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Assadej Vanichchinchai, Nonglak Limsomkiat

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Assadej Vanichchinchai* and
Nonglak Limsomkiat

Faculty of Engineering,
Mahidol University,
999 Salaya, Phuttamonthon,
Nakhon Pathom, 73170, Thailand
Fax: +66-(0)-2441-9731
Email: assadej_v@yahoo.com
Email: magiaglobal@gmail.com
*Corresponding author

Abstract: The purposes of this research are to explore shipper satisfaction about logistics service quality (LSQ) of freight forwarders, to evaluate resource allocation efficiency for LSQ, and to explore the effects of LSQ on financial performance of shippers. A modified SERVQUAL with additional cost dimensions was used to collect data from 237 furniture exporters in Thailand. Descriptive statistics, gap analysis with paired sample t-test, importance-performance analysis (IPA), priority nonconformity index (PNCI) and multiple regression were utilised for data analysis. It was found that there was significant shipper dissatisfaction with overall LSQ, every dimension and indicator. Shippers were dissatisfied most and least about cost and tangibles, respectively. Although the IPA revealed no over performed or underperformed LSQ dimensions, PNCI further suggested transfer of resources from reliability and tangibles to improve cost and assurance. Reliability, tangibles, responsiveness and cost significantly increased sales. However, no LSQ dimension had a significant effect on shipper profitability.

Keywords: service quality; logistics service quality; LSQ; SERVQUAL; logistics service provider; priority non-conformity index; PNCI; financial performance.

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Biographical notes: Assadej Vanichchinchai is a Lecturer in the Faculty of Engineering, Mahidol University, Thailand. He received his PhD in Management of Technology from the Asian Institute of Technology, MSc (with distinction) in Engineering Business Management from the University of Warwick, and MEng in Engineering Management and BEng in Industrial Engineering from the Chulalongkorn University and LLB from Ramkhamhaeng University.

Nonglak Limsomkiat received her BBA in Marketing from the Bangkokthonburi University and MEng in Logistics and Supply Chain from the Mahidol University.

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1 Introduction

Even during the worldwide COVID-19 pandemic, the United Nations Conference on Trade and Development (UNCTAD) reported that the value of global trade had increased to reach a record level of \$28.5 trillion in 2021. This was 25% higher than 2020 and 13% higher than 2019 (UNCTAD, 2022). International logistics service providers including freight forwarders are key supply chain partners in global trade. Logistics service quality (LSQ) is critical to enable logistics companies to achieve performance excellence and customer satisfaction (Huma et al., 2020; Ahmed et al., 2019). Rahman (2006) revealed that traditionally the LSQ scale was initiated to assess the quality of internal logistics services. Later, it was further developed to evaluate the quality of external logistics services.

Zailani et al. (2018) and Kilibarda et al. (2016) extensively reviewed LSQ literature and reported that market segments have different service quality assessments. Researchers applied several LSQ dimensions and methods to study LSQ from various aspects (So et al., 2006; Baki et al., 2009; Barabino et al., 2012). Hu et al. (2022) used importance-performance analysis (IPA), goal difficulty and the Kano model to explore the quality of home delivery logistics services. Recently, the priority non-conformity index (PNCI) was initiated to measure resource allocation efficiency to enhance service quality in healthcare (Vanichchinchai, 2021a). PNCI concepts can be used to manage resources and improve service quality in any business. Michalski et al. (2022), Akbari (2018) and Feng et al. (2007) commented that most research into LSQ outsourcing was carried out in developed countries, and suggested that there should be more studies in developing countries. Many studies have explored the influences of LSQ on customer satisfaction or loyalty (Restuputri et al., 2021; Huma et al., 2020; Uvet, 2020; Ahmed et al., 2019; Meidute-Kavaliausjeine et al., 2014; Rafiq and Jaafar, 2007). Others, Fernandes et al. (2018) have examined logistics capabilities, while Forgas et al. (2010) studied reputation. Zailani et al. (2018) looked at competitiveness. Trade-offs between performance dimensions such as quality and cost are still debatable (Vanichchinchai, 2021d; Varabyov and Schreyog, 2018). Although increasing service quality can satisfy customers, it may negatively affect operating costs and financial performance (Vanichchinchai, 2021c). Literature on links between LSQ and financial performance is scarce. The objectives of this research, therefore, are to investigate shipper satisfaction on LSQ of freight forwarders, to assess resource allocation efficiency on LSQ, and to explore the effects of LSQ on sales and profitability of shippers in Thailand. Descriptive statistics, gap analysis, IPA, and PNCI were employed for analysis.

