, Berger et al. (1993) offered two useful indices of the customer satisfaction coefficient: the satisfaction increment index (SII) and the dissatisfaction decrement index (DDI):

$$\text{Satisfaction increment index (SII)} = \frac{(A+O)}{(A+O+M+I)}$$

$$\text{Dissatisfaction decrement index (DDI)} = \frac{(O+M)}{(A+O+M+I)\times(-1)}$$

Figure 1 Kano's model and five categories of quality elements



Source: Kano et al. (1984)

These two customer satisfaction coefficients indicate the strength at which a product feature may influence satisfaction or, in the case of non-fulfilment, customer dissatisfaction (Matzler and Hinterhuber, 1998).

Certain studies have focused on improving Kano's model or combining it with other methodologies. Yang (2005) refined Kano's model by adding importance, and divided the original four categories into eight. Xu et al. (2008) proposed an analytical Kano model for analysing customer needs. Afterward, Yang et al. (2011) combined four methods, including Kano's model, the refined Kano model, the importance-satisfaction model, and the improvement index, to evaluate hotel service quality. Moreover, certain researchers have combined other methodologies with Kano's model, such as fuzzy theory or quality function deployment (Lee and Huang, 2008; Lee et al., 2008; Chen and Ko, 2008; Li et al., 2009). Despite several approaches having been proposed for improving Kano's model, it remains constrained to 2D application.

2.2 Importance-performance analysis

Martilla and James (1977) developed IPA by referring to customers' judgements of the importance of each attribute, and accordingly, a company's relative performance in each attribute. IPA can be used for exploring the prioritisation of attributes for improving service quality, but it can also promote service strategy development (Burns, 1986; Dolinsky and Caputo, 1991; Jemmasi et al., 1994; Matzler et al., 2004a; Slack, 1994; Sampson and Showalter, 1999; Yeo, 2003).

In other words, IPA uses the mean of both the importance and performance of each attribute as coordinates for plotting the attributes on a 2D matrix (Martilla and James, 1977). All of the attributes are plotted in the four quadrant boundaries of the IPA matrix: the top-left quadrant A is 'Concentrate here'; the bottom-left quadrant B is 'Lower priority'; the top-right quadrant C represents, 'Keep up the good work'; and the bottom-right quadrant D indicates, 'Possible overkill'. A manager should focus on the attributes in quadrant A, which shows the relatively higher sense of urgency for service improvement.

Numerous researchers have employed IPA in various service industries in marketing strategy analysis (e.g., Dolinsky and Caputo, 1991; Sampson and Showalter, 1999; Matzler et al., 2004b). In addition, certain other studies have focused on revising the application and form of IPA (Marlow and Casaca, 2003; Matzler et al., 2004a; Van Ryzin and Immerwahr, 2004). Lee and Hu (2012) assessed the PSQs of five major container ports in Asia. Although many researchers have extended the IPA model with negligent modifications in form, the basic framework has mostly remained unchanged (Sampson and Showalter, 1999; Sever, 2015). Moreover, studies have not considered the difficulties and the resources required by managers or companies having to improve the quality of prioritised service attributes. This paper aims to fill the research gap and proposes a 3D approach by combining Kano's model and IPA with an additional dimension (i.e., GD), which is addressed in the following.

2.3 Goal difficulty

Hanson (1966) indicated that a higher-level GD would lead to inefficiency. Goal-setting theory indicates that goals with varying levels of difficulty have different motivational effects (Hofstede, 1968; Locke, 1968). Steer (1976) and Kenis (1979) had developed this concept further through the notion of GD. GD specifies the degree of difficulty for managers in attaining their goals (Steer, 1976; Kenis, 1979). They have indicated that a difficult goal requires more effort, or necessitates higher-level technology and knowledge for achieving a specific objective.

High levels of GD occur when a goal is extremely difficult to attain, even if managers expend time and effort (Dunbar, 1971; Kenis, 1979), meaning that managers do not willingly accept a goal, but reject it mentally. Conversely, low levels of GD indicate that a goal can be achieved easily with less effort, and thus, managers are not required to allocate much effort to achieving their goal.

Researchers have long been interested in factors that affect the difficulty of goals resulting from a participative goal-setting process (Locke and Latham 2002). Although most studies on GD have been conducted in the management field, and have focused on the antecedents of GD or organisational performance, all of the results have shown GD to be a critical factor for managers when making a decision (Dewitte et al., 2003; Horvath et al., 2006; Lau, 2001; Latham et al., 2008; Moussa, 1996; Schmidt and Dolis, 2009; Schnake et al., 1984; Webb et al., 2010). Thus, employing GD to solve the priority issue for improving service quality attributes is a worthwhile task. In this paper, GD is defined as the degree of difficulty in improving a service quality attribute through limited resources and capabilities to fulfil a specific objective.

3 Development of the three-dimensional model

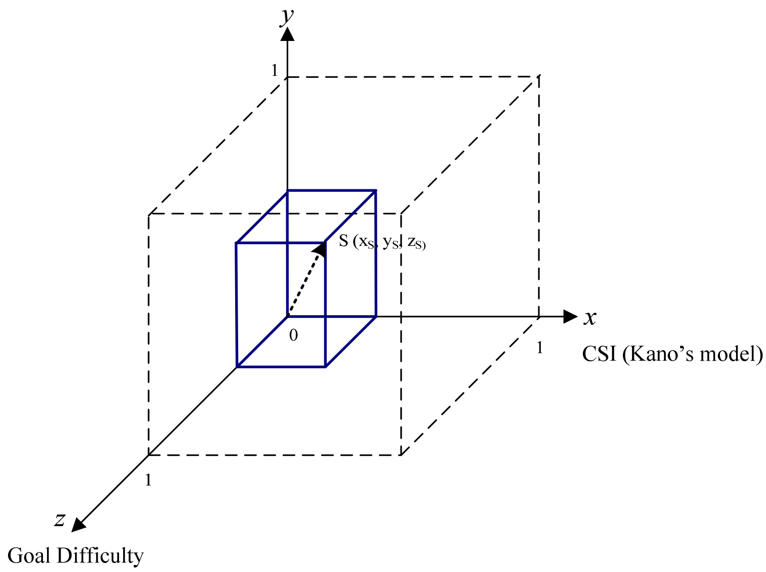
To evaluate and prioritise PSQ attributes, Hu and Lee (2011) developed a 2D matrix containing the satisfaction contribution index derived from Kano's model and the standardised weight (SW) derived from IPA (Figure 1). In their 2D matrix, the satisfaction contribution index is represented on the x-axis, whereas the SW is indicated on the y-axis. Although this 2D matrix can help port managers identify the service quality attributes that should be prioritised for improvement, from a practical and managerial viewpoint, the prioritised output of service quality cannot be implemented easily. Overall, they can neither have sufficient resources nor expand sufficiently in capacity to improve all service quality attributes simultaneously. This means that certain service quality attributes with a high improvement priority in the 2D matrix may not be improved under real-world conditions. Thus, it is neither practical nor feasible for them, even if their 2D matrix is useful for evaluating and prioritising service quality attributes. Because the availability of resources and managerial capability limit the actions of managers, it is critical that they strategically consider how to improve each service quality attribute from their managerial perspective.

Hanson (1966) indicated that a higher-level GD would lead to inefficiency. Steer (1976) and Kenis (1979) further developed the GD concept, and suggested that a difficult goal involves more effort, or that a higher level of technology and knowledge are required to achieve a specific objective. In this paper, GD is defined as the degree of difficulty for improving a service quality attribute through limited resources and capabilities in order to achieve a specific objective. Thus, employing GD to solve the issue of prioritising improvements to service quality attributes is a worthwhile pursuit.

