# An Empirical Assessment of Maritime Logistics Service Quality in Myanmar

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## ABSTRACT

This research empirically examines the composition of maritime logistics service quality and its impact perceived by both service providers and customers in Myanmar maritime transport industry. With the strong support of exploratory factor analysis (EFA) and structural equation modeling (SEM) analysis, the findings indicate that such a maritime logistics service quality (MLSQ) is represented by the six-dimensional construct consisting of logistics professional skills, resource, process, outcome, service costs, and image along with the associated measurement indicators. In addition, each of the six dimensions of maritime logistics service quality has a significant positive effect on customer satisfaction as well as long-term commitment. The significant direct relationship between customer satisfaction and long-term commitment of the customer to repurchasing intent of the service is also confirmed. Some insights, academic and managerial implications, and limitation of the research are further discussed.

**Keywords:** Maritime logistics service quality (MLSQ), Dimension, Measurement indicator, Customer satisfaction, Long-term commitment

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# 1. Introduction

In accordance with the increasingly important role of maritime transportation as a result of growing international and intraregional trade (UNCTAD, 2009; Berle et al., 2011), the key players of maritime transport industry including shipping companies and agencies, port and terminal operators, and freight forwarders are encouraged to provide a wider variety of logistics services nowadays (Lee, 2010). For instance, some sort of logistics services such as door-to-door service, multimodal service, and other integrated services provided by shipping companies seem necessary for shippers for the reduction of total transaction costs (Chen et al., 2009; Fremont, 2009). Moreover, Wang (2008), Berle et al. (2011), and Bae (2012) highlighted the role of ports in the maritime transport context and it has been found that port's activities of movement of cargo are well integrated with value-added logistics services such as warehousing, packaging, repackaging, and labeling. Lu and Dinwoodie (2002), Burkovskis (2008), and Banomyong and Supatn (2011) further mentioned that freight forwarders are responsible not only for transporting freight but also for facilitating trade transaction by providing shippers with various logistics service activities such as booking space, documentation, customs clearance, consolidation services for small scale exporters, negotiating with shipping lines or other carriers, and support coordination between all related parties.

In an attempt to gain a competitive advantage over its competitors, the key players of maritime transport industry must place great emphasis on the quality of logistics services that they provide the customers such as manufacturers and traders in their respective business areas. Undoubtedly, customer satisfaction as well as long-term commitment of customers to the logistics service delivered in the maritime transport industry can be achieved through the improved service quality. In this regard, the conceptualization and assessment of perceived service quality in various industries including shipping industry have been the most debated topics in the services marketing literature to date (Brady and Cronin, 2001). However, it is absolutely new to Myanmar.

Myanmar, one of the developing countries in Southeast Asia, is now in a transition period of opening up to trade, encouraging foreign investment, and deepening its financial sector in line with country's wide-ranging economic and policy reforms (ADB, 2012), and consequently it is expected to increase its maritime trade with foreign countries in the near future. The vital role of logistics service in maritime transport industry of Myanmar has also been acknowledged in this regard. However, UNCTAD (2003) reported that most of the developing countries are usually confronted with a number of factors such as technologies and physical infrastructure; security and safety; facilitation; legal aspects; and market access that are particularly detrimental to their countries' logistics service quality. Moreover, there are also different obstacles as to each of these factors and thus many of importers; manufacturers and exporters have only limited access to logistics service provided by local service providers in these countries. Such considerations led to a main reason for the necessity of research on how to assess maritime logistics service quality and what influencing factors are of critical importance to its substantial improvement in Myanmar context.

A number of previous studies found out the service quality attributes which have been used as selection criteria for mode, carrier and logistics service providers in specific shipping industry such as container shipping or liner shipping, and tramp shipping (Lu, 2000; Koo et al., 2009; Yang et al., 2009; Banomyong and Supatn, 2011; Thai et al., 2014). This research aims to investigate service quality indicators which represent the logistics service quality of maritime transport industry as a whole titling maritime logistics service quality (MLSQ). The research further intends to develop and empirically test the conceptual model that indicate the relationship between maritime logistics service quality (MLSQ), customer satisfaction, and long-term relationship between service providers and customers in Myanmar maritime transport industry.

# 2. Conceptual background and research model

## 2.1 Service quality

Service quality refers to an overall evaluation of the service delivery system of a firm and it can also be defined as the customer's overall impression of the relative inferiority or superiority of the firm's performance (Martinez and Martinez, 2010). Further, service quality has often been viewed as the evaluation of discrepancy between customers' expectation and actual service performance (Ruyter et al., 1997). Moreover, they indicated that service quality is an antecedent of customer satisfaction, and the perception of customers on the service performance is the most important indicator of service quality. In addition, service quality can be formed as a multidimensional construct of service related attributes being assessed by the customers (Ekinci, 2001; Kang and James, 2004). There have been a number of previous studies that explore the different dimensions of service quality along with associated measureable items in order to evaluate the performance of various service industries (Donabedian, 1980; Parasuraman et al., 1988, 1991, 1994; Brady and Cronin, 2001; Ekinci, 2001; Kang and James, 2004; Fullerton, 2005; Thai, 2008). According to Durvasula et al. (1999) and Chowdhary and Prakash (2007), a generalization of quality dimensions in evaluating the service quality was not possible among all types of services due to the variation in basic nature and consequently the measurement indicators involved in the formation of quality dimensions for the assessment of service quality are specific to each and every service industry.

## 2.2 Logistics service quality

Delivering logistics services is of critical importance to the effective supply chain management (SCM) in order to sustain a strategic competitive advantage through increased customer satisfaction (Bottani and Rizzi, 2006). According to Caro and Garcia (2007), logistics service quality is considered as a major criterion for a firm to differentiate itself from its competitors and thus offering better logistics services

from the firm is necessary in competitive situations in which logistics services are relatively important than characters and price of the product. In this regard, on the one hand the internal differentiation of a firm may focus on the number and level of different logistics services offered, but on the other value-added logistics service alternative is considered as the traditional major external logistics differentiation factor.

Due to the today's increasingly competitive and complex business nature, well-trained and skilled logistics professionals have become essential for a better logistics operational performance (Thai et al., 2011; Murphy and Poist, 1998, 2007; Mangan and Christopher, 2005). Furthermore, Wong and Karia (2010) suggested that logistics performance can be examined through firm's resources including physical resources, technology resources, and managerial competence. They also pointed out that firm's strategies, process capabilities, and resources are traditional explanatory factors for the competitive advantages of logistics service providers. In addition, physical resources including logistics hubs, warehouse capacities and transport vehicles are essential for delivering cargo, and hence these resources plays an important role in controlling logistics activity as well as improving reliability and speed of delivery (Murphy and Poist, 2000).

In accordance with the growth of maritime transportation as a result of intensifying trade globalization these days, adverse environmental impact and resource depletion have been imposed by the pollution and waste generated from ship operations (Lai et al., 2011). In this regard, Psaraftis and Kontovas (2010) explored the trade-offs between logistics efforts and policies to reduce the shipping-related environmental problems. They further postulated that the examination on the contribution of green shipping practices (GSPs) to the development of logistics service capability in shipping firms will be beneficial to improving and balancing environmental and productivity performance in their logistics operations. In order to assess the logistics service quality in various industries, some authors have developed the distinct quality constructs consisting of different dimensions represented by the relevant measurement indicators (Anderson et al., 1998; Mentzer et al., 1999; Lu, 2000; Rafele, 2004; Bienstock et al., 2008; Kersten and Koch, 2010; Banomyong and Supatn, 2011).