2 Literature review

2.1 Logistics service quality

Parasuraman et al. (1988) developed SERVQUAL composed of five dimensions: reliability, assurance, tangibles, empathy, and responsiveness (RATER) to assess service quality. SERVQUAL has since been widely applied and modified to evaluate service quality in various service businesses. Examples are shown in Vanichchinchai (2021a) and Chang et al. (2019) in healthcare, Datta and Vardhan (2017) and Vaz and Mansori (2013) in education, Al-Ababneh (2016) and Amballoor (2015) in hospitality. Some researchers attempted to develop more comprehensive service quality models by including more dimensions to the original SERVQUAL, for instance, in healthcare, Mahapatra (2013) with additional accessibility and affordability; Suki et al. (2011) with additional communication, courtesy, and understanding of customers; Buyukozkan et al. (2011) with additional professionalism.

In the context of logistics, Rafele (2004) proposed a LSQ framework comprised of tangible components, ways of fulfilment, and informative actions. Aktas and Ulengin (2005) identified LSQ with seven dimensions. These were reliability of the carrier, prompt response in the delivery cycle, prestige of the carrier, financial opportunities and flexibility to customer inquiries, reliability and quality of operations management and delivery cycle, ease of collaboration, accurate order receipts and follow-up. Feng et al. (2007) developed LSQ for online shopping, comprising six components: timeliness, personal contact quality, order quality, order discrepancy handling, order condition and convenience. Banomyong and Supatn (2011) extensively reviewed literature and identified LSQ for international freight forwarders based on SERVQUAL. Their model had 24 attributes in six dimensions: reliability, assurance, tangibles, empathy, responsiveness and cost. In the courier services industry in Malaysia, Ho et al. (2012) applied a modified SERVQUAL to measure the impacts of LSQ on customer satisfaction comprised of four dimensions: timeliness, condition/accuracy of order, quality of information and availability/quality of personnel. Thai (2013) developed a LSQ model from the perspective of users and providers that included five dimensions: customer focus quality, order fulfilment quality, timeliness, information quality and corporate image. Thongkruer and Wanarat (2020) comprehensively reviewed 52 examples of LSQ literature about the airline industry between 1993 and 2019 and identified six consequences of service quality: customer satisfaction, customer loyalty, trust, airline image, airline performance and perceived value.

Although many LSQ models exist, there are still no internationally accepted LSQ models. Feng et al. (2007) suggested that traditional LSQ scale was mainly developed for the US market and it cannot be applied to other markets because the components of LSQ can be affected by local communities. In addition, Zailani et al. (2018) commented that there were no LSQ models suitable for all industries. Recently, Vanichchinchai (2021a) extensively reviewed service quality literature and claimed that SERVQUAL is simple and practical for most service businesses. Neo et al. (2004) used SERVQUAL to evaluate service quality of logistics service providers in consumer goods businesses. So et al. (2006) applied analytic hierarchy process methods to assess the LSQ of four logistics service providers with five basic service quality dimensions. Chen et al. (2009) utilised SERVQUAL to assess service quality of sea transport. Baki et al. (2009) integrated SERVQUAL, the Kano model and quality function deployment to evaluate and improve

the LSQ in Turkey. Taskin and Durmaz (2010) employed modified SERVQUAL to explore the influences of LSQ and customer perception on the creation of value for customers. Barabino et al. (2012) applied a modified SERVQUAL to study the quality of urban bus transport in Sardinia, Italy. Seth et al. (2006) comprehensively reviewed LSQ literature and suggested that the gap analysis feature of the SERVQUAL framework is an applicable model for evaluating the LSQ of logistics service providers. Following a comprehensive literature review, Kilibarda et al. (2016) selected original SERVQUAL to analyse LSQ of freight forwarding firms in Serbia. LSQ in this study was therefore based on SERVQUAL. Cost is a key supply chain performance and relationship measure (Vanichchinchai, 2021b; ASCM, 2021). It is also a fundamental factor for buying decisions in general businesses. Earlier literature reported that quality improvement always needs additional resources leading to higher costs (Varabyov and Schreyog, 2018; Vanichchinchai, 2021d; Forgas et al., 2010), which negatively affects customer satisfaction. The trade-off between cost and quality performance is still inconclusive. Cost was included in LSQ in this research to explore customer satisfaction from more comprehensive dimensions, especially in the logistics business context in which cost is critical for competitiveness (Vanichchinchai and Apirakkhit, 2018).

