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Original Article

# The impact of port service quality on customer satisfaction: The case of Singapore

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**Abstract** This study investigates the concept of Port Service Quality (PSQ) and examines its influence on customer satisfaction in the port sector. Following a literature review, a conceptual model of PSQ and its influence on customer satisfaction is proposed. The model is first checked for validity in an interview with senior executives working in various container shipping lines in Singapore, then validated through a survey of 175 members of the Singapore Shipping Association and Singapore Logistics Association. A confirmatory factor analysis, followed by multiple regression is conducted to confirm the PSQ construct and examine the relationship between PSQ and customer satisfaction. It is found that PSQ is a four-dimensional construct and that the relationship between PSQ and customer satisfaction is positively significant. Specifically, the PSQ dimensions of *outcomes*, *management*, *process* and *image and social responsibility* all have significant positive impact on customer satisfaction. This study contributes to management practice as port managers can use the PSQ scale to measure their customers' satisfaction, and justify investments in port service quality as a relational marketing instrument. This research also contributes to theory building, as it presents and validates the respective model of PSQ and customer satisfaction specifically for the port sector.

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## Introduction

Ports play the role of nodes for both inbound and outbound logistics processes, that is, platforms where logistics-related activities occur, and are also important



national economic contributors. In this context, seaports are not only where cargoes are loaded/discharged onto/from vessels but also distribution centres where value-added services such as labelling, packaging, cross-docking and so on, are provided (World Bank, 2007). Ports integrate further to value chains by adding more value to shipments while in the port area. The role of ports is therefore essential as these transport nodes are indispensable for the effective and efficient management of the flows of products and information in supply chains. Any failure or unreliability of port services can greatly influence the smooth movement of these flows in the next stage of the supply chain and make port customers – shipping lines and cargo owners – unhappy. This role of ports in supply chains is increasingly seen not only in academic literature but also in management practice. Many ports are increasingly perceived as integrated and inseparable nodes in the supply chains of their customers. For example, the Victorian Transport Distribution and Logistics Industry Roundtable (2009) in Australia builds up interactive flow-charts of import and export processes in their homepage to help members understand the processes, organisations and documents involved, as well as enhancing their awareness of the role of the Port of Melbourne as one of the integrated partners in the supply chain.

The importance that ports play in the regional and national economy and their changing role in the context of logistics and supply chain management are well researched in the literature. Other well-developed researches about ports in the existing literature include the measurement of port efficiency and port choice in a logistics and supply chain context. However, research on what constitutes port service quality (PSQ) and its impacts on the satisfaction of port customers, such as shipping lines and cargo owners, is not well-investigated in the contemporary literature. In this article, we propose and validate a conceptual model of PSQ and examine the causal relationship between PSQ and customer satisfaction. The article is organised as follows. First, a literature review is provided followed by the proposed conceptual model of PSQ with factors and explaining variables. Methodologies are described next, followed by analyses and discussions on study findings. Finally, concluding comments, including academic and management implications and future research directions are outlined.

## Literature Review

### Service quality and port service quality

Research on the *quality movement* covering Total Quality Management; Business Excellence; quality tools; techniques; as well as core values/principles has been

extensive, as reflected in a recent analytical article by Dahlgaard-Park *et al* (2013). Although, the topic of service quality measurement has been in the existing research agenda for quite some time, there has never been a universal approach to the definition of quality and its associated dimensions. Albeit an elusive concept, there have been a plethora of studies on the subject of quality in the service industry. One of the initial and most commonly used tools to measure service quality is the SERVQUAL model (Parasuraman *et al*, 1985, 1988). Despite its pervasive applications, this model has met criticism from various scholars (cf. Carman, 1990; Cronin and Taylor, 1992). It has been argued that SERVQUAL was designed to only address the service delivery process, while neglecting the service encounter outcome (Baker and Lamb, 1993). Grönroos (1984) created a model that takes into consideration the service outcome component, and this was also echoed in the model proposed by Lehtinen and Lehtinen (1991). Many authors also started to claim that industry-specific determinants were required to provide a more accurate measurement (Babakus and Boller, 1992; Van Dyke *et al*, 1997; Caro and Garcia, 2007; Ladhari, 2008). Calabrese and Scoglio (2012) even proposed a methodology to assess service quality by means of firm-specific quality dimensions.