## 2.3 Maritime logistics service quality (MLSQ)

The conceptualization of maritime logistics service quality (MLSQ) is based on the concept of service quality and logistics literature. The term maritime logistics service quality (MLSQ) can be conceptualized as the customers' overall evaluation of logistics services which are delivered by the key logistics service providers of the maritime transport industry including shipping companies and agencies, port and terminal operators, and freight forwarders in the movement of goods and services together with information worldwide by sea. In the maritime transport context in order to offer the efficient and reliable logistics service; for example, door-to-door delivery service to the customer, maritime transport operators are forced to coordinate with operators of other modes of transport such as road, rail, and air. It is consequently suggested from the literature that logistics professional skills is necessary for maritime

transport operators to accomplish such sort of logistics integration system. Furthermore, it can be seen repeatedly from literature not only on general service quality but also on logistics related service quality that resource, process, outcome, service costs and image are strategically important for the quality assessment of customer service. Additionally, the environmental problems caused by shipping and port-related cargo movement activities in the international trade have been widely noticed by customers nowadays. Hence, maritime logistics service providers are encouraged to respond to such environmental concerns by adopting environmental management practices; for instance, green shipping practices in their operations in an environmentally responsible manner.

Accordingly, the maritime logistics service quality (MLSQ) is further conceptualized as a construct of seven dimensions along with their related measurement indicators. These dimensions include : (i) Logistics professional skill (LPS) which refers to the provision of skills and knowledge being necessary for senior-level logisticians or logistics managers who perform a logistics operation in the maritime transport industry; (ii) Resource (RES) which refers to anything tangible or intangible owned or acquired by a service firm; (iii) Process (PRO) which refers to the evaluation of how service is delivered during the service performance; (iv) Outcome (OUT) which refers to the evaluation of what services are delivered after the service performance; (v) Service costs (COS) which refers to any financial offer resulted from the differentiated logistics activity; (vi) Image (IMA) which refers to the corporate reputation that reflects the customer perception of firm's performance; and (vii) Environmental responsibility (ENV) which refers to the evaluation of the performance of the firm on environmental protection against adverse impacts caused by cargo movement and its concomitant logistics activities. The measurement indicators that represents each dimension of maritime logistics service quality (MLSQ) are extracted on the basis of findings from previous literature and semi-structured interviews conducted with a number of practitioners and academics in the logistics related field of maritime transport industry.
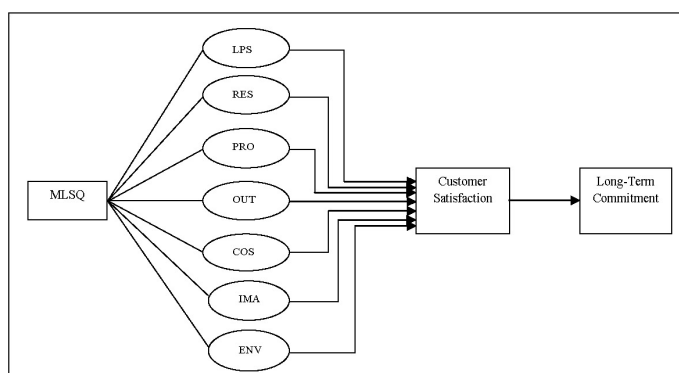


Figure 1. Conceptual model of maritime logistics service quality (MLSQ)

## 2.4 Customer satisfaction and Long-term commitment

Customer satisfaction refers to an outcome assessment of the extent to which customers are pleased and have positive emotional evaluation of providers' service performance (Flint et al., 2011). In addition, customers satisfaction is often based on the perception of how the service is offered and the main concurrence is that a satisfied customer is more likely to be loyal and a long-term client of the service provider (Caruana et al., 1999; Durvasula et al., 2002). Several previous empirical studies examined the relationship between perceived service quality and customer satisfaction in various service settings and they confirmed that service quality is positively related to customer satisfaction (Brady and Robertson, 2001; Cronin et al., 2000; Dabholkar et al., 2000; Yang et al., 2009; Deng et al., 2010). Long-term commitment refers to the loyalty of customers operationalised by their intention of continuing a long-term relationship with service providers or repurchasing services from the service provider (Wong and Karia, 2010). In this regard, building strong long-term relationship with customers or developing the loyalty of customers can be regarded as the key factor in winning market share and sustaining competitive advantage for the service providers (Deng et al., 2010; Flint et al., 2011). According to Fornell (1992), high customer loyalty is mainly resulted from high customer satisfaction. In addition, Sivadass and Baker-Prewitt (2000) stated that the long-term commitment reflected by customer loyalty is the ultimate objective of customer satisfaction measurement. Accordingly, it is anticipated in this research that maritime logistics service quality (MLSQ) has a positive effect on long-term commitment of customers to the logistics service delivered by the service providers of maritime transport industry through the enhanced customer satisfaction.

## 2.5 Conceptual model and research hypotheses

The conceptual model of maritime logistics service quality (MLSQ) is presented in Fig. 1 which portrays the association between the perceived maritime logistics service quality (MLSQ) and the outcome in terms of customer satisfaction which effects the long-term commitment of customers to repurchasing intent of the service. In this conceptual model, the maritime logistics service quality (MLSQ) is viewed as an antecedent of customer satisfaction and long-term commitment, and a number of reasonable hypotheses on the conceptual model are proposed as follows.

**Hypothesis 1:** Maritime logistics service quality (MLSQ) is described by a seven-dimensional construct and there is a positive effect of MLSQ on the customer satisfaction. In particular, the seven dimensions of MLSQ such as logistics professional skills (LPS), resource (RES), process (PRO), outcome (OUT), service costs (COS), image (IMA) and environmental responsibility (ENV), are hypothesized to have a positive effect on customer satisfaction.

**Hypothesis 2:** There exists a positive relationship between customer satisfaction and long-term commitment.

**Hypothesis 3:** Maritime logistics service quality (MLSQ) has an indirect positive

effect on the long-term commitment through customer satisfaction. Particularly, each of the dimensions of MLSQ has an indirect positive effect on the long-term commitment through customer satisfaction.

# 3. Research methodology

## 3.1 Survey instrument

The research instrument for the study is a questionnaire designed to collect data on logistics service quality of maritime transport industry and its concomitant impact perceived by both service providers and customers. The research instrument was developed through a two-step process. Firstly, an extensive literature review in the area of transportation, production economics, energy policy, management, customer service, marketing, and logistics was conducted in order to gain insight into composition of maritime logistics service quality, customer satisfaction, and long-term commitment. Secondly, a number of semi-structured interviews with practitioners and academics were carried out to identify and confirm the relevance and appropriateness of dimensions along with associated measurement items/indicators for the assessment of maritime logistics service quality in Myanmar.

The instrument was then pilot-tested with a group of 30 part-time postgraduate students studying for the postgraduate degree in shipping management and port management in the Myanmar Maritime University. These postgraduate students were chosen to pretest the questionnaire due to their proper work experience and educational background in relation to the maritime related logistics services as some of them are currently working in shipping lines and shipping agencies, port management companies, and freight forwarding companies, whereas some are working in export and import companies operated through the maritime transportation. Although some minor wording mistakes were found, the results of the pilot test proved to be satisfactory since all the respondents found that most of the questionnaire items are relevant, appropriate and clearly understandable.

## 3.2 Measures

Measures for seven quality dimensions conceptualized in this study including logistics professional skills, resource, process, outcome, service costs, image, and environmental responsibility were constructed based upon the previous studies as well as information collected from 26 semi-structured interviews with practitioners and academics in the field of shipping and port logistics in Myanmar. Each of such latent dimensions of maritime logistics service quality was measured by multi-indicator scale and all those indicators were subsequently scored against a five-point Likert scale anchoring from "1 = extremely unimportant" to "5 = extremely important".