2.2 Service quality techniques

Service quality should be comprehensively analysed from a number of perspectives (e.g., customer and service provider) (Vanichchinchai, 2021a), and with various tools (Hu et al., 2022). Parasuraman et al. (1985) proposed that customer satisfaction about service quality can be measured with service gaps or differences between customer perception and customer expectation on service quality. Customers are satisfied if their perceptions are equal to or exceed their expectations. Otherwise, they are dissatisfied. IPA initiated by Martilla and James (1997) is another tool, which can be used to analyse service quality and recommend strategies for improvement. IPA compares the importance (expectation) and performance (perception) of variables with their mean values, then graphically plots each variable in a matrix composed of four zones (i.e., keep-up-the-good-work, concentrate-here, low-priority, and possible-overkill). These zones suggest priorities for improvement. PNCI was proposed by Vanichchinchai (2021a) following an assessment of conformities between expectations (goals) and performance (resources) in order to quantitatively measure the efficiency of resource allocation in relation to goals (match, underperformed, and over performed). It can represent the degree to which service providers understand their customers, and suggest resource allocation strategies (proper attention, more attention, and less attention). PNCI can be applied together with IPA to improve resource allocation for higher service quality.

2.3 LSQ and performance

LSQ has been examined in various businesses. Examples include Gaudenzi et al. (2021) in B2B, Kasweng and Lambey-Checchin (2020) in grocery drive-through, Zailani et al. (2018) in food and beverage, Murfield et al. (2017) in omni-channel retail, Sohn et al. (2017) in the semiconductor manufacturing equipment industry, Rafiq and Jaafar (2007) in the logistics industry in the UK. LSQ is critical for creating competitiveness between logistics service providers (Zailani et al., 2018). Forgas et al. (2010) showed that airlines achieved better reputation, trust and lower costs through service quality. Many

researchers have confirmed the links between LSQ, customer satisfaction and loyalty (Uvet, 2020; Lisinska-Kusnierz and Gajewska, 2014; Chen et al., 2015). Rafiq and Jaafar (2007) suggested that LSQ had a significant influence on shipper satisfaction and loyalty. Meidute-Kavaliausjeine et al. (2014) revealed that LSQ increased the competitive advantage of service providers through consumer loyalty. Fernandes et al. (2018) reported that LSQ totally mediated the relationship between logistics capability and customer satisfaction. Ahmed et al. (2019) suggested that efficient logistics management was essential for customer satisfaction and loyalty. Huma et al. (2020) found that operational LSQ and relational LSQ had a significant impact on customer loyalty. Recently, Restuputri et al. (2021) found that LSQ had an impact on customer satisfaction, and that customer satisfaction affects customer loyalty.

The links between quality and cost have been discussed in many studies including Vanichchinchai (2021c, 2021d), Varabyov and Schreyog (2018), Forgas et al. (2010). Increasing quality and customer satisfaction may positively or negatively affect operational costs and financial performance. In the insurance business, Pooser and Browne (2018) found that customer satisfaction can increase productivity. For state-owned enterprises in China, Zhang and Pan (2009) found positive relationships between customer satisfaction, sales and profitability. However, Yeung and Ennew (2000) revealed that satisfaction had a positive financial impact although the direct effects were generally small. Only a small amount of literature has confirmed the relationships between LSQ and financial performance, which is the main goal of business. Thus, the following hypotheses were posited.

H1 LSQ of the freight forwarders has significant positive effects on sales of shippers.

H2 LSQ of the freight forwarders has significant positive effects on profitability of shippers.