For this study, a 3D model was developed which considers GD as the third dimension in the 2D matrix by Hu and Lee (2011). The framework of the 3D model is shown in Figure 2. In the model, each sum of the max value of all three axes is 1. The value of the composite satisfaction index (CSI) indicates how an attribute can increase satisfaction and reduce dissatisfaction. Thus, the attribute with a higher CSI should be prioritised for improvement. By contrast, a higher SW indicates that the attribute does not perform extremely well, but customers regard it with importance. GD is especially a reverse axis.

A lower value represents a higher level of difficulty, whereas a higher value represents less difficulty. This means that a higher value on the GD axis implies that it is not difficult for port managers to improve it. Thus, a higher-value attribute on the GD axis should be prioritised for improvement. The following are explanations regarding these three coordinates in the 3D model.

Figure 2 The three-dimensional model (see online version for colours)



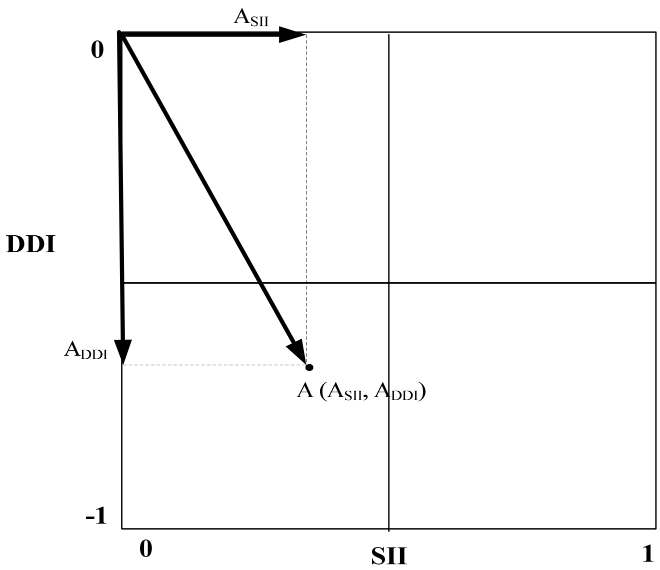
3.1 The x-axis: CSI

The x-axis represents CSI, which is calculated from Kano's model. According to Berger et al. (1993), an attribute contains both the effects of the SII and the DDI. Both of these indices show the contribution of an attribute toward any changes to satisfaction. The SII shows any increase in satisfaction, whereas the DDI shows the decrease in dissatisfaction. Therefore, the composite effect of these two indices can be considered the total change to satisfaction, which represents the contribution to satisfaction from a specific attribute. For this study, a vector concept was used to combine the SII and DDI based on customers' satisfaction coefficient matrix (Figure 3) proposed by Berger et al. (1993).

For example, an attribute A (A_{SII}, A_{DDI}) can be plotted in the satisfaction coefficient matrix, as shown in Figure 3. An attribute located in the top-left corner represents a minor influence in terms of both satisfaction and dissatisfaction. By contrast, an attribute located in the bottom-right corner represents a considerable influence on both satisfaction and dissatisfaction. Thus, the distance from point A to the original point can be regarded as the composite effect of the SII and DDI, which includes both increasing satisfaction and decreasing dissatisfaction. Vector analysis can easily be conducted for calculating this distance. Moreover, to present the relative merits among all of the quality attributes, normalisation should be performed. Because all of the scales of the SII and DDI are equal to 1, the maximum vector distance should be equal to $\sqrt{2}$. Thus, the number of the vector distance should be divided by $\sqrt{2}$, where the value of the CSI ranges from 0 to 1. The CSI can be expressed as follows.

$$\begin{aligned}\text{CSI} &= \sqrt{SII^2 + DDI^2} \Big/ \sqrt{2} \\ &= \sqrt{\left(\frac{(A+O)}{(A+O+M+I)}\right)^2 + \left(\frac{(O+M)}{(A+O+M+I)}\right)^2 \Big/ 2} \\ &= \sqrt{\frac{(A+O)^2 + (O+M)^2}{2(A+O+M+I)^2}}\end{aligned} \tag{1}$$

Figure 3 Customer satisfaction coefficient matrix



Source: Berger et al. (1993)

Therefore, the CSI shows how an attribute can contribute to improving total satisfaction (i.e., the sum of increasing satisfaction and decreasing dissatisfaction). A larger CSI for an attribute indicates a greater degree of influence that the attribute has on total satisfaction after undergoing quality improvement, irrespective of whether it is increasing satisfaction or reducing dissatisfaction, or both.

3.2 The y-axis: SW

The y-axis in the model indicates the SW, which was proposed by Wasserman (1993) based on IPA. The SW includes the satisfaction and importance results, and can indicate the improvement prioritisation based on the IPA results. The concept is valuable for calculating the SW, which contains the satisfaction and importance results, and can indicate the improvement priority based on the IPA results. The steps for calculating the SW in this paper are as follows:

1 Rank importance and satisfaction respectively from maximum to minimum.

2 Calculate the difference index which is equal to importance minus satisfaction.

3 Rank the difference index from maximum to minimum. If certain attributes have the same difference index, the attribute with a greater degree of satisfaction is assigned the higher rank. This ranking number is called priority weight (w_i), which represents the attribute with a larger value of difference index ranking before undergoing improvement.

4 Calculate the SW (sw_i) by normalising the priority weight. The equation is sw_i / w_i max(w_i).

A higher SW value indicates that an attribute does not perform extremely well, but that customers regard it with importance. Thus, attributes with a high SW should be the first to undergo improvements.

3.3 The z-axis: GD

The *z*-axis in the model indicates GD, which was integrated into the 3D model. According to Kenix (1979) and revised by Hirst and Lowy (1990), the measurement of GD is designed in such a manner that 'it is easy to achieve the objective for this service quality attribute' (coded as '*z*').

Specifically, GD is on a reverse axis; a lower value represents greater difficulty, whereas a higher value represents less difficulty. This means that a higher value of the GD axis implies that port managers would not find it difficult to improve the attribute in question. Thus, an attribute with a higher value on the GD axis should be prioritised for improvement. Each attribute is subject to a question rated on a five-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). To maintain consistency with the range of the other two dimensions, normalisation is performed by dividing each number by the maximum value of all of the other numbers. Therefore, the GD index for an attribute i can be expressed as follows.

$$GD_i = \frac{z_i}{\max\left(z_j\right)}$$

where $j = 1 \ldots J$, J = number of attributes, and $0 \leq GD_i \leq 1$.

3.4 Combination of three axes

To prioritise the service quality attributes for improvement, the 3D model should be integrated into a comprehensive index, called 'Alliance Index' (AI), representing the three merged dimensions.

An example is presented here to explain the equation formulation of the AI. As shown in Figure 2, point *S* represents three relationships of one attribute, the CSI of which is x_S, the SW of which is y_S, and the GD of which is z_S. The volume of the cube with solid lines expresses the level of attribute S performed in the CSI, SW, and GD. The total volume of the cube with dotted lines in Figure 3 is 1 × 1 × 1 = 1. The improvement ranking of attribute *S* thus becomes consistent with the ratio of the volume of the cube with solid lines to that of the cube with dotted lines. The AI can be expressed as follows:

$$\text{Alliance index of S} = \frac{x_S \cdot y_S \cdot z_S}{x_{\max} \cdot y_{\max} \cdot z_{\max}} = \frac{x_S \cdot y_S \cdot z_S}{1 \cdot 1 \cdot 1} = x_S \cdot y_S \cdot z_S$$

Because $x_S = CSI_S$, $y_S = sw_S$, and $z_S = GD_S$, this equation can be rewritten as

$$\text{Alliance index of S} = CSI_S \cdot sw_S \cdot GD_S$$

Thus, the AI is equal to multiplying the CSI from Kano's model by the SW and GD. The attribute with a higher AI has more correspondence, with more contributions to satisfaction and customer demand, and thus, it is relatively easier to improve with limited resources and capabilities. Moreover, the AI ranges from 0 to 1 because all three indices are normalised.