Most recent literature also points out that SERVQUAL is not a universal tool to measure service quality in specific contexts, for example, in luxurious restaurants of international hotel chains (Chin and Tsai, 2013); B2B services (Benazić and Došen, 2012); corporate banking (Guo *et al*, 2008); supply chain (Seth *et al*, 2006) and so on. This is confirmed in the study of Chowdhary and Prakash (2007) who show that the generalisation of quality dimensions is not possible among all types of services taken together, and therefore the development of quality dimensions should be tailored to each specific type of services. Ganguli and Roy (2013) even go further to develop a quality model for the new 'hybrid service category'. Interestingly, while SERVQUAL has been popularly used in the on service research literature, many authors have also indicated that it is not applicable for all industries and in all sociocultural and economic environments.

Despite numerous studies of service quality measurement in various industries, research of this area in the maritime industry in general and ports in particular is scant. Most maritime-related literature in this respect often focuses on the issue of carrier and port selection rather than on detailed measurement of service quality in this sector. Among a few relevant studies, Ugboma *et al* (2004) found that all five SERVQUAL dimensions were valid. Meanwhile, Lopez and Poole (1998) indicated that three dimensions contributed to the quality of port services, namely, 'efficiency', 'timeliness' and 'security'. Ha (2003) devised a group of port service quality factors including 'information availability of port-related activities', 'port location', 'port turnaround time', 'facilities available',



'port management', 'port costs' and 'customer convenience'. Meanwhile, a six-factor service quality, namely, 'services', 'security and safety', 'cleanliness', 'guidance-communication', 'parking facilities' and 'information' was developed by Pantouvakis (2006) that is very much specific for passenger ports. On another note, Cho *et al* (2010) developed a separate measurement tool of port service quality, comprising 'endogenous quality', 'exogenous quality' and 'relational quality'. Nevertheless, there seems little convergence so far on what dimensions consistently constitute port service quality. In addition, these studies also neglected a critical dimension, 'social responsibility', which can enhance or damage the image or reputation of organisations and hence the perceived quality of their services. This is particularly important in the context of many ports around the world, now trying to implement green initiatives. In addition, the influence of port service quality on customer satisfaction particularly in the port sector is not a topic that has been well-researched empirically.

Thai (2008) explored the concept of service quality in maritime transport and developed and validated a measurement model (ROPMIS) consisting of six dimensions: 'resources', 'outcomes', 'processes', 'management', 'image' and 'social responsibility'. This model was based on a comprehensive review of various service quality dimensions and factors in previous studies, and it also incorporated newly developed elements such as *management image* and *social responsibility*. In comparison to SERVQUAL, the ROPMIS model is more suitable to the maritime industry, as it incorporates the image and social responsibility aspects which are critically important. Although, the model was supposed to be generically applicable to maritime transport services, the author argued that its factors could be readily revised for specific sub-sectors, such as ports. Therefore, we here adopt this model, revising operationalised measurement items specific to the port sector.

### **Service quality and customer satisfaction**

Essentially, customer satisfaction is the feeling which is derived when a customer's experience with the service meets or surpasses his expectation. In most literature on marketing, satisfaction is defined as the global evaluation of relationship fulfilment by the firm (Dwyer and Oh, 1987) or the positively affected state resulting from the assessment of a firm's working relationship (Gaski and Nevin, 1985; Farrelly and Quester, 2005). Thus, satisfaction is one of the most important elements for explaining any type of relationship among participants (Sanzo *et al*, 2003). According to Oliver (1997), satisfaction is 'the consumer's fulfilment response that is, a judgement that a product or service feature (or the product or service itself) provides (or is providing) a pleasurable level of consumption-related fulfilment'.