3 Research methodology

In this study, a questionnaire was modified from Banomyong and Supatn (2011) and Kilibarda et al. (2016), which had been developed to assess LSQ, then tested in developing countries including Thailand. LSQ of freight forwarders in this research was composed of six dimensions: reliability (RL), assurance (AS), tangibles (TG), empathy (EM), responsiveness (RS) and cost (CT). Single questions about sales and profits of shippers were employed to evaluate their financial performance. An executive in a furniture exporting firm, an executive in a freight forwarding firm and an academic in logistics service validated the measurement instrument with index of item-objective congruence (IOC). The central institutional review board of the university approved the questionnaire to ensure compliance with international guidelines for human research protection. Each indicator in the questionnaire has paired questions to assess LSQ expectation and perception. A five-point Likert scale from 1 (strongly disagree) to 5 (strongly agree) was employed for evaluation. Information regarding the companies' and respondents' profiles was included to ensure legibility of the returned questionnaire. Data was collected from furniture exporting firms in the database of the Department of International Trade Promotion, Ministry of Commerce, Thailand using Google Forms. The targeted informants were exporting managers with at least one year of experience in

their companies. The returned questionnaires were screened to exclude ineligible, incomplete questionnaires and outliers. The final number of completed questionnaires was 237. Sample profiles are shown in Table 1.

Table 1 Sample profiles

<i>Characteristics</i>	<i>Count</i>	<i>%</i>
Respondents		
Middle management	193	81.4
Executive management	44	18.6
Revenue from export		
<25%	22	9.3
25–50%	44	18.6
51–75%	62	26.2
>75%	109	46.0
No. of employee		
<50	121	51.1
51–200	61	25.7
>200	55	23.2

4 Validity and reliability

SPSS AMOS 20 was utilised for data analysis in this study. Confirmatory factor analysis with maximum likelihood estimation was employed to assess the validity of the LSQ models. Sub-constructs were assessed to eliminate the items with weak loading coefficients, below 0.5. Consequently, six indicators, i.e., RL01 of reliability dimension and AS06, AS07, AS10 of assurance dimension were removed from the questionnaire. Multiple fit indexes, including chi-square divided by degree of freedom: (χ^2/df), goodness of fit index (GFI), comparative fit index (CFI), Tucker Lewis index (TLI) and standardised root mean squared residual (SRMR) were applied to examine the overall goodness of fit of each dimension. Generally, χ^2/df ratio should be below 3. GFI, CFI and TLI should be at least 0.9 and SRMR should be less than 0.1 (Hair et al., 1998). All measurement models met these suggested values and all p-values were well above 0.05 as shown in Table 2. Cronbach's alpha was utilised to ensure the reliability of the measurement items. Generally, a Cronbach's alpha score above 0.7 is considered a good value. However, a score of 0.6 is still acceptable in empirical research (Nunnally and Burnstein, 1994; Hair et al., 1998). Cronbach's alpha of all factors met this requirement.

5 Result and discussion

Descriptive statistics, gap analysis with paired sample t-test, IPA and PNCI were used analyse LSQ in the study as follows:

5.1 Level of service quality and satisfaction gap analysis

Using SERVQUAL without a cost dimension, Kilibarda et al. (2016) collected data from 120 customers of freight forwarding companies in Serbia and found that for both expectation and perception, responsiveness had the highest score, while assurance had the lowest score. Banomyong and Supatn (2011) revealed that reliability, assurance and cost were significantly related to logistics service provider selection. Rahman (2006) found that on-time delivery was the most important component of LSQ. Descriptive statistics were applied to measure levels of LSQ expectation, perception and satisfaction of shippers in this study as shown in Table 3. It was found that overall expectation was 4.836. Cost (4.973) was the most expected LSQ dimension according to Banomyong and Supatn (2011), while tangibles (4.626) was the least expected, For perception levels, reliability (3.854) had the highest scores, whereas assurance (3.722) was the lowest: similar to Kilibarda et al. (2016).

Table 2 Multiple fit indexes

	<i>Cronbach's alpha</i>	χ^2/df	<i>p-value</i>	<i>GFI</i>	<i>CFI</i>	<i>TLI</i>	<i>SRMR</i>
RL	0.688	0.064	0.800	1.000	1.000	1.024	0.0041
AS	0.856	0.124	0.725	1.000	1.000	1.008	0.0041
TG	0.865	0.163	0.686	1.000	1.000	1.007	0.0032
EM	0.692	1.458	0.227	0.996	0.996	0.988	0.0228
RS	0.803	1.464	0.186	0.988	0.993	0.983	0.0280
CT	0.798	0.321	0.571	0.999	1.000	1.014	0.0070
LSQ	0.897	3.214	0.012	0.983	0.991	0.965	0.0220