4 Method

4.1 Questionnaire design

Traditionally, ports have made use of quantitative measures to assess their performance (Marlow and Casaca, 2003). Foster (1978) indicated that shippers are swayed by service frequency and quality, convenience, and habit. The objective of his second survey was to determine what shippers want most in a port, and how they chose the ports (Foster, 1979). López and Poole (1998) reported that the quality dimensions of port commercial services should include efficiency (costs and benefits), timeliness (punctuality), and security (trust). After reviewing several studies on PSQ (Foster, 1978, 1979; Willingale, 1981; Murphy et al., 1987; Notteboom, 1997; Robinson, 1998; Fleming and Baird, 1999; Fleming, 2000), Ha (2003) found that most studies appeared to have focused more on the physical infrastructure of the port (e.g., facility, availability, and terminal size) before they shifted their attention to pricing.

Pantouvakis (2006) examined the quality dimensions of ports in the provision of services to passengers who use the port and its services for coastal shipping. His findings revealed six factors, including service, safety and security, cleanliness, communication, guidance, and information, which effectively comprise the multidimensional construct of PSQ. Ugboma et al. (2004) applied SERVQUAL measures on two ports in Nigeria, and acknowledged that 'responsiveness' and 'tangibles' are evaluated more positively compared with 'empathy' in ports. Ugboma et al. (2007) then applied the customer satisfaction index to measure port users' level of satisfaction for the same ports. By contrast, Thantongpaiboon and Wasusri (2008) measured the service quality of ocean transport services by applying SERVQUAL and the Gap model, and concluded that shipping lines' most preferable service quality attribute was 'assurance and responsiveness', followed by 'reliability and empathy', whereas perception towards tangibility was ranked lowest.

To test the proposed 3D model, the PSQ attributes were generated by referring to previous studies including Ugboma et al. (2004, 2007), Ha (2003), and Lee and Hu (2012). The 19 PSQ attributes were identified within the five SERVQUAL dimensions (Table 1). Before a formal survey was conducted for this study, a preliminary trial of the questionnaire was performed to modify any ambiguous or misleading items, and it involved three experts in this area and six managers of shipping lines.

Table 1 Attributes of port service quality

Dimensions	*Items*	
Tangibles	1	Port location and network
	2	Cargo handling facilities
	3	Port congestion
Reliability	4	On-dock operation
	5	Ready information system (e.g., port MIS, EDI)
Responsiveness	6	The harmonised and integrated system among Customs Office, Port Authority and Quarantine Office
	7	Container cargo security procedures
	8	Good communication system with port users
	9	Reply to port user's opinions and requirements
	10	Settlement of accident claims
	11	Pricing negotiation and administrative process
	12	Satisfaction survey
Assurance	13	Service promises
	14	Port personnel's skills and knowledge
	15	Increase value-added of a port user
	16	Do not have bureaucratic aspect in dealing with cargo claims and a port user's needs
	17	Trustworthy and reliable services of employees
Empathy	18	User oriented policy and reviews it timely responding to market changes
	19	Employees understand user's specific needs

The questionnaire contains two parts (i.e., for port users and for port managers). The first part was designed to investigate Kano's scale, including the functional and dysfunctional forms of attributes. The respondents were asked to choose among one of five options: 'I like it that way', 'I am expecting it to be that way', 'I am neutral', 'I can accept that it is that way', and 'I dislike it that way'. The second part concerns attribute satisfaction. A five-point Likert scale was used to evaluate the satisfaction of port services from the viewpoint of port users, ranging from 1 (*very unsatisfied*) to 5 (*very satisfied*). Moreover, one question on total satisfaction was also included to calculate the implicitly derived importance which was calculated based on the three steps proposed by Deng (2007) by conducting partial correlation analysis for each attribute performance with total satisfaction. However, Deng's method cannot be used to obtain a fixed range of importance because of the characteristics of multivariate correlation, which might introduce uncertainty to the axis of the IPA matrix. Therefore, the implicitly derived importance was also been normalised.

In the second part of the questionnaire (i.e., targeting port managers), GD was investigated by asking port managers the level of difficulty concerning improving a PSQ attribute with the resources available at their company as well as their capabilities. A five-point Likert scale was used ranging from 1 (*very difficult*) to 5 (*very easy*), which is a reverse scale.

4.2 Data collection

To test the 3D model, five major container ports in Asia (i.e., Singapore, Shanghai, Hong Kong, Busan, and Kaohsiung) were used as case studies because Asia has become the most crucial continent for global container ports, according to an UNCTAD (2010) report. Because the 3D model considers the viewpoints of both port users and managers, data collection had to be conducted separately for port users and managers.

The port user data were collected through a questionnaire survey for the relevant employees involved with these five container ports. To obtain comprehensive results, the questionnaires were distributed to 18 major shipping lines calling in to these five ports; they were APM-Maersk, Mediterranean Shg Co, CMA CGM Group, Evergreen Line, Hapag-Lloyd, COSCO Container Line, APL, CSCL, NYK, Hanjin, MOL, OOCL, K Line, Yang Ming Line, CSAV Group, Hyundai M.M, Pacific International Line, and Wan Hai Lines. To maintain the sample size and avoid preference bias from a single responder in each company, three copies of the questionnaire were distributed to three managers in each company. In total, 54 (18 × 3) questionnaires were distributed to managers responsible for direct management or contacting the five ports. Of the 30 questionnaires returned, 25 were valid, yielding a valid response rate of 46.3% (25/54). Moreover, these questionnaires were received from 15 companies from among the 18 companies, meaning that our received questionnaires potentially covered most of the opinions of these shipping lines. Cronbach's α was used to analyse the reliability of all the items. Cronbach's α of the functional and dysfunctional forms of attributes and satisfaction were 0.713, 0.825, and 0.847, respectively, meaning that the data used for this study achieved acceptable reliability.

The questionnaire was distributed to high-level managers responsible for port development planning or operational management at the five ports so that we can obtain accurate results for GD. The number of respondents was 19. The average period of their job experience spanned 15.9 years. Cronbach's α was 0.879, showing high data reliability.

5 Results

5.1 Composite satisfaction index

For this study, the CSI was employed to analyse how an attribute can contribute to improving total satisfaction. The CSI was calculated from the SII and DDI by employing equation (1). The CSI results are listed under the fourth column in Table 2. The 'cargo-handling facilities (1)' attribute made the largest contribution to satisfaction, with its CSI value of 0.88 being the highest among the 19 attributes. The second highest attribute was 'port location (2)', meaning that cargo-handling facilities and the port location can have the greater effect on increasing satisfaction and reduce dissatisfaction than other attributes. Although it is difficult for an existing port to modify its location or enhance cargo-handling facilities immediately, these results suggest that port authorities or managers should focus on planning or designing a future port.