Customer satisfaction is positively related to the quality of products or services provided to the customer, that is, the level of customer satisfaction increases along with his *perceived* increases in the level of product or service quality. There have been many studies so far, examining the relationship between service quality and customer satisfaction in many service sectors, confirming this positive relationship (for example, see Cronin and Taylor, 1994; Parasuraman *et al*, 1994; Brady and Robertson, 2001; Sureshchandar *et al*, 2002; Santouridis and Trivellas, 2010; Liao, 2012). Conflicting evidence (for example, see Rosen and Suprenant, 1998) has also been present. In the transportation sector, there have been a few studies researching the relationship between service quality and customer satisfaction in aviation (for example, see Anderson *et al*, 2009) and high-speed trains (for instance, see Cao and Chen, 2011), having found that this relationship is positive and significant. Other researchers also expanded the discussion on service quality and customer satisfaction to include other marketing variables. Most recently, Chen and Hu (2013) found that service quality has positive impacts on relational benefit and customer loyalty in the airline industry. In addition, relational benefit influences customer loyalty directly, while service quality would also affect customer's loyalty through customer relational benefits. These results are in line with the study conducted with travel agencies by Seto-Pamies (2012) which revealed that loyalty depends on the customer's degree of satisfaction and trust, and satisfaction is, in turn, influenced by service quality. Meanwhile, satisfaction can be either a factor mediating the indirect relatedness of service quality to customers' behavioural intentions (Rajic and Dado, 2013), or an outcome of service quality via relationship quality (Chang *et al*, 2012).

Despite of various studies about service quality and its relationship with customer variables in other sectors, research on what constitutes service quality of a port, as well as the relationship between service quality and other marketing constructs, is scant and deserves further investigation.

## **Methodology**

### **Target population**

The target population of this study is the port customers – shipping lines, cargo owners and their representatives (freight forwarders and logistics service providers) – using the Port of Singapore. In 2014, Singapore was ranked as the second busiest container port in the world in terms of the volume of containers loaded and discharged (Maritime and Port Authority of Singapore, 2015).



## Conceptual framework and measures

We adopt (ROPMIS), as developed and validated by Thai (2008), to measure port service quality. This model consists of six quality dimensions as follows:

1. *Resources-related quality dimension*: relates to physical resources, financial resources, condition of facilities, equipment, location, infrastructures and so on.
2. *Outcome-related*: involves the services being received by the customers, for instance, service accomplishment such as the on-time delivery of a shipment, or the price of a service offered.
3. *Process-related*: relates to factors regarding the interaction between employees and customers, for example, how customers perceive the behaviour of staff in dealing with customer requirements; staff's knowledge of customer wants and needs; as well as application of technology in better serving the customers.
4. *Management-related*: involves the selection and deployments of resources in the most efficient way so as to ensure (meet, or even exceed) customer needs and expectations, knowledge, skills and professionalism of employees and their understanding and transforming customer needs and requirements into what they really want.
5. *Image/reputation-related*: relates to the overall perception of customers about the service organisation.
6. *Social responsibility-related*: involves the ethical perception and operations of an organisation to behave in a socially responsible manner.

It is envisaged that the resources-related quality dimension, to a large extent, influences others. Therefore, to measure customers' assessment of a port's service quality in the most neutral way, this dimension was removed from our PSQ model. In addition, since there is a close relationship between an organisation's social responsibility profile and its perceived image in the market and society, the 'image' and 'social responsibility' dimensions were combined into one new dimension, 'image and social responsibility' in our revised model of PSQ. Each PSQ dimension is measured by a number of variables, which were revised from the ROPMIS model to suit the specific context of the port sector. For example, the measurement item of 'physical infrastructures' under the 'resources' dimension in the original ROPMIS model has been expanded to include 'physical infrastructures such as berths, yards, warehouses, distribution centres and hinterland connection networks'. Regarding customer satisfaction, this construct is well developed in the existing literature to include measurements of satisfaction with equipment and facilities; services; as well as overall satisfaction (for example, see Anderson *et al*, 2009; Pantouvakis, 2010). In addition, it can be logically

inferred that once customers are satisfied with the service, there is the possibility that they will continue to use the service and make referral of the service to others (Cao and Chen, 2011). Hence, these two measurement items were also included in the customer satisfaction construct.