In order to assess the dimension of logistics professional skills, eight measurement indicators were adapted from Murphy and Poist (1998), Mangan and Christopher

(2005), Murphy and Poist (2007), Daud et al. (2010), and Thai et al. (2011). Similarly, eight measurement items were used to measure the dimension of resource based on the previous studies (Lu, 2000; Murphy and Poist, 2000; Lai et al., 2004; Fullerton, 2005; Thai, 2008; Yang et al., 2009; Wong and Karia, 2010). Process dimension was measured by seven indicators extracted from Anderson et al. (1998), Lu (2000), Fullerton (2005), Bienstock et al. (2008), Thai (2008), Yang et al. (2009), Wong and Karia (2010), Kersten and Koch (2010), and Banomyong and Supatn (2011). Thirteen measurement items adapted from Anderson et al. (1998), Lu (2000), Murphy and Poist (2000), Durvasula et al. (2002), Fullerton (2005), Bienstock et al. (2008), Thai (2008), Yang et al. (2009), Kersten and Koch. (2010), and Banomyong and Supatn (2011) were used to assess the dimension of outcome. Five measurement items were extracted from Pirttila and Huiskonen (1996), Anderson et al. (1998), Lu (2000), and Banomyong and Supatn (2011) to measure the service costs dimension. Dimension of image was assessed by four items adopted from the previous studies (Lu, 2000; Thai, 2008; Kersten and Koch, 2010). Lastly, three measurement items were adapted from Thai (2008), Psaraftis and Kontovas (2010), Lindstad et al. (2011), Fitzgerald et al. (2011), Lai et al. (2011), and Thai et al. (2011) to measure the dimension of environmental responsibility.

In this research, the impact of maritime logistics service quality was evaluated through customer satisfaction and the extent of long-term relationship between service providers and customers. Measurement indicators of three items for customer satisfaction were built on a literature basis (Hayes, 2008; Lewin, 2009; Li, 2011). In the same way long-term commitment of customers to the logistics service rendered by the providers in maritime transport industry was measured by three measurement items adapted from the previous studies (Deng et al., 2010; Udo et al., 2010; Li, 2011; Zhao et al., 2012).The indicators for the constructs of customer satisfaction and long-term commitment were scored by five-point Likert scale anchoring from "1 = strongly disagree" to "5 = strongly agree". A list of survey items used to assess the maritime logistics service quality, customer satisfaction, and long-term commitment are included in Table 2.

## 3.3 Sample and data collection

The survey was conducted in Yangon where is the major place of doing maritime transport business in Myanmar. The data used to test the hypotheses were collected from both service providers and customers because several studies have indicated that front line providers' perceptions are highly correlated with those of customers not only in their overall assessment of service quality, but also in their evaluation of specific aspects of the firm's service setting (Schneider and Bowen, 1985; Schlesinger and Zornitsky, 1991; Tornow and Wiley, 1991; Goodale et al., 1997). In addition, although the majority of service quality research has focused on customers as the primary source of data (Parasuraman et al., 1988, 1991; Carman, 1990; Cronin and Taylor, 1992), in some respects service providers are superior to customers as a source of service quality data (Goodale et al., 1997). The inclusion of both service providers and customers in this research was further expected to gain a comprehensive

and wider perception of logistics service quality of maritime transport industry as a whole.

The unit of analysis for this research was defined as each individual logistics service provider's company and customer's company. The research population of maritime logistics service providers is being composed of three categories of service providers such as shipping companies and agencies, port and terminal operators, and freight forwarders who provide their customers with logistics services in the Myanmar maritime transport industry. The samples of shipping companies and agencies as well as port and terminal operators were selected from the registered lists controlled by the Department of Marine Administration (DMA) under the Ministry of Transport in Myanmar, whereas the sample of freight forwarders was selected from the members' list of the Myanmar International Freight Forwarders' Association (MIFFA). On the other hand, the sample of customers was selected from the population of exporters and importers who run the business of manufacturing and/or trading and are registered in the members' list of the Union of Myanmar Federation of Chambers of Commerce and Industry (UMFCCI).

**Table 1.** Profile of the respondent companies

| Service provider companies | | Customer companies | |
|---|---|---|---|
| Respondent's position | Business category | Respondent's position | Business category |
| Administrator 1.39% | Freight forwardin 51.39% | Assistant director 6.35% | Manufacturing 36.51% |
| Assistant manager 17.36% | Port operation 7.99% | Assistant manager 18.65% | Trading 63.49% |
| Deputy general manager 4.16% | Shipping 40.62% | Director 21.03% | |
| Director 10.07% | | Manager 49.84% | |
| General manager 2.78% | | Managing director 4.13% | |
| Manager 55.21% | | | |
| Managing director 9.03% | | | |
| Length of service in years | No. of employees | Length of service in years | No. of employees |
| < 5 39.24% | < 200 89.92% | < 5 36.11% | < 300 76.19% |
| 5-9 35.07% | 200-399 4.51% | 5-9 31.75% | 300-599 9.92% |
| 10-14 17.71% | 400-599 4.17% | 10-14 21.83% | 600-899 7.54% |
| 15-19 6.25% | 600-899 0.70% | 15-19 8.33% | 900-1199 2.78% |
| ≥ 20 1.73% | ≥ 900 0.70% | ≥ 20 1.98% | 1200-1499 2.38% |
| | | | ≥ 1500 1.19% |

| Ownership | | | | | Ownership | | | |
|---|---|---|---|---|---|---|---|---|
| | Freight forwarding | Port operation | Shipping | **Total** | | Manufacturing | Trading | Total |
| Local | 148 | 17 | 105 | 270 (93.75%) | Local | 22 | 160 | 182 (72%) |
| Foreign-local | - | 1 | - | 1 (0.35%) | Foreign-local | 26 | - | 26 (10%) |
| Foreign-owned | - | 5* | 12 | 17 (5.90%) | Foreign-owned | 44 | - | 44 (18%) |
| Total | 148 | 23 | 117 | 288 (100%) | Total | 92 | 160 | 252 (100%) |

*Under the build, operate and transfer (BOT) scheme

Since the size of the population of maritime logistics service providers in Myanmar is not very large, all the population elements of 331 consisting of 147 shipping companies and agencies, 23 port and terminal operators, and 161 freight forwarding companies

were considered to be included in the sample in this research. The total population elements of customers were shown as 857 in the members' list of the Union of Myanmar Federation of Chambers of Commerce and Industry (UMFCCI) by the end of March, 2013, and thus the sample size was determined to be 270 by using the sample size table of Saunders et al. (2009). For this reason, 331 final versions of questionnaires together with the cover letter and self-addressed envelope for returning the responses were sent to the service provider companies and also those of 270 were sent to the randomly selected customer companies in the first week of January, 2014 using standard mail survey procedures suggested by Dillman (1991). A follow-up mailing was sent four weeks after the initial mailing and subsequently a total of 561 responses consisting of 296 from the service providers and 265 from the sample group of customers were received over a three-month period. Out of these returned questionnaires, 21 were rejected due to being unreasoning and significantly incomplete answers. There were 288 usable responses from service provider companies with a response rate of 87%, and 252 usable responses from customer companies with a response rate of 93%, respectively. The total number of usable responses were therefore 540, and the overall response rate of this research was 89.85%.

Table 1 reports the organizational characteristics of the respondent companies. It was found that more than 80% of responses come from those whose position is manager and above endorsing the reliability of the survey findings. In addition, over half (52.78%) of the responding service provider companies had worked in delivering their service for 5 to 14 years while 39.24% for less than 5 years. Similarly, 53.58% of the responding customer companies had been in operation for 5 to 14 years and 36.11% for less than 5 years respectively. Further, the responding service provider companies include 148 freight forwarding companies (51.39%), 117 shipping companies and agencies (40.62%), and 23 port and terminal operators (7.99%), whereas the responding customer companies are composed of 92 manufacturing companies (36.51%) and 160 trading companies (63.49%) respectively in this research. The vast majority of responding service provider companies are quite small with below 200 employees (89.92%) and only port and terminal operators act as a large service delivery firm with more than 600 employees in Myanmar maritime transport industry. In contrast, the largest proportion (76.19%) of responding customer companies operate their business with less than 300 employees, and only manufacturing companies manage 600 and above employees. As regards the ownership pattern, more than 90% of the service provider companies are local firms while only a few proportions: 0.35% and 5.90% are foreign-local firm and foreign-owned firms respectively. Similarly, the majority of customer companies (72%) are local firms, while 10% and 18% are foreign-local firms and foreign-owned firms respectively.