Table 2 The comprehensive results

Items	*SII*	*DDI*	*CSI*	*Implicitly derived importance*	*Singapore*					*Shanghai*					*Hong Kong*					*Busan*					*Kaohsiung*				
					SAT	*sw*	*GD*	*AI*	*AI rank*	*SAT*	*sw*	*GD*	*AI*	*AI rank*	*SAT*	*sw*	*GD*	*AI*	*AI rank*	*SAT*	*sw*	*GD*	*AI*	*AI rank*	*SAT*	*sw*	*GD*	*AI*	*AI rank*
1	0.80	–0.96	0.88	0.45	4.76	0.26	0.92	0.21	11	4.44	0.11	0.61	0.06	17	4.32	0.42	0.71	0.26	9	4.20	0.26	1.00	0.23	9	3.92	0.32	0.75	0.21	10
2	0.84	–0.68	0.76	1.00	4.92	0.53	0.50	0.20	13	3.84	0.84	0.33	0.21	10	4.44	0.58	0.43	0.19	13	3.60	0.95	0.54	0.39	5	3.64	0.95	0.58	*0.42*	1
3	0.80	–0.60	0.71	0.53	3.24	0.95	0.50	0.34	4	3.28	0.90	0.52	0.33	2	3.28	0.95	0.43	0.29	7	3.92	0.58	0.69	0.29	7	3.88	0.63	0.83	0.37	4
4	0.56	–0.80	0.69	0.18	4.44	0.32	0.67	0.15	15	4.16	0.05	0.61	0.02	19	4.12	0.32	0.86	0.19	12	3.88	0.37	0.85	0.22	11	3.84	0.26	0.67	0.12	15
5	0.52	–0.56	0.54	0.40	4.64	0.21	0.75	0.09	16	3.92	0.37	0.94	0.19	11	4.60	0.16	0.86	0.07	17	4.12	0.32	0.85	0.15	15	3.88	0.42	0.75	0.17	13
6	0.60	–0.60	0.60	0.29	4.60	0.11	0.50	0.03	18	3.96	0.16	0.55	0.05	18	4.52	0.21	0.71	0.09	16	4.20	0.16	0.54	0.05	18	3.84	0.53	0.58	0.19	12
7	0.44	–0.56	0.50	0.59	4.52	0.74	0.83	0.31	6	4.04	0.58	0.76	0.22	9	4.32	0.74	1.00	0.37	4	4.24	0.47	0.69	0.16	13	4.16	0.37	0.92	0.17	14
8	0.56	–0.68	0.62	0.54	4.56	0.58	0.92	0.33	5	4.00	0.53	0.73	0.24	8	4.40	0.53	1.00	0.33	5	4.04	0.53	0.69	0.23	10	4.00	0.47	0.83	0.24	9
9	0.40	–0.84	0.66	0.04	4.32	0.37	0.83	0.20	12	3.60	0.32	0.88	0.19	12	4.04	0.26	0.71	0.12	15	3.76	0.21	0.85	0.12	16	3.88	0.16	0.83	0.09	16
10	0.48	–0.64	0.57	0.59	4.00	0.90	0.67	0.34	3	3.28	0.95	0.61	0.33	3	3.84	0.90	0.86	*0.44*	1	3.60	0.90	0.85	0.43	2	3.64	0.90	0.75	0.38	3
11	0.56	–0.60	0.58	0.20	3.80	0.63	0.83	0.30	7	3.32	0.68	0.88	*0.35*	1	3.36	0.68	0.71	0.28	8	3.40	0.74	0.85	0.36	6	3.36	0.74	0.75	0.32	5
12	0.20	–0.20	0.20	0.97	3.36	1.00	1.00	0.20	14	2.92	1.00	0.61	0.12	16	3.40	1.00	0.86	0.17	14	3.16	1.00	1.00	0.20	12	3.08	1.00	1.00	0.20	11
13	0.52	–0.88	0.72	0.47	4.36	0.79	0.75	*0.43*	1	3.88	0.63	0.70	0.32	4	4.16	0.63	0.71	0.32	6	3.76	0.79	0.77	*0.44*	1	3.88	0.68	0.58	0.29	6
14	0.52	–0.76	0.65	0.08	4.40	0.16	0.75	0.08	17	3.72	0.26	1.00	0.17	14	4.32	0.11	0.86	0.06	18	4.00	0.05	0.85	0.03	19	3.92	0.11	0.67	0.05	18
15	0.52	–0.68	0.61	0.16	4.24	0.47	0.75	0.22	10	3.64	0.42	0.67	0.17	13	4.04	0.37	0.86	0.19	11	3.88	0.42	0.62	0.16	14	3.60	0.58	0.75	0.27	7
16	0.80	–0.56	0.69	0.26	2.88	0.84	0.67	0.39	2	2.60	0.79	0.52	0.28	6	2.64	0.84	0.71	0.41	3	2.52	0.84	0.69	0.40	4	2.68	0.84	0.67	0.39	2
17	0.60	–0.84	0.73	0.15	4.56	0.05	0.83	0.03	19	3.84	0.21	0.85	0.13	15	4.60	0.05	0.86	0.03	19	4.04	0.11	0.85	0.07	17	4.08	0.05	0.58	0.02	19
18	0.56	–0.72	0.64	0.43	4.36	0.68	0.58	0.25	9	3.72	0.74	0.64	0.30	5	4.04	0.79	0.86	0.43	2	3.80	0.63	0.69	0.28	8	3.80	0.79	0.50	0.25	8
19	0.68	–0.72	0.70	0.31	4.52	0.42	0.92	0.27	8	3.88	0.47	0.82	0.27	7	4.32	0.47	0.71	0.24	10	3.76	0.68	0.85	0.40	3	4.08	0.21	0.58	0.09	17
Average	---	---	---	---	4.24	0.53	0.75	---	---	3.69	0.53	0.70	---	---	4.04	0.53	0.77	---	---	3.78	0.53	0.77	---	---	3.75	0.53	0.71	---	---

Notes: 1 SAT represents satisfaction; sw represents standardised weight; GD represents goal difficulty; AI represents alliance index.
2 Ital means that the attribute has the highest AI value among others for each port.

By contrast, the 'port users' satisfaction survey (12)' attribute contributed less to satisfaction. This result supports the past finding obtained from Kano's model indicating that this attribute is an 'indifferent attribute' (Hu and Lee, 2011.), meaning that it can neither increase satisfaction nor reduce it.

The CSI results can provide information on port users' demand and the attributes' overall influence on satisfaction. The following subsection presents an evaluation of the five ports on the importance and satisfaction of port service attributes.

5.2 Standardised weight

Table 2 lists the implicitly derived importance and satisfaction values for each port. The two most crucial attributes were 'port location (2)' and 'port users' satisfaction survey (12)'. The results of satisfaction (SAT) for these five ports are listed separately in Table 2. The average SAT of the Singapore port was 4.24, which was the most satisfactory port among the five ports. By contrast, the Shanghai (SAT = 3.69) port had a lower degree of satisfaction compared with the other ports.

According to Wasserman (1993), SW is calculated using the importance and satisfaction values. For all five ports, 'port users' satisfaction survey (12)' still had the highest SW value, and should thus be prioritised for improvement. However, the attribute with the second highest SW value differed among the ports. For the Singapore, Shanghai, and Hong Kong ports, the attribute with the second highest SW value was 'port congestion (3)', whereas for the Busan and Kaohsiung ports, 'port location (2)' had the second highest SW value. Because these attributes had higher importance and lower satisfaction values, managers must focus on how to improve them.

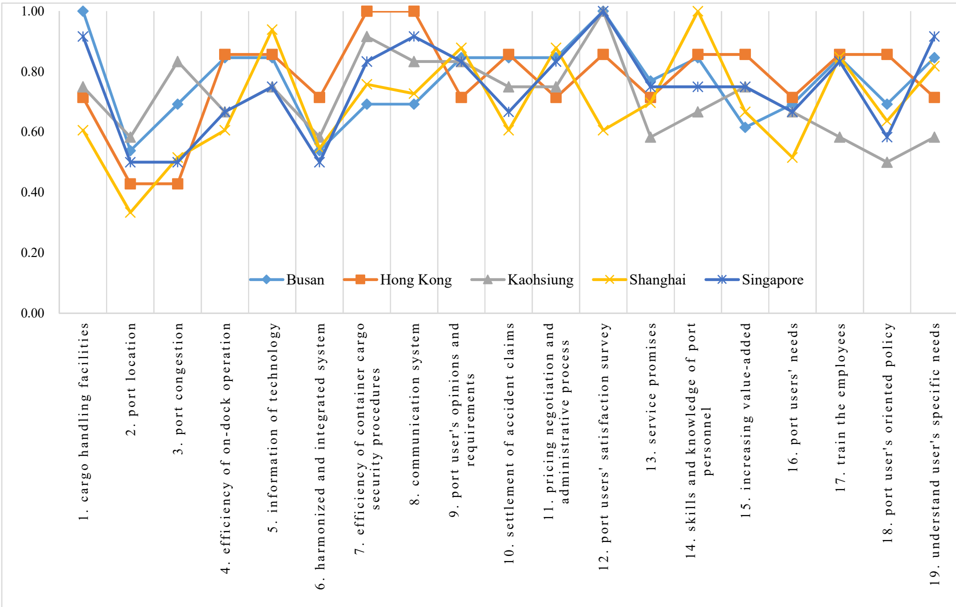
Although the SW value can distinguish between attributes in terms of improvement priority, port managers may find it difficult to take action because of resource limitations and/or capability issues. Thus, the following subsection presents an analysis of GD from the perspective of port managers.