The conceptual framework for this research and summary of measures is presented in Table 1. As the model of Thai (2008) is adopted in this research, the measurement items of quality dimensions in this model are also used but revised to suit the port context in our model of PSQ.

### **Research hypotheses**

As the relationship between service quality and customer satisfaction is not well-researched in the port sector, this study will examine how PSQ as a four-dimension construct affects the satisfaction of port customers. Hence, four hypotheses were developed as follows:

**Hypothesis 1:** Outcomes-related PSQ positively influences customer satisfaction.

**Hypothesis 2:** Process-related PSQ positively influences customer satisfaction.

**Hypothesis 3:** Management-related PSQ positively influences customer satisfaction.

**Hypothesis 4:** Image and social responsibility-related PSQ positively influences customer satisfaction.

### **Sampling and data collection**

Four senior executives, working in various container shipping lines in Singapore, were approached and asked to comment on the relevance and accuracy of the variables measuring port service quality and customer satisfaction proposed in our PSQ model. These professionals hold senior positions in marketing, operations and customer service in their respective organisations. They were all of the view that the proposed PSQ model contains dimensions and attributes which truly reflect a port's service quality as well as customer satisfaction. As the face validity of the measurement constructs was confirmed, a survey was conducted to further validate the proposed PSQ model. The mailing list was constructed with 285 sample points from the member directory of Singapore Shipping Association. In addition, the member directory of Singapore Logistics Association was also used to extract member companies with business portfolio involving importing and exporting by sea

**Table 1:** Constructs and measurement items

<i>Research variables &amp; measurement items</i>	<i>Code</i>	<i>References</i>
<i>Outcomes-related PSQ</i>		Adopted from Thai (2008)
The port always provide fast service	OUTC01	
The port always provide service in a reliable manner	OUTC02	
The port always provide service in a consistent manner	OUTC03	
The port always ensure safety and security to our ships/ shipments	OUTC04	
The port always produce error-free invoice and related documents	OUTC05	
The port always offers competitive price of service	OUTC06	
The port can always meet our service requirements anytime and anywhere we want	OUTC07	
<i>Process-related PSQ</i>		
The staff in the port always demonstrate professional attitude and behaviour in meeting our requirements	PROCE1	
The staff in the port always respond quickly to our enquiries and requests	PROCE2	
The staff in the port always demonstrate good knowledge of our needs and requirements	PROCE3	
The level of ICT applications in customer service at the port is comprehensive	PROCE4	
<i>Management-related PSQ</i>		
The level of ICT applications in port operations and management at the port is comprehensive	MANAG1	
The port demonstrates high level of efficiency in operations and management	MANAG2	
The management in the port always demonstrate good knowledge and competence, including incident-handling capability	MANAG3	
The management in the port always demonstrate good understanding of our needs and requirements	MANAG4	
The port always collect our feedback about their services and reflect on their improvement	MANAG5	
The port continuously improve their customer-oriented operation and management processes	MANAG6	
<i>Image and Social Responsibility-related PSQ</i>		
The port demonstrates good relationship with other ports and land transport service providers	IMAGE1	
The port possesses positive reputation for reliability in the market	IMAGE2	
The port always emphasizes on operations and work safety	IMAGE3	
The port demonstrates good record of operations and work safety	IMAGE4	
The port fulfil good social responsibility to their employees and other stakeholders	IMAGE5	
The port always emphasizes on environmentally responsible operations	IMAGE6	
The port has in place the environmental management system	IMAGE7	
<i>Customer satisfaction</i>		Anderson <i>et al</i> (2009), Pantouvakis (2010), Cao and Chen (2011)
Overall, we are satisfied with the facilities, equipment and other infrastructures of the port	SATIS1	
Overall, we are satisfied with the management and employees of the port	SATIS2	
Overall, we are satisfied with the service quality of the port	SATIS3	
We will refer services of the port to our business partners	SATIS4	
We will continue using services of the port	SATIS5	



(and thus having their shipment transported through ports). This led to the selection of another 364 companies in the category of cargo owners or their representatives, making the total sample size equal to 649 observations.