# 4. Data analysis and findings

## 4.1 Comparison of perceptions between service provider and customer

The data analysis was initially started with comparison of perceptions between service provider and customer in assessing the importance or agreement of each and every indicator that can capture the proposed dimensions of maritime logistics service quality and its concomitant impact. The independent t-test and Levene's F-test were used to test whether there is a marked difference in the assessment of quality indicators between service provider and customer in terms of mean score and its variance respectively. The p-value for examining the significance of t and F statistics were described in Table 2. The results showed that the only one indicator, namely discount offering is statistically significant at 5% significance level since both of the p-value were lower than 0.05 meaning that the indicator of discount offering was assessed differently by service providers and customers. However, almost all the indicators ensured the remarkable similarity of perceptions between service providers and customers. Therefore, the comparison results of t-test and F-test were strong enough to support combining the observed data collected from service providers and that from customers for subsequent analyses.

## 4.2 Factor structure of maritime logistics service quality

Factor analysis is a useful technique for reducing a large set of variables to a smaller set of underlying factors in order to detect the presence of meaningful patterns among the observed variables (Field, 2009). In this research, an exploratory factor analysis (EFA) with principal component extraction and oblique rotation was performed by using the statistical software SPSS 17 to identify the strategic latent dimensions (factors) represented by proposed measurement items ensuring the construct validity (Rossiter, 2002). The sufficiency of the data for performing factor analysis was indicated through the Kaiser-Meyer-Olkin (KMO) of 0.946 with p-value of 0.000 for Bartlett's test of Sphericity (Hair et al., 1998). A large KMO value which exceeds the acceptable limit of 0.50 and a high level of significance of the test of Sphericity suggest that the inter-correlation matrix contains enough common variance to make factor analysis worth pursuing (Norusis, 2002). The exploratory factor analysis showed that most measurement indicators could determine each dimension of maritime logistics service quality as proposed. However, measurement items for the dimensions of image and environmental responsibility were loaded on the same factor. The cut-off point of loading was

**Table 2.** Comparison results

| Dimension | Quality Indicators | Mean (Provider) | Mean (Customer) | Mean Difference | P-value (Mean) | P-value (Variance) |
|---|---|---|---|---|---|---|
| Logistics Professional Skills (LPS) | LPS1. Ability of managing customer relationship | 3.37 | 3.23 | 0.14 | 0.150 | 0.977 |
| | LPS2. Problem-solving ability | 3.50 | 3.38 | 0.12 | 0.220 | 0.402 |
| | LPS3. Cost control ability | 3.38 | 3.43 | -0.05 | 0.607 | 0.012* |
| | LPS4. Strategic management ability | 3.09 | 3.15 | -0.06 | 0.590 | 0.033* |
| | LPS5. Risk management ability | 3.08 | 2.96 | 0.12 | 0.250 | 0.238 |
| | LPS6. Ability of identifying opportunities and threats | 3.38 | 3.21 | 0.17 | 0.083 | 0.769 |
| | LPS7. Ability of using knowledge | 2.86 | 3.06 | -0.20 | 0.058 | 0.486 |
| | LPS8. Professional integrity | 3.44 | 3.42 | 0.02 | 0.822 | 0.196 |
| Resource (RES) | RES1. Physical infrastructure | 3.47 | 3.35 | 0.12 | 0.208 | 0.743 |
| | RES2. Supportive regulation | 3.41 | 3.42 | -0.01 | 0.876 | 0.507 |
| | RES3. Equipment and facilities availability | 3.51 | 3.37 | 0.14 | 0.179 | 0.052 |
| | RES4. Shipment tracking capability | 3.04 | 3.04 | 0.00 | 0.951 | 0.629 |
| | RES5. Financial stability | 3.34 | 3.31 | 0.03 | 0.678 | 0.112 |
| | RES6. Frequency of sailings and geographical coverage of service | 3.08 | 3.13 | -0.05 | 0.604 | 0.008* |
| | RES7. Skillful human resource | 3.36 | 3.35 | 0.01 | 0.870 | 0.902 |
| | RES8. Knowledge of customer needs and requirements | 3.45 | 3.37 | 0.08 | 0.358 | 0.455 |
| Process (PRO) | PRO1. Timely response to customers' inquiries and request | 3.43 | 3.30 | 0.13 | 0.165 | 0.288 |
| | PRO2. Meeting customers' requirements | 3.15 | 3.06 | 0.09 | 0.399 | 0.558 |
| | PRO3. Effective support of IT and EDI | 3.44 | 3.44 | 0.00 | 0.936 | 0.159 |
| | PRO4. Personal contact and relationship | 3.37 | 3.39 | -0.02 | 0.790 | 0.292 |
| | PRO5. Accommodating the changes needed by customers | 3.39 | 3.47 | -0.08 | 0.420 | 0.539 |
| | PRO6. Timely information on the ongoing process | 3.10 | 3.04 | 0.06 | 0.575 | 0.940 |
| | PRO7. Simplicity of documentation | 3.45 | 3.44 | 0.01 | 0.912 | 0.403 |
| Outcome (OUT) | OUT1. Speed of service performance | 3.06 | 3.01 | 0.05 | 0.608 | 0.268 |
| | OUT2. Reliability of service performance | 3.11 | 3.15 | -0.04 | 0.707 | 0.906 |
| | OUT3. Flexibility of handling different types of cargo depending upon the specific nature and characteristics | 3.07 | 3.06 | 0.01 | 0.925 | 0.629 |
| | OUT4. Ability to provide customized service | 3.55 | 3.37 | 0.18 | 0.060 | 0.062 |
| | OUT5. Ability to provide door-to-door service | 3.38 | 3.48 | -0.10 | 0.325 | 0.691 |
| | OUT6. Ability to provide warehousing service | 3.52 | 3.41 | 0.11 | 0.235 | 0.684 |
| | OUT7. Ability to provide customs clearance service | 3.42 | 3.56 | -0.14 | 0.143 | 0.279 |
| | OUT8. Ability to provide insurance service | 2.98 | 3.10 | -0.12 | 0.234 | 0.180 |
| | OUT9. Ability to provide consolidation service | 3.43 | 3.58 | -0.15 | 0.109 | 0.380 |
| | OUT10. Shipment safety and security | 3.05 | 3.05 | 0.00 | 0.950 | 0.775 |
| | OUT11. Accuracy of documentation | 3.14 | 3.06 | 0.08 | 0.407 | 0.361 |
| | OUT12. Reliability of booking space | 3.47 | 3.57 | -0.10 | 0.310 | 0.011* |
| | OUT13. Competitive price of service | 3.49 | 3.47 | 0.02 | 0.857 | 0.072 |
| Service Costs (COS) | COS1. Reasonable price | 3.17 | 3.56 | -0.39 | 0.000* | 0.074 |
| | COS2. Ease of payment | 3.26 | 3.06 | 0.20 | 0.060 | 0.243 |
| | COS3. Appropriate credit term | 3.13 | 2.99 | 0.14 | 0.172 | 0.380 |
| | COS4. Discount offering | 3.17 | 3.40 | -0.23 | 0.019* | 0.036* |
| | COS5. Promotion | 3.15 | 3.49 | -0.34 | 0.000* | 0.899 |
| Image (IMA) | IMA1. Being well-known in the industry | 3.30 | 3.25 | 0.05 | 0.621 | 0.875 |
| | IMA2. Reputation for reliability | 3.31 | 3.26 | 0.05 | 0.656 | 0.889 |
| | IMA3. Reputation for quality and customer oriented service | 3.30 | 3.29 | 0.01 | 0.988 | 0.046* |
| | IMA4. Reputation for corporate social responsibility | 3.05 | 3.07 | -0.02 | 0.874 | 0.494 |

* Significant at the 5% level of significance.