5.3 Goal difficulty

Table 2 lists the GD values separately for all five ports. In this study, a higher value indicated that port managers could improve an attribute more easily because they believed they had more resources and/or capabilities. Thus, attributes with a higher GD value can be improved earlier than attributes with a lower GD value. The GD values of the five ports are plotted in Figure 4.

Overall, 'port location (2)' had the lowest GD value, meaning that port managers believed that it was challenging to improve. Although according to the SW value the port's location and land network should be prioritised for improvement for the Busan and Kaohsiung ports, changing the port infrastructure within a brief period is difficult for port managers. The results of the previous IPA may show the impracticability of such a suggestion. Thus, introducing GD in the questionnaire survey from the viewpoint of port managers can help managers identify the attributes that can be improved in practice. Moreover, 'port congestion (3)' and 'harmonised and integrated system (6)' had a lower GD value compared with the other attributes for most of the ports. Each port also has a respective focus. For attributes that are difficult to improve, for the Singapore port, it was 'port user's oriented policy (18)'; for Shanghai, it was 'port users' needs (16)'; For Kaohsiung, they were 'service promise (13)', 'train the employees (17)', 'port user's oriented policy (18)', and 'understand user's specific needs (19)'. For Hong Kong and Busan, all of the attributes, except for (2) and (3), had a high GD value.

Figure 4 Goal difficulty of five ports (see online version for colours)



Each port had various attributes with a high GD value that could be prioritised for improvement. The managers of the Singapore port believed that conducting a port user satisfaction survey (12) was easier compared with what was required of the other attributes. By contrast, those of the Shanghai port indicated that training the skills and enhancing the knowledge of port personnel was substantially easier for them. The managers of the Hong Kong port indicated that they could enhance the efficiency of container cargo security procedures (7) and the communication system (8) with ease. By contrast, the managers of the Busan port reported that improving cargo-handling facilities (1) and conducting a port user satisfaction survey (12) were easy tasks. The managers of the Kaohsiung port also stated that conducting a port user satisfaction survey (12) is easier compared with what was required for improving the other attributes. The following details the application of AI for integrating GD into Kano's model and IPA to obtain a complete analysis in prioritising PSQ attributes.

5.4 Alliance index

To integrate the 3D results of Kano's model, IPA, and GD, the proposed AI was employed to analyse the improvement prioritisation of port service attributes. The value of the AI represents each attribute's contribution towards satisfaction, managers' limitations, and its improvement priority. The results of the AI are listed in Table 2, and are also plotted in Figures 5 to 9.