Respondents were asked to indicate their attitude towards statements describing the service quality factors of the port that their company is using its services most of the time in Singapore, and their satisfaction with the port's services. Respondents' attitude is measured using the five-point Likert scale, ranging from 1: 'strongly disagree' to 5: 'strongly agree'. Upon completion, the questionnaire was pre-tested with a small group of shipping and logistics companies to ensure clarity. It was then administered by post with a follow-up mailing 2 weeks after the first one. By the cut-off date, a total of 175 usable questionnaires were returned, yielding a response rate of 27 per cent. Among respondents, 28 per cent were working in shipping companies, 29 per cent were freight forwarders and logistics companies, while the remaining 43 per cent of responses were from cargo owners. In addition, 27 per cent of respondents have had less than or equal to 10 years work experience, 35 per cent had been working for more than 10 years but less than 20 years, while the remaining 38 per cent of respondents had been working for more than 20 years. These descriptive figures indicate that respondents who participated in this study were quite senior professionals and therefore well-qualified to participate in the study.

## **Analysis of Results**

### **Factor analysis of the PSQ model**

The measurement of the four-factor PSQ model on 24 items and customer satisfaction on five items, as reflected in Table 1, was evaluated for overall fit using tests of reliability, convergent and discriminant validity. Construct validity was established using confirmatory factor analysis (CFA) (Churchill, 1991). Several runs of CFA were conducted to derive the best fit model, and in this process items with high standardized residual covariance and low loading to its factor would be eliminated to increase the overall fit indices. In this process, 10 items were deleted, including OUTCO4, OUTCO5, OUTCO6, PROCE4, MANAG4, MANAG5, MANAG6, IMAGE1, IMAGE5 and IMAGE7, as their absence does not jeopardize the conceptual meaning of the factor representing them. The measurement model of PSQ based on CFA is depicted in Figure 1 and Table 2.

The results of CFA show that all item loadings are significant with the smallest standardized loading of 0.65, above the recommended minimum value