Table 3 Gap analysis

<i>Code</i>	<i>Description</i>	<i>Expectation</i>		<i>Perception</i>		<i>Gap</i>	<i>t-value</i>	<i>Sig.</i>
		<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>			
<i>OLSQ</i>	<i>Overall logistics service quality</i>	4.836	0.209	3.800	0.378	-1.036	42.660	<0.001
<i>RL</i>	<i>Reliability</i>	4.945	0.172	3.854	0.416	-1.091	38.856	<0.001
<i>RL01*</i>	Good service and consistency							
<i>RL02</i>	Problem solving on the spot	4.949	0.220	3.831	0.518	-1.118	33.398	<0.001
<i>RL03</i>	Accurate and well organised documents	4.949	0.220	3.865	0.494	-1.084	32.488	<0.001
<i>RL04</i>	Arrangement for shorter transit time	4.937	0.244	3.865	0.519	-1.072	31.251	<0.001
<i>AS</i>	<i>Assurance</i>	4.698	0.428	3.722	0.491	-0.976	30.733	<0.001
<i>AS05</i>	Company reputation	4.658	0.493	3.738	0.559	-0.920	24.715	<0.001
<i>AS06*</i>	Staff experience and competence							
<i>AS07*</i>	Tracking and traceability service							

Note: *deleted indicators.

Table 3 Gap analysis (continued)

<i>Code</i>	<i>Description</i>	<i>Expectation</i>		<i>Perception</i>		<i>Gap</i>	<i>t-value</i>	<i>Sig.</i>
		<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>			
AS08	One stop service	4.717	0.461	3.717	0.568	-1.000	26.117	<0.001
AS09	High standard service	4.717	0.470	3.709	0.600	-1.008	28.110	<0.001
AS10*	No damaged goods in transit							
<i>TG</i>	<i>Tangible</i>	4.626	0.513	3.724	0.491	-0.902	28.568	<0.001
TG11	Modern equipment (reloading, transportation facilities, etc.)	4.688	0.491	3.726	0.564	-0.962	27.458	<0.001
TG12	IT support (EDI, e-commerce services)	4.700	0.486	3.717	0.575	-0.983	26.006	<0.001
TG13	Proper staff clothing	4.487	0.693	3.729	0.618	-0.758	19.995	<0.001
<i>EM</i>	<i>Empathy</i>	4.873	0.234	3.827	0.418	-1.046	38.892	<0.001
EM14	Customer relationship management and service	4.738	0.450	3.730	0.555	-1.008	31.321	<0.001
EM15	Care for customer requirements and interests	4.932	0.251	3.793	0.508	-1.139	33.573	<0.001
EM16	Keeping confidential information of customers	4.949	0.220	3.958	0.476	-0.992	30.279	<0.001
<i>RS</i>	<i>Responsiveness</i>	4.903	0.154	3.828	0.396	-1.075	41.092	<0.001
RS17	Quick responses to fulfil customer requirements	4.970	0.170	3.852	0.486	-1.118	35.121	<0.001
RS18	Across the board service coverage	4.700	0.468	3.696	0.632	-1.004	24.367	<0.001
RS19	Providing up-to-date freight rates	4.975	0.157	3.861	0.453	-1.114	36.560	<0.001
RS20	Caring for customers with good treatment	4.857	0.351	3.781	0.531	-1.076	32.153	<0.001
RS21	Consolidation of cargo and service	4.949	0.238	3.903	0.445	-1.047	34.828	<0.001
RS22	Providing express delivery service	4.966	0.181	3.873	0.488	-1.093	34.550	<0.001
<i>CT</i>	<i>Cost</i>	4.973	0.104	3.847	0.414	-1.126	40.265	<0.001
CT23	Competitive price	4.958	0.201	3.852	0.478	-1.105	34.825	<0.001
CT24	Ease of payment method	4.987	0.112	3.895	0.471	-1.093	35.185	<0.001
CT25	Flexible credit terms	4.966	0.181	3.840	0.504	-1.127	34.339	<0.001
CT26	Discount offering	4.979	0.144	3.802	0.503	-1.177	36.383	<0.001

Note: *deleted indicators.