Figure 5 Top five AIs in Singapore port

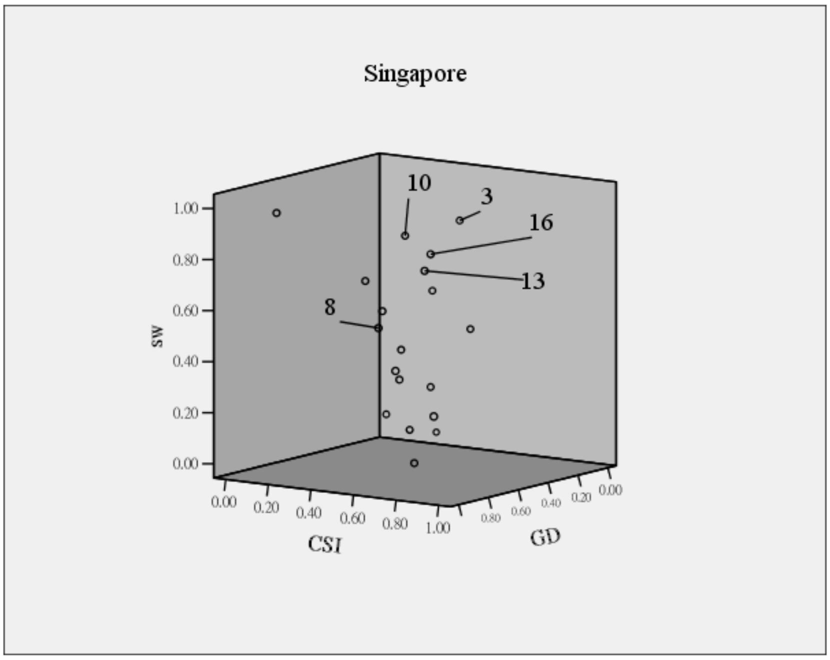


Figure 6 Top five AIs in Shanghai port

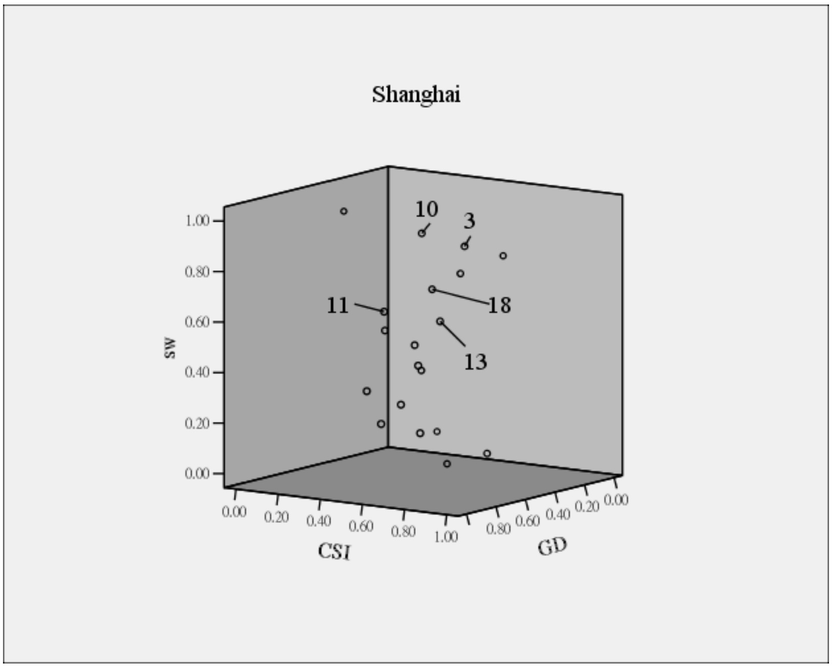


Figure 7 Top five AIs in Hong Kong port

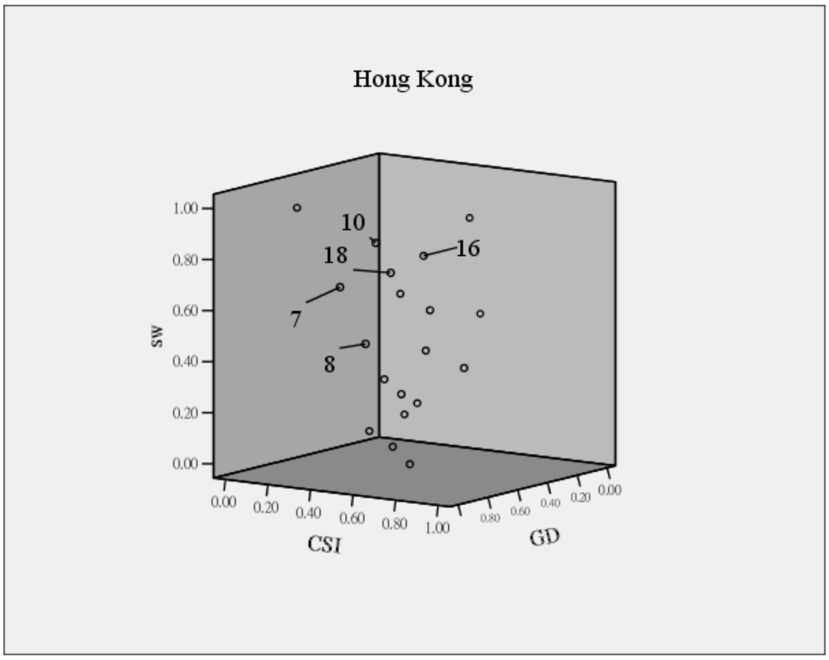


Figure 8 Top five AIs in Busan port

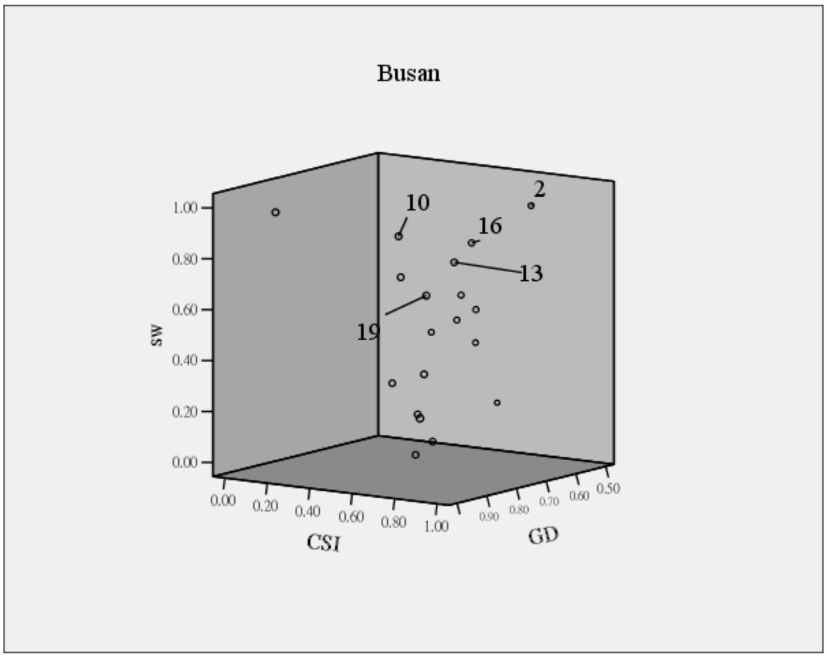
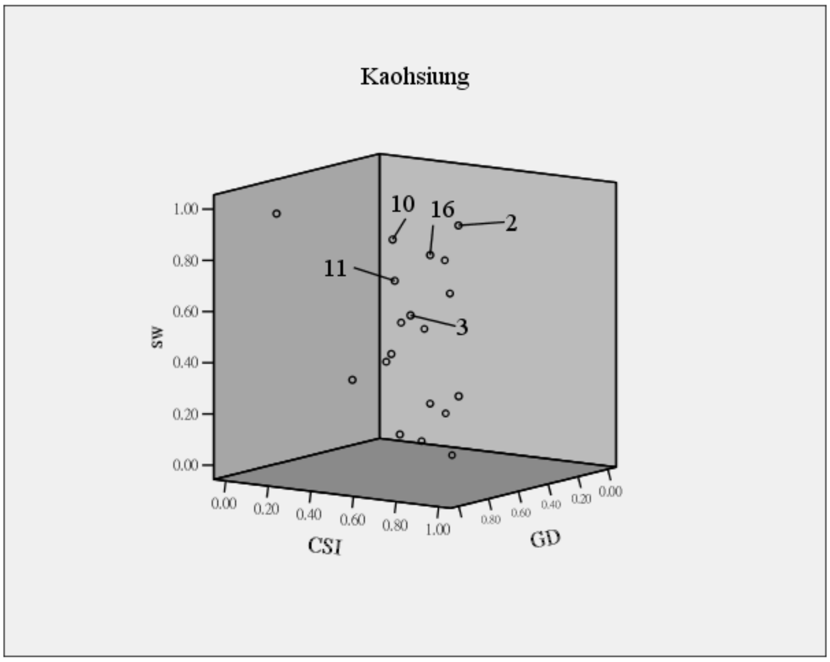


Figure 9 Top five AIs in Kaohsiung port



Figures 5 to 9 show that the five ports had one common attribute that could undergo instant improvement, which was 'settlement of accident claims (10)'. The main reason is that this attribute had an extremely high SW value (> 0.9) for all of the ports, and its GD value was also high for most of the ports. Although this attribute cannot increase satisfaction to a considerable extent (CSI = 0.57), it had a relatively high importance, with a decent degree of satisfaction and a relatively low GD. Thus, improving the settlement amicability of accident claims had a high improvement priority.

Furthermore, three attributes could be improved for at least three of the ports: 'port congestion (3)', 'service promises (13)', and 'port users' needs (16)'. For the Singapore, Shanghai, and Hong Kong ports, the 'port congestion (3)' attribute had a high CSI value and a high SW value. Although this attribute cannot be improved easily (GD < 0.5), the result implied that reducing port congestion can increase satisfaction. Thus, these three ports should increase their focus on how to manage port congestion.

For the Singapore, Shanghai, and Busan ports, the 'service promises (13)' attribute also had a high AI value because it had high CSI, SW, and GD values. The managers of these three ports believed that fulfilling the service promises at the time of the interview was considerably easier than improving the other attributes. Thus, this attribute can be improved beforehand. Moreover, the 'port users' needs (16)' attribute also had a higher priority for improvement for the Singapore, Hong Kong, and Kaohsiung ports, and it also had high SW and GD values for all three ports. Therefore, managing cargo claims and port users' needs efficiently can help managers enhance user satisfaction without expending too much effort.

6 Conclusions and discussion

PSQ improvement should be focused on port users' needs and consider the limited resources and capabilities of the port managers. For this paper, a 3D model was constructed, and the AI was developed by combining Kano's model, IPA, and GD to prioritise port service attributes and concurrently measure the level of difficulty in improving them by referring to the resources available at a port manager's company as well as its capabilities. Therefore, unlike 2D approaches such as IPA, this 3D model can provide more practicable, feasible, and managerial information, and can help managers allocate resources efficiently in prioritising service quality improvement, and in optimising service users' needs and service providers' constraints. The results revealed that this method could be used for identifying PSQ to generate satisfaction which is critical to container shipping lines.

The advantages of this 3D model that was devised by integrating Kano's model, IPA, and GD are threefold. First, it can enhance the validity and practicability of the 2D methodology in identifying PSQ improvement prioritisation in tandem with the practicability and feasibility of port managers, who have limited resources and time constraints for ensuring that the service quality attributes are improved correctly. Second, another advantage is the concrete questionnaire design. As mentioned, the questionnaires for Kano's model and IPA were designed to investigate port users' needs, and did not consider the feasibility, practicability, and capabilities of port service providers. The proposed 3D approach thus enabled us to design it to reflect the positions of both groups, so that the CSI, SW, and GD could be identified. The AI can be said to involve more concrete information for prioritising the PSQ attributes for improvement. Finally, although the 3D framework was developed within the PSQ context, the proposed 3D model can be applied to typical service industries in prioritising their attributes, as has been widely done with IPA and Kano's 2D model.