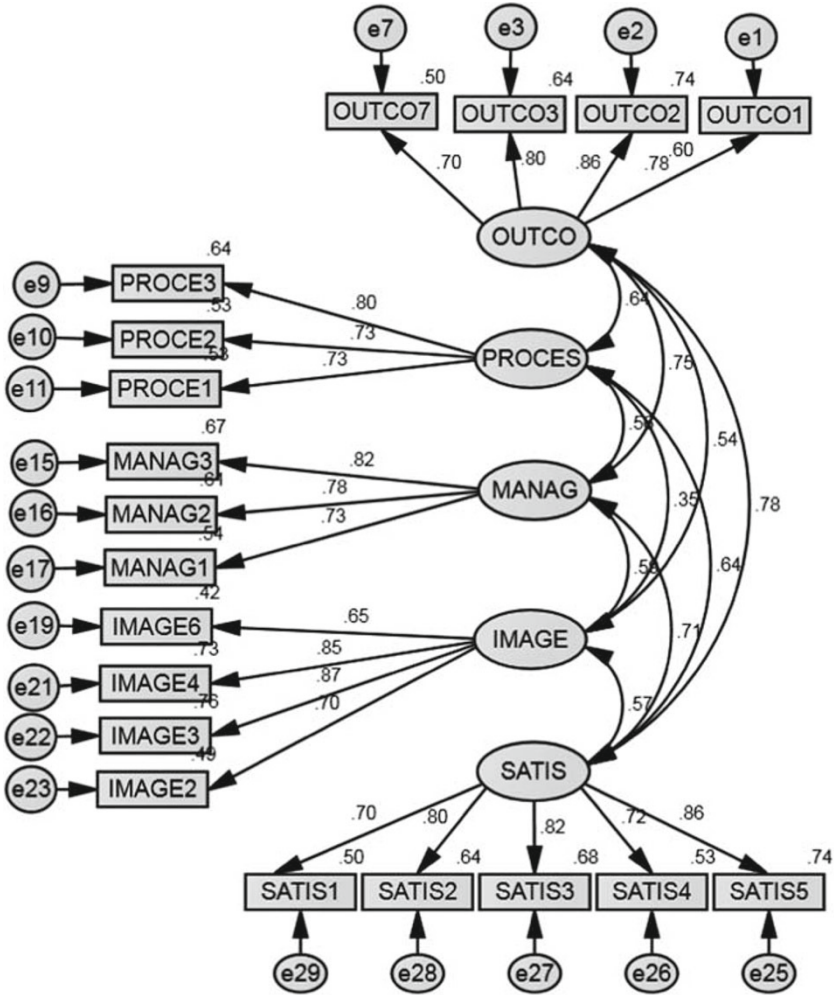


Figure 1: PSQ and customer satisfaction measurement model based on CFA.

of 0.50 (Bagozzi *et al*, 1991). The overall fit of the PSQ measurement model is reasonable given the results of fit indices compared with the thresholds suggested by various authors such as Ha *et al*, (2011), Hair *et al* (2010), Zhang (2002), Garver and Mentzer (1999). Thus, the four factors and 14 measuring items contribute to the overall goodness-of-fit of the PSQ model and imply sufficient support for the results to be deemed an acceptable representation of the hypothesised PSQ constructs.

**Table 2:** Results of CFA and scale reliability

<i>Constructs</i>	<i>Variables</i>	<i>Standardised loadings</i>	<i>SMCs</i>	<i>AVE</i>	<i>Cronbach's <math>\alpha</math></i>
Outcomes	OUTCO1	0.78	0.60	0.618	0.865
	OUTCO2	0.86	0.74		
	OUTCO3	0.80	0.65		
	OUTCO7	0.70	0.50		
Process	PROCE1	0.73	0.58	0.568	0.794
	PROCE2	0.73	0.58		
	PROCE3	0.80	0.64		
Management	MANAG1	0.73	0.54	0.606	0.817
	MANAG2	0.78	0.61		
	MANAG3	0.82	0.67		
Image & Social Responsibility	IMAGE2	0.70	0.49	0.599	0.815
	IMAGE3	0.87	0.76		
	IMAGE4	0.85	0.73		
	IMAGE6	0.65	0.42		
Customer satisfaction	SATIS1	0.70	0.50	0.614	0.884
	SATIS2	0.80	0.64		
	SATIS3	0.82	0.68		
	SATIS4	0.73	0.53		
	SATIS5	0.86	0.74		

Notes:  $\chi^2/DF = 2.622$ ,  $RMR = 0.018$ ,  $GFI = 0.829$ ,  $TLI = 0.862$ ,  $CFI = 0.885$ ,  $RMSEA = 0.097$ .

**Table 3:** Results of reliability and validity tests in CFA

	<i>CR</i>	<i>AVE</i>	<i>MSV</i>	<i>ASV</i>
Image and social responsibility	0.855	0.599	0.346	0.274
Outcomes	0.866	0.618	0.602	0.469
Process	0.798	0.568	0.415	0.317
Management	0.821	0.606	0.563	0.432
Customer satisfaction	0.888	0.614	0.602	0.464

To further confirm the validity and reliability of the four-factor PSQ model, their convergent and discriminant validity, as well as composite reliability, were also examined through composite reliability, average variance extracted (AVE), maximum shared squared variance (MSV) and average shared squared variance (ASV) (Hair *et al.*, 2010). The results of the reliability and validity tests are summarized in Table 3. It can be seen that the thresholds required for reliability and validity in CFA are satisfied for all factors extracted, as all composite reliability values are greater than 0.7, all AVE values are bigger than 0.5 (convergent validity), and all MSV and ASV values are smaller than AVE values (discriminant validity). Therefore, it can be concluded from the CFA exercise that the model of four factors and 14 items is reliable and valid as a measurement tool for port service quality.