Kilibarda et al. (2016) reported that LSQ of freight forwarding firms in Serbia was not at a satisfactory level. They revealed significant dissatisfaction between perceptions and expectations of all SERVQUAL dimensions and overall. Empathy and reliability were the least and the most dissatisfied dimensions, respectively. In this research, paired-sample t-test was applied to assess satisfaction (differences between perceptions

and expectations) for overall LSQ, all dimensions and indicators as shown in Table 3. Similar to Kilibarda et al. (2016), there were significant negative gaps between perceptions and expectations in overall LSQ concerning every dimension and item as shown in Table 3. The overall LSQ gap was -1.036 . The cost dimension had most dissatisfaction (-1.126), whereas tangibles showed least dissatisfaction (-0.902).

5.2 Importance-performance analysis

To display all LSQ indicators and all dimensions in one IPA matrix, the mean scores of expectation and perception dimensions were set as zero values on the expectation and perception axes. Scales on IPA axes presented the differences between the scores of each item and the mean scores of its dimension. Expectation together with perception of each item was plotted on the IPA matrix in relation to the mean scores of its dimension. Similarly, each LSQ dimension was plotted with reference to the mean scores of overall LSQ expectation and perception as displayed in Figure 1 and Table 4.

Figure 1 IPA matrix (see online version for colours)

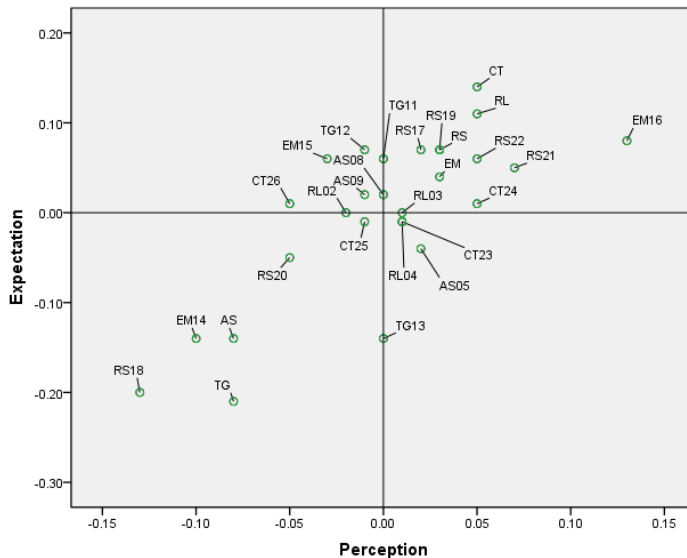


Table 4 IPA strategies

<i>Dimension</i>	<i>Keep-up-the-good-work</i>	<i>Possible-overkill</i>	<i>Low-priority</i>	<i>Concentrate-here</i>
Reliability	(RL), RL03	RL04	RS20	RL02
Assurance		AS05	(AS)	AS08, AS09
Tangibles	TG11	TG13	(TG)	TG12
Empathy	(EM), EM16		EM14	EM15
Responsiveness	(RS), RS17, RS19, RS21, RS22		RS18	
Cost	(CT), CT24	CT23	CT25	CT26
Count	12	4	6	6

Reliability, empathy, responsiveness and cost were plotted in the keep-up-the-good-work zone (upper-right quadrant). Compared with dimensions in other zones, they are LSQ strengths of freight forwarders. Assurance and tangibles were plotted in the low-priority (lower-left quadrant) zone. Freight forwarders should not pay much attention to, or concentrate on these two dimensions or other indicators in this zone. There were no dimensions in the possible-overkill zone (lower-right quadrant) or the concentrate-here zone (upper-left quadrant). This primarily showed that overall freight forwarders used resources for managing LSQ efficiently. It supported cost dimensions in the keep-up-the-good-work zone. Freight forwarders did not provide excessive attention or resources to any LSQ dimensions. However, there are still indicators in the possible-overkill and concentrate-here zones, which should be further improved. Excessive resources for indicators in the possible-overkill zone (i.e., RL04, AS05, TG13 and CT23) should be transferred to those in the concentrate-here zone for more shipper satisfaction.

5.3 *PNCI analysis*

To determine PNCI, expectations and perceptions of all dimensions were ranked by their scores. The absolute value of differences between rank of expectation and perception of each dimension was measured so as to identify conformity between the expectation and perception of that dimension. All absolute values were totalled, and then divided by the numbers of dimensions to quantify the overall non-conformity score between expectations and perceptions or PNCI. Zero is the best PNCI value.