Furthermore, this study involved collecting 25 questionnaires from port users and 19 questionnaires from port managers. The port user respondents were responsible for managing or contacting the business of the five ports directly. In addition, the port manager respondents were responsible for port development planning or operational management. Thus, the survey results contained their professional opinions and judgements which are reliable and credible. Moreover, this study proposes a three-dimensional model for prioritising attributes of PSQ. Although the three dimensional framework is developed in the context of the PSQ, the proposed three dimensional model could be applied to general service industries to prioritise their attributes as the IPA and the Kano's two dimensional model have been widely applied.

Although the case studies were five major container ports in Asia, the results may have managerial implications for other ports. The findings showed that each port had a different priority in terms of improving service quality attributes because they had different resources and capabilities. These results enabled us to draw managerial and operational implications for port operators, because inter- and intra-port competitions have grown intense among neighbouring ports with larger container ships. The AI results revealed that several attributes should be improved immediately for all five ports [i.e., 'port congestion (3)', 'settlement of accident claims (10)', 'service promises (13)', and 'port users' needs (16)']. Three possible reasons exist for improving these attributes beforehand:

a they can increase satisfaction and reduce dissatisfaction to a considerably greater extent compared with the others

b they provide low satisfaction but rank high in importance

c they are easy to improve.

Moreover, considering the increasingly fierce port competition among neighbouring ports, port operators should be more concerned with service attributes with a high AI value to attract shipping lines at their ports. Otherwise, certain shipping lines may skip one of the five ports on their regular routes because they are facing increasing pressure to reduce ship turnaround time because of the larger ships.

This study is still subject to research limitations. First, greater control could not be exercised over the subjects and samples collected. This study recommends that following researchers expand the selection of sample ports in different continents or areas. A cross-comparison may yield significant contributions for port management. Second, the data analysed in this study were of a cross-sectional type. Future researchers could conduct a longitudinal survey to obtain insights from a trend analysis on port development. Third, although this study involved collecting the opinions of shipping lines regarding five major Asian ports, the other port stakeholders were not considered. This will be a significant issue for future research to enhance the understanding of comprehensive service quality for container ports. Finally, future researchers can employ the method proposed in this study for exploring and comparing the service quality of major European or American container ports against their Asian counterparts.

References

Berger, C., Blauth, R., Boger, D., Bolster, C., Burchill, G., Duouchel, W., Pouliot, F., Richter, R., Rubinoff, A., Shen, D., Timko, M. and Walden, D. (1993) 'Kano's methods for understanding customer-defined quality', *The Center for Quality Management Journal*, Vol. 2, No. 4, pp.2–36.

Burns, A.C. (1986) 'Generating marketing strategy priorities based on relative competitive position', *Journal of Customer Marketing*, Vol. 13, No. 4, pp.49–56.

Chen, C.C. and Chuang, M.C. (2008) 'Integrating the Kano model into a robust design approach to enhance customer satisfaction with product design', *International Journal of Production Economics*, Vol. 114, No. 2, pp.667– 681.

Chen, L.H. and Ko, W.C. (2008) 'A fuzzy nonlinear model for quality function deployment considering Kano's concept', *Mathematical and Computer Modelling*, Vol. 48, Nos. 3/4, pp.581–593.

Chen, T.L. and Lee, Y.H. (2006) 'Kano two-dimensional quality model and important-performance analysis in the student's dormitory service quality evaluation in Taiwan', *Journal of American Academy of Business*, Vol. 9, No. 2, pp.324–330, Cambridge.

Cuadrado, M., Frasquet, M. and Cervera, A. (2004) 'Benchmarking the port services: a customer oriented proposal', *Benchmarking: An International Journal*, Vol. 11, No. 3, pp.320–330.

Dewitte, S., Verguts, T. and Lens, W. (2003) 'Implementation intentions do not enhance all types of goals: the moderating role of goal difficulty', *Current Psychology: Developmental, Learning, Personality, Social*, Vol. 22, No. 1, pp.73–89.

Dolinsky, A.L. and Caputo, R.K. (1991) 'Adding a competitive dimension to importance-performance analysis: an application to traditional health care systems', *Health Marketing Quarterly*, Vol. 8, Nos. 3/4, pp.61–79.

Dunbar, R.L.M. (1971) 'Budgeting for control', *Administrative Science Quarterly*, Vol. 16, No. 1, pp.88–96.

Fleming, D.K. (2000) 'A geographical perspective of the transshipment function', *International Journal of Maritime Economics*, Vol. 2, No. 3, pp.163–176.

Fleming, D.K. and Baird, A.J. (1999) 'Some reflections on port competition in the United States and Western Europe', *Maritime Policy and Management*, Vol. 26, No. 4, pp.383–394.

Foster, T.A. (1978) 'Ports: what shippers should look for', *Distribution Worldwide*, Vol. 77, No. 1, pp.41–48.

Foster, T.A. (1979) 'What's important in a port', *Distribution Worldwide*, Vol. 78, No. 1, pp.32–36.

Ha, M.S. (2003) 'A comparison of service quality at major container ports: implications for Korean ports', *Journal of Transport Geography*, Vol. 11, No. 2, pp.131–137.

Hanson, E.I. (1966) 'The budgetary control function', *The Account Review*, Vol. 41, No. 2, pp.239–243.

Hawes, J.M. and Rao, C.P. (1985) 'Using importance-performance analysis to develop health care marketing strategies', *Journal of Health Care Marketing*, Vol. 5, No. 4, pp.19–25.

Herzberg, F., Bernard, M. and Snyderman, B.B. (1959) *The Motivation to Work*, John Wiley & Sons Press, New York.

Hirst, M.K. and Lowy, S.M. (1990) 'The linear additive and interactive effects of budgetary goal difficulty and feedback on performance', *Accounting, Organizations and Society*, Vol. 15, No. 5, pp.425–436.

Hofstede, G.H. (1968) *The Game of Budget Control*, Tavistock, London.

Horvath, M., Herleman, H.A. and McKie, R.L. (2006) 'Goal orientation, task difficulty, and task interest: a multilevel analysis', *Motivation and Emotion*, Vol. 30, No. 2, pp.171–178.

Hu, K-C. and Lee, P.T-W. (2011) 'Developing a new technique for evaluating service quality of container ports', in Notteboom, T. (Ed.): *Current Issues in Shipping, Ports and Logistics*, pp.337–356, University Press Antwerp, Brussels.

Jemmasi, M., Strong, K.C. and Taylor, S.A. (1994) 'Measuring service quality for strategies planning and analysis in service firms', *Journal of Applied Business Research*, Vol. 10, No. 4, pp.24–34.

Kano, N. and Takahashi, F. (1979) 'Nippon QC Gakkai', *9th Annual Presentation Meeting*, pp.21–26.

Kano, N., Seraku, N., Takahashi, F. and Tsuji, S. (1984) 'Attractive quality and must-be quality', *The Journal of the Japanese Society for Quality Control*, Vol. 14, No. 2, pp.39–48.

Kenis, I. (1979) 'Effects of budgetary goal characteristics on managerial attributes and performance', *The Accounting Review*, Vol. 54, No. 4, pp.707–721.

Latham, G.P., Seijts, G. and Crim, D. (2008) 'The effects of learning goal difficulty level and cognitive ability on performance', *Canadian Journal of Behavioural Science*, Vol. 40, No. 4, pp.220–229.

Lau, C.M. (2001) 'The interactive effects of emphasis on tight budget targets and cost control on budgetary performance', *Pacific Accounting Review*, Vol. 13, No. 1, pp.59–84.

Lee, P.T.W. and Hu, K.C. (2012) 'Evaluation of the service quality of container ports by importance-performance analysis', *International Journal of Shipping and Transport Logistics*, Vol. 4, No. 3, pp.197–211.

Lee, Y.C. and Huang, S.Y. (2008) 'A new fuzzy concept approach for Kano's model', *Expert Systems with Applications*, Vol. 36, No. 3, pp.4479–4484.

Lee, Y.C., Sheu, L.C. and Tsou, Y.G. (2008) 'Quality function deployment implementation based on fuzzy Kano model: an application in PLM system', *Computers and Industrial Engineering*, Vol. 55, No. 1, pp.48–63.