## The impact of PSQ on customer satisfaction

Regression analysis was carried out to test the hypotheses in this study, at 95 per cent confidence level, with customer satisfaction as the dependent variable and the extracted four factors of the PSQ model as predictors. The results of this analysis are summarised in Table 4 and Table 5. All four factors of PSQ met the entry requirements to be included in the regression equation. The multiple  $R$  ( $R=0.759$ ) shows that there is a substantial correlation between the dependant variable (customer satisfaction) and four predictors, and this is statistically significant ( $P=0.000$ ). In this respect, more than 56 per cent of the variance in customer satisfaction is explained by the four predictor variables ( $R^2=0.566$ ). All four predictors have positive influence on customer satisfaction ( $P=0.000, 0.001, 0.001$  and  $0.003$  respectively). Specifically, the outcomes-related PSQ factor has the greatest positive influence on customer satisfaction ( $\beta=0.310$ ), followed by management-related PSQ ( $\beta=0.239$ ), process-related factor ( $\beta=0.214$ ) and image and social responsibility-related ( $\beta=0.184$ ). Hence, all four proposed hypotheses are supported.

The finding that the outcomes and management-related PSQ factors have the greatest positive influence on customer satisfaction is in line with the results of Thai (2008), in which these factors were also perceived as the most important in the delivery of service quality in maritime transport. Indeed, while the port, as a service provider, may concentrate on all factors of PSQ as an all-rounded approach to manage service quality, what matters most to the customer is the outcomes of service encountered. In line with the general theory of service quality, outcomes of the service encountered shape the customer's experience of the service, and thus help to derive perceived service quality through comparison with the customer's service expectations. Besides, it is also worth noting that the image and social responsibility-related dimension of PSQ has also a significant positive impact on customer satisfaction that implies the emphasis on the port's corporate social performance as an important service quality enabler. This finding is important as it confirms a pre-conception that, apart from reputation for reliability, safe and environmentally responsible operations are also essential to a quality service in the maritime industry, including that of ports. This industry

**Table 4:** Model summary – coefficient of determination

<i>Model summary<sup>a</sup></i>					
<i>Model</i>	<i>R</i>	<i>R<sup>2</sup></i>	<i>Adjusted R<sup>2</sup></i>	<i>Standard error of the estimate</i>	<i>Durbin-watson</i>
1	0.759 <sup>b</sup>	0.576	0.566	0.22257	2.160

<sup>a</sup>Dependent Variable: SATISFACTION.

<sup>b</sup>Predictors: (Constant), IMAGESOCIAL, PROCESS, MANAGEMENT, OUTCOME.

**Table 5:** Model summary – regression coefficients

Model		Coefficients <sup>a</sup>				
		Unstandardized coefficients		Standardized coefficients	t	Sig.
		B	Standard Error	$\beta$		
1	(Constant)	1.517	0.182	—	8.328	0.000
	Outcomes	0.216	0.050	0.310	4.300	0.000
	Process	0.141	0.040	0.214	3.528	0.001
	Management	0.157	0.045	0.239	3.466	0.001
	Image and social responsibility	0.136	0.045	0.184	3.005	0.003

<sup>a</sup>Dependent Variable: SATISFACTION

is known for being well-regulated, as maritime accidents and incidents are often of substantial impact in terms of safety and environmental pollution. Performance relating to reliability and safe and environmentally responsible operations can therefore influence customers' perception of quality of a maritime transport service provider. This issue has long been realised by ports around the world, for instance, through the Green Award of the port of Rotterdam, the Ecoport project of the European Union, the Green Port Initiatives in Singapore and so on. Hence, the positive influence of the image and social responsibility-related dimension on customer satisfaction would justify port investments in this aspect.