Table 2. Continued.

| Dimension | Quality Indicators | Mean (Provider) | Mean (Customer) | Mean Difference | P-value (Mean) | P-value (Variance) |
|---|---|---|---|---|---|---|
| Environmental Responsibility (ENV) | ENV1. Practicing the environmentally safe operations (i.e., waste reduction, resource conservation) | 3.23 | 3.25 | -0.02 | 0.862 | 0.148 |
| | ENV2. Following the international standards on environmental management system (i.e., ISO 14001) | 3.35 | 3.34 | 0.01 | 0.928 | 0.856 |
| | ENV3. Understanding and mitigating the impact of climate change on logistics operations | 3.11 | 3.03 | 0.08 | 0.400 | 0.103 |
| Customer Satisfaction (SAT) | SAT1. Logistics service provided in maritime transport industry meets the customers' needs. | 3.35 | 3.55 | -0.20 | 0.040* | 0.279 |
| | SAT2. Logistics service provided in maritime transport industry exceeds the customers' expectations. | 3.55 | 3.38 | 0.17 | 0.078 | 0.011* |
| | SAT3. Logistics service provided in maritime transport industry is totally satisfied by the customers. | 3.45 | 3.41 | 0.04 | 0.665 | 0.189 |
| Long-term Commitment (LOG) | LOG1. Having a long-term relationship between service provider and the existing customer for the past several years | 3.41 | 3.48 | -0.07 | 0.443 | 0.521 |
| | LOG2. Keeping up a long-term relationship between service provider and the existing customer at present | 3.59 | 3.56 | 0.03 | 0.806 | 0.351 |
| | LOG3. Planning a long-term relationship between service provider and the existing customer for the next several years. | 3.36 | 3.50 | -0.14 | 0.137 | 0.251 |

*Significant at the 5% level of significance.

used as 0.40 for the measurement item selection, and consequently items with low loading (below 0.40) and those with cross loadings were dropped out of the analysis (Field, 2009).

Accordingly, four items from logistics professional skills, two items from resource, two items from process, seven items from outcome, two items from service costs, one item from image, and one item from environmental responsibility were removed and the exploratory factor analysis was repeated during the purification process. As a result, a total of eight factors with eigenvalues greater than one were emerged from the factor analysis accounting for 76.31% of the total variance and thus could be considered to adequately represent 35 measurement indicators as described in Table 3. Specifically, the exploratory factor analysis identified the six dimensions for maritime logistics service quality and two dimensions for its subsequent impact. These were labeled as follows:

- Factor 1 represents the dimension of outcome consisting of six items: ability to provide customs clearance service; reliability of booking space; ability to provide door-to-door service; competitive price of service; ability to provide warehousing service; and ability to provide consolidation service.
- Factor 2 represents the dimension of process which included five items: simplicity of documentation; effective support of information technology (IT) and elec-

tronic data interchange (EDI); personal contact and relationship; timely response to customers' inquiries and request; and accommodating the changes needed by customers.

- Factor 3 represents the dimension of image including five items: practicing the environmentally safe operations; following the international standards on environmental management system; reputation for quality and customer oriented service; reputation for reliability; and being well-known in the industry. The first two items were initially identified as indicators for the proposed environmental responsibility dimension. Unfortunately, the dimension of environmental responsibility was failed to extract as underlying factor as proposed. This result is in line with the previous studies of Russo and Fouts (1997), Hunter and Bansal (2006), Walker and Wan (2012), and Amores-Salvado et al. (2014). They stated that the firm's corporate image is closely linked to the perception of its environmental performance especially in environmentally sensitive industries such as energy generation and polluting industries. Therefore, the environmental-related indicators seem to be reasonable enough to represent the underlying factor of image dimension in this research.

**Table 3.** Exploratory factor analysis and factor loadings

| Item | Factor 1 | Factor 2 | Factor 3 | Factor 4 | Factor 5 | Factor 6 | Factor 7 | Factor 8 |
|---|---|---|---|---|---|---|---|---|
| OUT7 | 0.885 | | | | | | | |
| OUT12 | 0.866 | | | | | | | |
| OUT5 | 0.865 | | | | | | | |
| OUT13 | 0.839 | | | | | | | |
| OUT6 | 0.717 | | | | | | | |
| OUT9 | 0.712 | | | | | | | |
| PRO7 | | 0.866 | | | | | | |
| PRO3 | | 0.859 | | | | | | |
| PRO4 | | 0.844 | | | | | | |
| PRO1 | | 0.802 | | | | | | |
| PRO5 | | 0.771 | | | | | | |
| ENV1 | | | -0.924 | | | | | |
| ENV2 | | | -0.905 | | | | | |
| IMA3 | | | -0.850 | | | | | |
| IMA2 | | | -0.812 | | | | | |
| IMA1 | | | -0.796 | | | | | |
| COS1 | | | | 0.906 | | | | |
| COS5 | | | | 0.896 | | | | |
| COS4 | | | | 0.882 | | | | |
| LOG3 | | | | | 0.889 | | | |
| LOG1 | | | | | 0.872 | | | |
| LOG2 | | | | | 0.859 | | | |
| RES2 | | | | | | 0.844 | | |
| RES1 | | | | | | 0.839 | | |
| RES8 | | | | | | 0.837 | | |
| RES5 | | | | | | 0.822 | | |
| RES7 | | | | | | 0.808 | | |
| RES3 | | | | | | 0.771 | | |
| LPS1 | | | | | | | -0.883 | |
| LPS8 | | | | | | | -0.859 | |
| LPS2 | | | | | | | -0.774 | |
| LPS6 | | | | | | | -0.758 | |
| SAT3 | | | | | | | | -0.892 |
| SAT2 | | | | | | | | -0.808 |
| SAT1 | | | | | | | | -0.578 |
| Eigenvalue | 12.713 | 3.917 | 2.512 | 2.139 | 1.825 | 1.378 | 1.223 | 1.000 |
| Percentage of variance | 36.324 | 11.191 | 7.178 | 6.111 | 5.215 | 3.938 | 3.495 | 2.858 |

- Factor 4 represents the dimension of service costs consisting of three items: reasonable price; promotion; and discount offering.
- Factor 5 represents the dimension of long-term commitment which included three items: having a long-term relationship between service provider and the existing customer for the past several years; keeping up a long-term relationship between service provider and the existing customer at present; and planning a long-term relationship between service provider and the existing customer for the next several years.
- Factor 6 represents the dimension of resource including six items: supportive regulation; physical infrastructure; knowledge of customer needs and requirements; financial stability; skillful human resource; and equipment and facilities availability (including EDI and internet service).
- Factor 7 represents the dimension of logistics professional skills including four items: ability of managing customer relationship; professional integrity; problem-solving ability; and ability of identifying opportunities and threats.
- Factor 8 represents the dimension of customer satisfaction which consisted of three items: logistics service provided in maritime transport industry meets the customers' needs; logistics service provided in maritime transport industry exceeds the customers' expectations; and logistics service provided in maritime transport industry is totally satisfied by the customers.
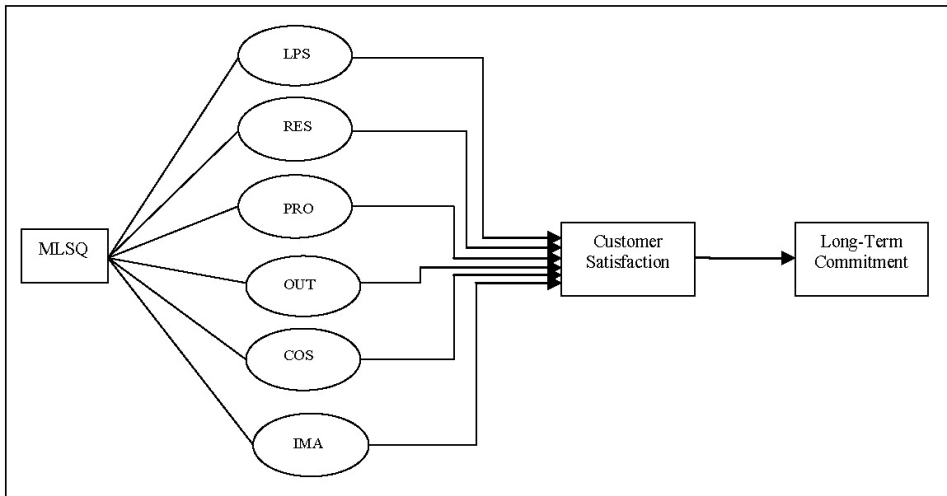


**Figure 2.** Revised model of maritime logistics service quality (MLSQ)

The Cronbach's alpha coefficient and corrected item-total correlation (CITC) were subsequently used to test the reliability of constructs and measurement items extracted (Hair et al., 2010). Satisfactory Cronbach's alpha coefficient were illustrated in Table 4 since all varied from 0.865 to 0.924 which exceeded the cut-off point of 0.70 recommended by Nunnally (1978). In addition, all CITC values were larger than the minimum acceptable value of 0.50. Based on the Cronbach's alpha coefficient

and CITC values, the reliability of all constructs was confirmed. Being a lack of identifying environmental responsibility as one of the underlying factors in the exploratory factor analysis, the conceptual model was revised and in which maritime logistics service quality is specified as a six-dimensional construct as portrayed in Fig. 2.