Li, Y., Tang, J., Luo, X. and Xu, J. (2009) 'An integrated method of rough set, Kano's model and AHP for 'rating customer requirements' final importance', *Expert Systems with Applications*, Vol. 36, No. 3, pp.7045–7053.

Locke, E.A. (1968) 'Toward a theory of task motivation and incentives', *Organizational Behavioral and Human Performance*, Vol. 3, No. 2, pp.159–189.

Locke, E.A. and Latham, G. (2002) 'Building a practically useful theory of goal setting and task motivation', *American Psychologist*, Vol. 57, No. 9, pp.705–717.

Löfgren, M. and Witell, L. (2005) 'Kano's theory of attractive quality and packaging', *The Quality Management Journal*, Vol. 12, No. 3, pp.7–20.

Löfgren, M. and Witell, L. (2008) 'Two decades of using Kano's theory of attractive quality: a literature review', *The Quality Management Journal*, Vol. 15, No. 1, pp.59–75.

López, R.C. and Poole, N. (1998) 'Quality assurance in the maritime port logistic chain: the case of Valencia, Spain', *Supply Chain Management: An International Journal*, Vol. 3, No. 1, pp.33–44.

Marlow, P.B. and Casaca, A.C.P. (2003) 'Measuring lean ports performance', *International Journal of Transport Management*, Vol. 1, No. 4, pp.189–202.

Martilla, J.A. and James, J.C. (1977) 'Importance-performance analysis', *Journal of Marketing*, Vol. 41, No. 1, pp.77–79.

Matzler, K. and Hinterhuber, H.H. (1998) 'How to make product development projects more successful by integrating Kano's model of customer satisfaction into quality function deployment', *Technovation*, Vol. 18, No. 1, pp.25–38.

Matzler, K., Bailom, F., Hinterhuber, H.H., Renzl, B. and Pichler, J. (2004a) 'The asymmetric relationship between attribute-level performance and overall customer satisfaction: a reconsideration of the importance-performance analysis', *Industrial Marketing Management*, Vol. 33, No. 4, pp.271–277.

Matzler, K., Fuchs, M. and Schubert, A.K. (2004b) 'Employee satisfaction: does Kano's model apply?', *Total Quality Management*, Vol. 15, Nos. 9/10, pp.1179–1198.

Matzler, K., Hinterhuber, H.H., Bailom, F. and Sauerwein, E. (1996) 'How to delight your customers', *Journal of Product and Band Management*, Vol. 5, No. 2, pp.6–18.

Moussa, F.M. (1996) 'Determinants and process of the choice of goal difficulty', *Group & Organization Management*, Vol. 21, No. 4, pp.414–431.

Murphy, P.R., Daley, J.M. and Dalenberg, D.R. (1987) 'Port selection criteria: an application of a transportation research framework', *Logistics and Transportation Review*, Vol. 28, No. 3, pp.237–255.

Myers, J. (2001) *Measuring Customer Satisfaction: Hot Buttons and Other Measurement Issues*, x American Marketing Association, Myers.

Notteboom, T.E. (1997) 'Concentration and Load centre development in the European Container Port System', *Journal of Transport Geography*, Vol. 5, No. 2, pp.99–115.

Pantouvakis, A. (2006) 'Port-service quality dimensions and passenger profiles: an exploratory examination and analysis', *Maritime Economics and Logistics*, Vol. 8, No. 4, pp.402–418.

Rivière, P., Monrozier, R., Rogeaux, M., Pagès, J. and Saporta, G. (2006) 'Adaptive preference target: contribution of Kano's model of satisfaction for an optimized preference analysis using a sequential consumer test', *Food Quality and Preference*, Vol. 17, Nos. 7/8, pp.572–581.

Robinson, R. (1998) 'Asian hub/feeder nets: the dynamics of restructuring', *Maritime Policy and Management*, Vol. 25, No. 1, pp.21–40.

Sampson, S.E. and Showalter, M.J. (1999) 'The performance-importance response function: observations and implications', *The Service Industries Journal*, Vol. 19, No. 3, pp.1–25.

Schmidt, A.M. and Dolis, C.M. (2009) 'Something's got to give: the effects of dual-goal difficulty, goal progress, and expectancies on resource allocation', *Journal of Applied Psychology*, Vol. 94, No. 3, pp.678–691.

Schnake, M.E., Bushardt, S.C. and Spottswood, C. (1984) 'Internal work motivation and intrinsic job satisfaction: the effects of goal clarity, goal difficulty, participation in goal setting, and task complexity', *Group and Organization Studies*, Vol. 9, No. 2, pp.201–219.

Sever, I. (2015) 'Importance-performance analysis: a valid management tool?', *Tourism Management*, June, Vol. 48, pp.43–53.

Slack, N. (1994) 'The importance-performance matrix as a determinant of improvement priority', *International Journal of Operations and Production Management*, Vol. 14, No. 5, pp.59–75.

Steer, R.M. (1976) 'Factor affecting job attitudes in a goal setting environment', *Academy of Management Journal*, Vol. 19, No. 1, pp.6–16.

Tan, B.L., Tang, K.H. and Forrester, P.L. (2004) 'Application of QFD for e-business planning', *Production Planning and Control*, Vol. 15, No. 8, pp.802–818.

Thantongpaiboon, C. and Wasusri, T. (2008) 'Ocean transport service quality assessment', *13th International Symposium on Logistics: Integrating the Global Supply Chain*, pp.163–171.

UNCTAD (2010) *Review of Maritime Transport 2009*, United Nations Publication, Geneva.

Ugboma, C., Ibe, C. and Ogwude, I.C. (2004) 'Service quality measurements in ports of a developing economy: Nigerian port survey', *Managing Service Quality*, Vol. 14, No. 6, pp.487–495.

Ugboma, C., Ogwude, I.C., Ugboma, O. and Nnadi, K. (2007) 'Service quality and satisfaction measurements in Nigerian ports: an exploration', *Maritime Policy and Management*, Vol. 34, No. 4, pp.331–346.

Van Ryzin, G.G. and Immerwahr, S. (2004) 'Derived importance-performance analysis of citizen survey data', *Public Performance and Management Review*, Vol. 27, No. 4, pp.144–173.

Wassenaar, H.J., Chen, W., Cheng, J. and Sudjianto, A. (2005) 'Enhancing discrete choice demand modeling for decision-based design', *ASME Journal of Mechanical Design*, Vol. 127, No. 4, pp.514–523.

Wasserman, G.S. (1993) 'On how to prioritise design requirements during the QFD planning process', *IIE Transactions*, Vol. 25, No. 3, pp.59–65.

Webb, A., Jeffrey, S.A. and Schulz, A. (2010) 'Factors affecting goal difficulty and performance when employees select their own performance goals: evidence from the field', *Journal of Management Accounting Research*, Vol. 22, No. 1, pp.209–232.

Willingale, M.C. (1981) 'The port-routeing behaviour of short-sea operators: theory and practice', *Maritime Policy and Management*, Vol. 8, No. 2, pp.109–120.

Xu, Q., Jiao, R.J., Yang, X. and Helander, M. (2008) 'An analytical Kano model for customer need analysis', *Design Studies*, Vol. 30, No. 1, pp.87–100.

Yang, C.C. (2005) 'The refined Kano's model and its application', *Total Quality Management*, Vol. 16, No. 10, pp.1127–1137.

Yang, C.C., Jou, Y.T. and Cheng, L.Y. (2011) 'Using integrated quality assessment for hotel service quality', *Quality and Quantity*, Vol. 45, No. 2, pp.349–364.

Yeo, A.Y.C. (2003) 'Examining a Singapore bank's competitive superiority using importance-performance analysis', *Journal of American Academy of Business*, Vol. 3, Nos. 1/2, pp.155–161.