Table 5 Integrated gap analysis, IPA and PNCI

<i>Dimension</i>	<i>Mean</i>			<i>Rank</i>			<i>PNCI</i>	<i>IPA strategy</i>	<i>PNCI strategy</i>
	<i>E</i>	<i>P</i>	<i>G</i>	<i>E</i>	<i>P</i>	<i>G</i>			
Reliability	4.945	3.854	-1.091	2	1	5	-1.00	Keep-up-the-good-work	Less attention
Assurance	4.698	3.722	-0.976	5	6	2	+1.00	Low-priority	More attention
Tangibles	4.626	3.724	-0.902	6	5	1	-1.00	Low-priority	Less attention
Empathy	4.873	3.827	-1.046	4	4	3	0.00	Keep-up-the-good-work	Proper attention
Responsiveness	4.903	3.828	-1.075	3	3	4	0.00	Keep-up-the-good-work	Proper attention
Cost	4.973	3.847	-1.126	1	2	6	+1.00	Keep-up-the-good-work	More attention
Overall	4.836	3.800	-1.036				0.67		

Notes: E = expectation, P = perception, and G = gap.

As shown in Table 5, overall PNCI of freight forwarders was 0.67. PNCI of each dimension was 0 to 1, which was not much different. Kilibarda et al. (2016) studied LSQ in Serbia using five SERVQUAL dimensions and a seven-point Likert scale. With this concept, PNCI of LSQ in Serbia was 0.40, showing more efficient resource allocation to satisfy customers rather than freight forwarders in Thailand. Although IPA in this study showed no dimensions in the possible-overkill and the concentrate-here zones, PNCI

further suggested that prioritisation of attention and resource allocation of freight forwarders can be improved to enhance shipper satisfaction. The dimensions with rank of expectation higher than that of performance (i.e., cost and assurance) underperformed and should receive more attention. The dimensions with rank of performance higher than that of expectation (i.e., reliability and tangibles) over performed and should receive less attention. The dimensions with rank of performance equal to that of expectation (i.e., responsiveness and empathy) received proper attention.

5.4 LSQ and financial performance

Multiple regression analysis was used to analyse the impact of LSQ performance on sales and profits as shown in Table 6. It was found that LSQ significantly affected sales, but did not affect profit significantly. Thus, H1 was accepted, and H2 was rejected. For H1, reliability, tangibles, responsiveness and cost had significant effects on sales. This is because empathy and assurance are less critical for customers in low-contact services such as exporting and freight forwarding businesses. Reliable and responsible delivery at low cost are competitive dimensions for higher sales of exporting firms. Improvement of freight forwarders in these LSQ dimensions can increase shippers' sales according to (Zhang and Pan, 2009).

For profitability in H2, there are trade-offs between cost and non-cost performance. Higher cost will reduce profit. More investment and expenditure are required to enhance quality (Vanichchinchai, 2021d; Varabyov and Schreyog, 2018). Consequently, although increasing service quality improved customer satisfaction and loyalty (Restuputri et al., 2021; Huma et al., 2020; Uvet, 2020; Ahmed et al., 2019), it often increased costs and then did not always increase profitability according to Yeung and Ennew (2000).

Table 6 Multiple regression analysis

	<i>Sales</i>			<i>Profit</i>		
	<i>B</i>	<i>t</i>	<i>Sig.</i>	<i>B</i>	<i>t</i>	<i>Sig.</i>
RL	0.219	2.521	0.012*	-0.009	-0.099	0.921
AS	0.068	0.693	0.489	0.131	1.284	0.200
TG	-0.239	-2.423	0.016*	-0.117	-1.144	0.254
EM	0.099	0.937	0.350	0.194	1.771	0.078
RS	0.487	3.664	0.000*	0.154	1.120	0.264
CT	-0.236	-2.259	0.025*	0.086	0.791	0.430
R ²		0.227			0.171	
Adjusted R ²		0.207			0.150	

6 Implications

Shippers in this study give most importance to cost and pay least attention to tangibles. This is because cost is a major factor for customers in general businesses including logistics. Logistics is a low-contact service when compared with hospitality, healthcare or education. Thus, shippers do not expect much from physical tangible facilities. It is

suggested that in addition to traditional SERVQUAL, a cost dimension should be included into the LSQ framework.