**Table 4.** Descriptive statistics and construct reliability values

| Construct | No. of items | Mean | Standard deviation | Cronbach's alpha | CITC range |
|---|---|---|---|---|---|
| LPS | 4 | 3.37 | 1.12 | 0.896 | 0.742-0.796 |
| RES | 6 | 3.40 | 1.10 | 0.924 | 0.757-0.804 |
| PRO | 5 | 3.41 | 1.12 | 0.907 | 0.734-0.804 |
| OUT | 6 | 3.48 | 1.11 | 0.923 | 0.723-0.809 |
| COS | 3 | 3.31 | 1.13 | 0.885 | 0.764-0.788 |
| IMA | 5 | 3.29 | 1.15 | 0.924 | 0.774-0.835 |
| SAT | 3 | 3.45 | 1.13 | 0.881 | 0.752-0.802 |
| LOG | 3 | 3.48 | 1.09 | 0.865 | 0.737-0.751 |

## 4.3 Structural equation modeling (SEM) analysis

The structural equation modeling (SEM) was applied by using LISREL 8.54 to analyze the hypothesized associations among various constructs specified in the revised conceptual model as shown in Fig. 2. In this model customer satisfaction and long-term commitment are both seen as endogenous latent constructs which are influenced by six exogenous latent constructs, namely logistics professional skills, resource, process, outcome, service costs and image. The full model represents an eight-construct with 35-indicator recursive system while input data consist of a covariance matrix based on 540 observations.

**Table 5.** Measurement model results

| Construct | Quality Indicator | Unstandardized factor loading | Completely standardized factor loading | t-value* | R2 (item reliability) | CRa (composite reliability) | AVEb |
|---|---|---|---|---|---|---|---|
| Logistics professional skills (LPS) | LPS1 | 1.00 | 0.88 | -c | 0.78 | 0.92 | 0.74 |
| | LPS8 | 0.90 | 0.88 | 28.35 | 0.77 | | |
| | LPS2 | 1.01 | 0.85 | 26.71 | 0.73 | | |
| | LPS6 | 0.77 | 0.82 | 25.16 | 0.68 | | |
| Resource (RES) | RES2 | 1.00 | 0.81 | - | 0.66 | 0.94 | 0.72 |
| | RES1 | 1.39 | 0.88 | 25.01 | 0.78 | | |
| | RES8 | 1.01 | 0.84 | 23.13 | 0.70 | | |
| | RES5 | 1.26 | 0.85 | 23.70 | 0.72 | | |
| | RES7 | 1.22 | 0.85 | 23.81 | 0.73 | | |
| | RES3 | 1.35 | 0.86 | 24.21` | 0.74 | | |
| Process (PRO) | PRO7 | 1.00 | 0.86 | - | 0.74 | 0.93 | 0.71 |
| | PRO3 | 0.90 | 0.85 | 25.44 | 0.72 | | |
| | PRO4 | 0.81 | 0.81 | 23.37 | 0.65 | | |
| | PRO1 | 0.92 | 0.90 | 28.11 | 0.80 | | |
| | PRO5 | 0.85 | 0.81 | 23.41 | 0.65 | | |
| Outcome (OUT) | OUT7 | 1.00 | 0.86 | - | 0.74 | 0.94 | 0.71 |
| | OUT12 | 0.98 | 0.86 | 26.37 | 0.73 | | |
| | OUT5 | 1.01 | 0.86 | 26.73 | 0.74 | | |
| | OUT13 | 0.85 | 0.87 | 27.23 | 0.76 | | |
| | OUT6 | 0.80 | 0.82 | 24.36 | 0.67 | | |
| | OUT9 | 0.79 | 0.79 | 22.85 | 0.62 | | |
| Service costs (COS) | COS1 | 1.00 | 0.90 | - | 0.80 | 0.91 | 0.77 |
| | COS5 | 0.92 | 0.88 | 27.67 | 0.78 | | |
| | COS4 | 0.87 | 0.86 | 26.76 | 0.74 | | |

Table **5.** Continued.

| Construct | Quality Indicator | Unstandardized factor loading | Completely standardized factor loading | t-value* | R2 (item reliability) | CRa (composite reliability) | AVEb |
|---|---|---|---|---|---|---|---|
| Image (IMA) | ENV1 | 1.00 | 0.90 | - | 0.81 | 0.94 | 0.76 |
| | ENV2 | 1.23 | 0.91 | 32.68 | 0.83 | | |
| | IMA3 | 0.91 | 0.84 | 27.16 | 0.70 | | |
| | IMA2 | 0.79 | 0.86 | 28.58 | 0.73 | | |
| | IMA1 | 0.91 | 0.85 | 28.27 | 0.73 | | |
| Customer satisfaction (SAT) | SAT3 | 1.00 | 0.81 | - | 0.66 | 0.90 | 0.75 |
| | SAT2 | 1.03 | 0.88 | 24.31 | 0.78 | | |
| | SAT1 | 1.17 | 0.90 | 24.81 | 0.81 | | |
| Long-term commitment (LOG) | LOG3 | 1.00 | 0.84 | - | 0.70 | 0.89 | 0.73 |
| | LOG1 | 0.92 | 0.85 | 22.75 | 0.72 | | |
| | LOG2 | 1.17 | 0.88 | 23.47 | 0.77 | | |

*All factor loadings are significant at p<0.05 or better.
aCR = (sum of standardized indicator loadings)2/ [(sum of standardized indicator loadings)2 + (sum of indicator error variances)].
bAVE = (sum of squared standardized indicator loadings)/[( sum of squared standardized indicator loadings) + (sum of indicator error variances)].
c Being a fixed parameter, it is not accompanied by t-value.

### 4.3.1 Measurement model analysis

The relationships between latent constructs and their indicators are emphasized in evaluating the measurement part of the model. The analysis of measurement model was conducted to determine the validity and reliability of the measurement indicators used to represent the constructs concerned through assessing the indicator loadings and squared multiple correlations (R2). In this research, all indicator loadings were significant at the 0.05 level of significance, as indicated by t-values well in excess of 1.96 in absolute terms as described in Table 5. This indicates the validity evidence of measurement indicators and thus all indicators were significantly related to their specified constructs. The squared multiple correlation (R2 ) shows the proportion of variance in an indicator that is explained by its underlying latent construct, and a high R2 value denotes high reliability for the indicator concerned (Diamantopoulos and Siguaw, 2000). Additionally, Bollen (1989) suggested that R2 values above 0.50 provide the evidence of acceptable reliability. It can be seen from Table 5 that all items exhibited an R2 value greater than 0.50 in this research.