## Discussion and Implications

This article makes contributions to the existing literature by validating the composition of port service quality, constructed from the generic model developed by Thai (2008), investigating its impact on customer satisfaction in the port sector. It was confirmed that port service quality is a four-dimensional construct consisting of those items relating to outcomes, process, management, and image and social responsibility. This PSQ construct encompasses all aspects of service delivery experience, internally within the port, and externally between the port and its customers, including the particularly important aspect of image and social responsibility. As such, this finding is academically significant, as it introduces and empirically validates a service quality measurement which is unique for the port sector. Given that this is not adequately studied in the current literature, the PSQ model in this research lays the foundation for further studies on the management and delivery of service quality in the port sector. For example, future studies may be conducted to explore PSQ according to the types of cargo



ports handle, their size in terms of cargo throughput, their strategic functions (that is, feeder versus transshipment ports, regional versus global hub ports and so on). Future research may also be done to compare PSQ of ports across geographical locations. Such future research would enhance the understanding of PSQ for various port sizes, types, functions and locations, and therefore assist port management in the design and delivery of quality service to specific groups of their customers.

It was also confirmed that delivering a port quality service will have a significant positive impact on customer satisfaction. Specifically, the outcomes-related PSQ dimension has the strongest influence on customer satisfaction, followed by other dimensions. The result that port service quality has a significant impact on customer satisfaction is in line with other studies of various sectors (for example, see Polyorat and Sophonsiri, 2010 and Dehghan *et al.*, 2012). Hence, this research confirms the important causal relationship between the two constructs of service quality and customer satisfaction, which are essential in the relational marketing domain. In addition, this research also highlights the importance of managing port service quality from an all-rounded approach, both external to the customers and internal to the port management.

The findings of this study also provide meaningful implications for port managers. First, the validated PSQ model in this study helps port managers understand what dimensions and aspects of port service quality are appreciated and assessed by customers, that is, shipping lines and cargo owners and their representatives. On the basis of this understanding, port managers can develop a standard scale of PSQ to measure customer satisfaction. In the long run, the use of such a standard measurement tool would facilitate the comparison and benchmarking between ports in terms of their service quality performance, and through that implement necessary solutions to enhance port service quality. Second, as service quality has a significant positive impact on customer satisfaction, port managers have further assurance that serious investment in providing quality port services would be critical in retaining existing customers as well as attracting potential customers to use the port. In addition, such an investment should not be concentrated only on providing good physical infrastructure such as port equipment and facilities, since customer satisfaction can be greatly enhanced from the provision of good outcomes of port service performance and beyond. On a further note, port managers should also pay attention to corporate social responsibility activities which could help enhance the port's image and thus perceived service quality and satisfaction in the eyes of their customers. Specifically, port management should promote the culture of workplace and operational safety top down and bottom up, as well as have in place a mechanism to reward employees for best practice. In addition, green performance in port operations and related activities should also be promoted

and measured, such as the use of greener equipment (for example, electric RTGs), emitting less harmful substances (for example, SO<sub>x</sub> and NO<sub>x</sub>) to the environment, and the application of tariff discounts for ships using low sulphur bunker while in the port.

## **Conclusion, Limitation and Future Research**

The impact of service quality on customer satisfaction in the port sector is an under-researched area in the literature. Results from this study reveal that PSQ is a construct of four factors, and that enhanced PSQ will positively influence customer satisfaction, in which the outcomes of port service performance would have the greatest impact. Findings of this research have academic and managerial implications as they help to enhance the understanding of service quality as a relational marketing instrument, especially in the context of the port sector, both in terms of contribution to knowledge and practical applications.

Nevertheless, several limitations of this study should be considered when generalising its findings. First, the hypotheses of this study were tested in the port sector in Singapore, which makes the external validity of the results a constraint. Hence, researchers would need to broaden the similar study in the future to cross-industry and cross-country levels. Second, this study stopped at the preliminary level of investigating the relationship between port service quality and customer satisfaction, in which the latter was treated as a single construct. Hence, it will be useful for future research to further examine the influence of port service quality on other important aspects such as customer loyalty, word of mouth intention and repurchase intention, in view of customer satisfaction as a mediating variable.

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