Although cost performance of freight forwarders ranked second in relevance to other LSQ dimensions, it is insufficient. Shippers are still dissatisfied most with cost because of its highest expectation. Cost performance needs further improvement. With reference to measurement indicators in this study, shippers required discounts and suitable credit terms. However, responses to customer requirements and satisfaction about the cost dimension must be done carefully. They should not affect quality, other non-cost performance dimensions or total profit of service providers. Creative cost reduction such as lean principles should be initiated to eliminate waste leading to higher quality and lower cost. Measures in the possible-overkill zone of IPA should be reduced or transferred to those in the concentrate-here zone. For example, investment in tangible facilities, which is often high, but receives the least expectation and least dissatisfaction from shippers should be reduced.

Customers give unequal importance to service quality dimensions. Service providers should understand the priorities of customer expectations, and allocate limited resources efficiently to each service quality dimension in accordance with such priorities. Over performing with excessive resources on unimportant dimensions is wasteful, while underperforming with insufficient resources on key dimensions leads to customer dissatisfaction. PNCI is a simple but applicable tool to assess understanding about customer requirements or efficiency in resource allocations to service quality dimensions by comparing performance relevant to expectations. It can be used regardless of the description of the variables, the numbers of variables, or the range of measurement scales. Thus, PNCI can be used for quantitative benchmarking between firms, countries or as a baseline for self-improvement. In this study, although IPA suggested the keep-up-the-good-work strategy for cost and reliability, PNCI further recommended transferring excessive attention and resources from reliability to improve cost. This is because cost and reliability were the most and second most expected dimensions, whereas reliability and cost were the most and second most performed dimensions. Similarly, assurance and tangibles were plotted as low-priority in the IPA matrix. PNCI further advised transferring some attention from tangibles to assurance. In respect to shipper expectation, assurance and tangibles ranked 5 and 6, respectively. However in relation to freight forwarder performance, assurance and tangibles ranked 6 and 5, consecutively. Freight forwarders need to understand shipper requirements more to improve their resource allocations in order to satisfy shippers efficiently.

Logistics service providers are key partners in businesses, especially those involved in exporting. Improvements to critical LSQ dimensions (i.e., reliability, tangibles, responsiveness and cost) of freight forwarders significantly increase shippers' sales. Freight forwarders and shippers should pay more attention to these competitive dimensions. However, such improvements always require expense or investment leading to higher costs and freight rates. As a result, shippers' profits will not significantly increase. When working together for higher LSQ, shippers and freight forwarders must carefully consider suitable levels of improvement and their effects on sales, cost and profit.

7 Conclusions

Service quality should not be analysed with a single tool or technique. Descriptive statistics, gap analysis, IPA, PNCI and multiple regression analysis can be integrated to investigate service quality for more accurate results and strategies. PNCI can be used to support gap analysis and IPA, and to suggest improvement strategies in more detail. In this research, shippers in Thailand expected most on cost and least on tangibles. Thus, conceptually, cost should be included in the LSQ model and used to evaluate LSQ. Freight forwarders performed most on reliability, and least on assurance. There was significant dissatisfaction on overall LSQ: every dimension and indicator. Cost and tangibles were the most and the least dissatisfied dimensions, respectively. No dimensions in the possible-overkill zone in IPA showed efficient allocation of limited resources for LSQ. However, PNCI further recommended giving more attention and resources to underperforming dimensions (i.e., cost and assurance) and less attention to over performing ones (i.e., reliability and tangibles). Investment in physical tangibles should be reduced to improve costs. Although LSQ improvement cannot directly increase profit, shippers should encourage freight forwarders to improve reliability, tangibles, responsiveness and cost for higher shippers' sales and market share. Appropriate levels of resources for individual LSQ dimension should be considered.

In future studies, back translation should be conducted by translating the English questionnaire to Thai and back to English. This improves translation between English and Thai to enhance reliability of the measurement instrument. Other specific frameworks for logistics service providers such as warehousing service providers, ocean liners, or airlines should be further developed and tested in developing countries. LSQ expectation and performance in this research is based on perceptual opinions. In future research, actual operational data (e.g., complaints, actual sales and profit) should be incorporated and analysed for more reliable data and accurate results. Multiple respondents should be used by collecting data from at least two respondents per company to improve reliability of the obtained data. Characteristics of responding firms (e.g., size and nationality of major shareholders) or even individual informants (e.g., gender and age) may affect the expectation, perception and satisfaction. The impact of these contexts should be further investigated.

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