**Table 6.** Discriminant validity analysis

| Construct | SAT | LOG | LPS | RES | PRO | OUT | COS | IMA |
|---|---|---|---|---|---|---|---|---|
| SAT | 0.75a | | | | | | | |
| LOG | 0.29b (0.54)c | 0.73 | | | | | | |
| LPS | 0.35 (0.59) | 0.10 (0.32) | 0.74 | | | | | |
| RES | 0.35 (0.59) | 0.10 (0.32) | 0.14 (0.38) | 0.72 | | | | |
| PRO | 0.28 (0.53) | 0.08 (0.29) | 0.48 (0.69) | 0.07 (0.26) | 0.71 | | | |
| OUT | 0.37 (0.61) | 0.11 (0.33) | 0.18 (0.43) | 0.53 (0.73) | 0.11 (0.33) | 0.71 | | |
| COS | 0.18 (0.43) | 0.05 (0.23) | 0.08 (0.28) | 0.05 (0.22) | 0.07 (0.27) | 0.06 (0.24) | 0.77 | |
| IMA | 0.21 (0.46) | 0.06 (0.25) | 0.13 (0.36) | 0.22 (0.47) | 0.08 (0.29) | 0.27 (0.52) | 0.01 (0.11) | 0.76 |

a: Diagonal value represents the average variance extracted (AVE).
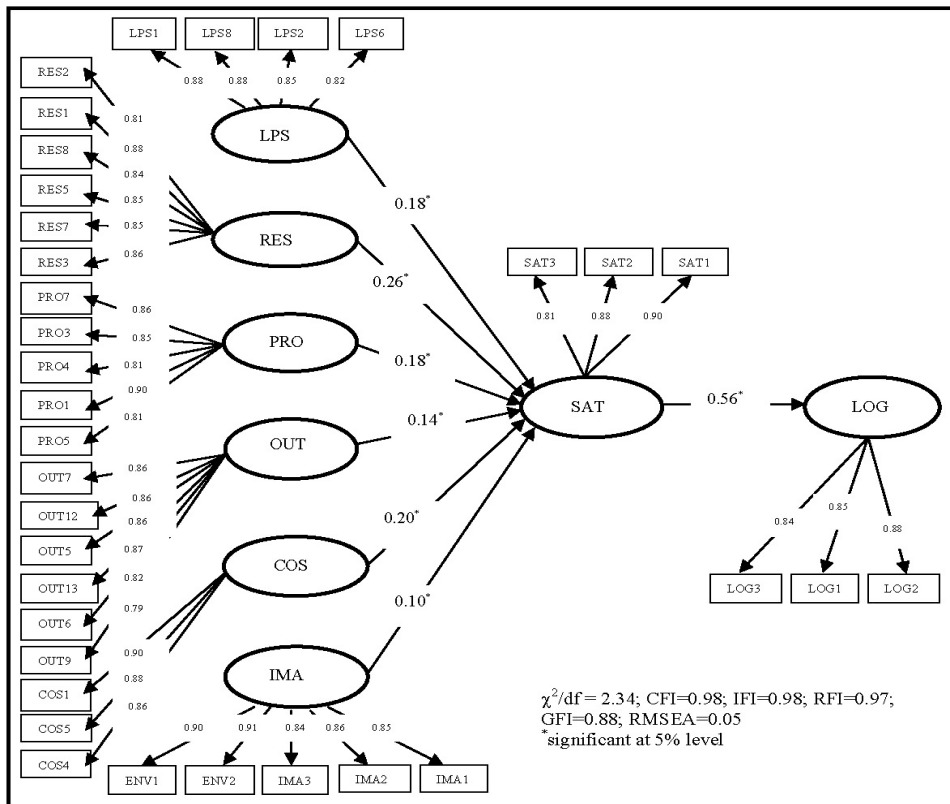b: Squared correlation (R2).
c: Correlation (R)

**Figure 3.** Structural equation modeling results

In addition to assessing the reliability of the individual indicators, the composite reliability was used to measure the reliability of each latent construct which is also known as the construct reliability. Since, as presented in Table 5, all the composite reliability values were greater than the minimum cut-off value of 0.7, the latent constructs identified in this model are considered satisfactorily reliable (Diamantopoulos and Siguaw, 2000). The average variance extracted (AVE) was also used to assess the convergent validity of the constructs, and the AVE value larger than 0.50 suggests that a substantially higher amount of variance in the indicators is captured by the construct compared to that accounted for measurement error (Anderson and Gerbing, 1988). The convergent validity was achieved in this research since the AVE values for all of the dimensions were well above the threshold value of 0.50 as described in Table 5. The discriminant validity was further evaluated by comparing the AVE values with squared correlation between constructs. Table 6 indicates the high discriminant validity between each pair of constructs as the AVE for each construct was greater than the standardized squared correlation of the given construct with any other construct in the model, and thus the constructs were considered different from one another (Fornell and Larcker, 1981).

### 4.3.2 Structural model analysis

The linkages between various endogenous and exogenous latent constructs are focused in evaluating the structural part of the model. Structural model analysis was conducted to determine whether the theoretical relationships specified at the conceptualization stage are actually supported by the data (Diamantopoulos and Siguaw, 2000). Table 7 presents the LISREL results of the goodness-of-fit measures for the model depicted in Fig. 2. The ratio of chi-square (c2) to the degrees of freedom (df) was 2.34 which is less than 3, and is acceptable fit value for the model with relatively large sample (Hair et al., 2010). The other common fit indices such as goodness-of-fit index (GFI), adjusted goodness-of- fit index (AGFI), comparative fit index (CFI), root mean square error of approximation (RMSEA), standardized root mean square residual (SRMR), normed fit index (NFI), incremental fit index (IFI), and relative fit index (RFI) were also evaluated in Table 7, and the model exhibited a fit value exceeding or close to the common threshold for the respective indices recommended in the literature (Bentler and Bonett, 1980; Bentler, 1990; Deng et al., 2010; Hair et al., 2010 and Zhao et al., 2012). Overall, the revised model showed the evidence of a reasonable fit with the data collected.

Fig. 3 further depicts the structural equation modeling testing results for the revised model. All the hypotheses were found to be supported by the data. As summarized in Table 8, all of the six dimensions of maritime logistics service quality: logistics professional skills, resource, process, outcome, service costs, and image had significant positive influence on customer satisfaction. In addition, customer satisfaction was found to have a significant positive effect on long-term commitment of customers to the service offered by the providers. The parameter estimates for all of the structural equations were significant at the 5% significance level since t-value exceeded 1.96 in absolute terms. The squared multiple correlations (R2) for customer satisfaction and long-term commitment were 0.61 and 0.29 respectively. Therefore, 61% of the variance in customer satisfaction was jointly explained by logistics professional skills, resource, process, outcome, service costs, and image whereas 29% of the variance in long-term commitment was accounted for by the customer satisfaction. Additionally, LISREL results showed the significant indirect effects of the six dimensions of maritime logistics service quality on long-term commitment via customer satisfaction as shown in Table 9.

**Table 7.** Fit statistics for structural equation model

| Fit statistics | c2 | df | c2/df | GFI | AGFI | CFI | RMSEA | SRMR | NFI | IFI | RFI |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Recommended value | - | - | < 3 | ³0.90 | ³0.80 | ³0.90 | £0.08 | £0.05 | ³0.90 | ³0.90 | ³0.90 |
| Value in the revised model | 1261.44 | 538 | 2.34 | 0.88 | 0.86 | 0.98 | 0.050 | 0.044 | 0.97 | 0.98 | 0.97 |

The supplementary insights into the relative impact of each dimension on customer satisfaction as well as long-term commitment were gained by looking at the standardized parameter estimates of the respective structural equations. Accordingly, it was found that the dimension of resource had a greatest impact on customer satisfaction as

indicated by largest standardized parameter estimate of 0.26. In contrast, the image has a lowest impact on customer satisfaction as indicated by its smallest standardized parameter estimate of 0.10. Similarly, the resource dimension was found to have the largest standardized indirect effect on long-term commitment as opposed to the image.

**Table 8.** Hypotheses testing results

| Paths | Parameter estimate | Standard error | t-value | Result |
|---|---|---|---|---|
| H1: Maritime logistics service quality ® Customer satisfaction | | | | |
| Logistics professional skills ® Customer satisfaction | 0.18 | 0.05 | 3.80* | Supported |
| Resource ® Customer satisfaction | 0.26 | 0.06 | 4.68* | Supported |
| Process ® Customer satisfaction | 0.18 | 0.04 | 3.95* | Supported |
| Outcome ® Customer satisfaction | 0.14 | 0.04 | 3.42* | Supported |
| Service costs ® Customer satisfaction | 0.20 | 0.03 | 6.16* | Supported |
| Image ® Customer satisfaction | 0.10 | 0.04 | 2.66* | Supported |
| | | | | |
| H2: Customer satisfaction ® Long-term commitment | 0.56 | 0.05 | 11.45* | Supported |

\* Parameter estimate is significant at p<0.05 or better.

**Table 9.** Indirect effect of maritime logistics service quality on long-term commitment

| Paths | Parameter estimate | Standard error | t-value | Result |
|---|---|---|---|---|
| H3: Maritime logistics service quality ® Long-term commitment | | | | |
| Logistics professional skills ® Long-term commitment | 0.10 | 0.03 | 3.66* | Supported |
| Resource ® Long-term commitment | 0.15 | 0.03 | 4.42* | Supported |
| Process ® Long-term commitment | 0.10 | 0.03 | 3.79* | Supported |
| Outcome ® Long-term commitment | 0.08 | 0.02 | 3.31* | Supported |
| Service costs ® Long-term commitment | 0.11 | 0.02 | 5.60* | Supported |
| Image ® Long-term commitment | 0.06 | 0.02 | 2.61* | Supported |

*Parameter estimate is significant at p<0.05 or better.

# 5. Conclusion and implications

The purpose of the research mainly included: (1) understanding the concept of maritime logistics service quality, (2) developing and testing the instrument that captures the dimensions of maritime logistics service quality and its concomitant impact, and (3) investigating the relationship between maritime logistics service quality, customer satisfaction, and long-term commitment. Although the maritime logistics service quality was initially conceptualized as seven dimensional construct, the six dimensions consisting of logistics professional skills, resource, process, outcome, service costs, and image, along with the respective reliable and valid measurement indicators were extracted through the exploratory factor analysis. The dimension of environmental responsibility was dropped out during the analysis since all of its proposed measurement indicators significantly represented the image dimension instead, and this finding ensured the close link between firm's image and its environmental responsible manner

while engaging in maritime transport industry of Myanmar. The results of structural equation modeling analysis further indicated that maritime logistics service quality has a significant positive influence on customer satisfaction. In particular, logistics professional skills, resource, process, outcome, service costs, and image were found to impact on customer satisfaction significantly. Among these dimensions the resource has a greatest impact on customer satisfaction followed by service costs, logistics professional skills, process, outcome, and image. The indirect effect of each of these dimensions on long-term commitment via customer satisfaction was also significant.

Additionally, the indicator of "physical infrastructure" was found to be the most important quality indicator for the resource dimension followed by "equipment and facilities availability", "skillful human resource", "financial stability", "knowledge of customer needs and requirements", and "supportive regulation". The most important indicator for the dimension of service costs was "reasonable price" followed by "promotion" and "discount offering". For the logistics professional skills, the most important indicator was "ability of managing customer relationship" followed by "professional integrity", "problem-solving ability", and "ability of identifying opportunities and threats". The most important indicator for the process was "timely response to customers' inquiries and request" followed by "simplicity of documentation", "effective support of IT and EDI", "personal contact and relationship", and "accommodating the changes needed by the customer". For the outcome, the most important indicator was "competitive price of service" followed by "ability to provide door-to-door service", "ability to provide customs clearance service", " reliability of booking space", "ability to provide warehousing service", and "ability to provide consolidation service". Lastly, the most important indicator for the image was "following the international standards on environmental management system" followed by "practicing the environmentally safe operations", "reputation for reliability", "being well-known in the industry", and "reputation for quality and customer oriented service".

It can be inferred from the findings that the sufficient physical infrastructure and proper equipment and facilities play a significance role in delivering effective and efficient maritime logistics service in Myanmar. As a developing country, Myanmar still needs to improve physical infrastructure, skills, experience and knowledge relevant to its local logistics operations as well as successful integration of its logistics service into regional and international logistics network. In this regard, the government's logistics infrastructure development strategy through encouraging private sector participation, for instance, investment in the implementation of Yangon inner harbor development plan; deep sea port projects in the strategic location of country's coastal area, seems necessary for maritime logistics service providers to meet the service level required by their customers. It is also noted that service costs represented by reasonable price; promotion and discount offering is being considered as the traditional fundamental service attribute for maritime logistics service like in other business industries of Myanmar.

Moreover, the strategically important role of logistics professional skills in improving customer care and customer relationship for the sustainable growth of service firms was further acknowledged in Myanmar logistics context. In this regard, the supportive coordination of United Nations Economic and Social Commission for Asia

and the Pacific (UNESCAP), Myanmar International Freight Forwarders' Association (MIFFA), and Myanmar Maritime University (MMU) to often provide those who work for either public firm or privately-owned firm operating in the maritime transport industry with logistics service training courses under the human resource development programme, would be highly beneficial to their logistics-related professional skills and knowledge improvement.

Further, the government of Myanmar has made an effort to develop the information technology and related infrastructure under the country's national economic development plan these days. Accordingly, the effective support of information technology (IT) and electronic data interchange (EDI) for the electronic communication of customers with service providers and other governmental departments during the service provision would have been increased today than that in the past. The improvement of other process-related indicators and all of the outcome-related indicators can be achieved internally by service providers themselves. In Myanmar, the environmental awareness has now also been raised in various industries though adopting the international environmental management system such as ISO 14001 certification system. This practice of environmental responsibility reflected well the image of service provider as a quality service firm in Myanmar. Overall the findings can assist the logistics service providers in the maritime transport industry in their attempt to improve service quality as a source of sustainable competitive advantage and to generate better solutions for the satisfaction of their customers in order to maintain the long-term commitment.

A number of previous studies attempted to explore the distinct constructs of service quality indicators as useful criteria for either selecting mode and carrier or selecting logistics service providers in specific shipping industry such as container shipping or liner shipping, and tramp shipping. Moreover, the assessment of indicators which constitute the service quality in shipping industry was mostly conducted by the shippers/customers. This research tried to investigate the constructs of logistics service quality indicators which were assessed by both service providers and customers in order to gain a wide and deep insight into composition of logistics service quality of the maritime transport industry as a whole. Accordingly, the model developed and tested in this research is considered to be the valuable academic implication to the literature on logistics service quality in the maritime transport context.

There are also several managerial implications of this research. Firstly, logistics service providers in maritime transport industry can be able to use the quality indicators as guidelines for the improvement in their service performance. Secondly, the managers of the service provider companies can be able to develop research instrument based on the model designed and tested in this research for a survey that produce feedback from their customers on quality of logistics service they provided and thus this would be helpful to managers for devising their service improvement plan. Thirdly, although this research was conducted in a single country such as Myanmar, the results offer insights into which indicators managers of logistics service provider companies need to stress as important ones for the enhancement of customer satisfaction and long-term commitment while improving their logistics service quality.

Despite of the academic and managerial implications, a limitation is also found

that since this research was conducted in Myanmar, one of the developing countries, the generalization of the findings beyond the region of Myanmar might be interpreted with caution. Another point one may consider as a limitation is that this research was based on the majority of local service providers and customers. Therefore, if there are substantial numbers of multinational service providers who offer maritime logistics service in Myanmar, further study could be attempted to compare the perceptions of such a quality assessment between local and multinational service providers and customers. The result will then be beneficial to those providers for the better performance of international maritime logistics service in Myanmar. The future research may also conduct using the same instruments on customers and service providers separately, and compare the findings in order to strengthen the validity and reliability of the dimensions and indicators identified in this research.

# Acknowledgements

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