Service Quality Appraisal: A Study of Interactions

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Service Quality Appraisal: A Study of Interactions

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Service Quality Appraisal: A Study of Interactions

Customer satisfaction or dissatisfaction is a direct response from the appraisal of service quality attributes. The purpose of this study is to discuss and test for interactions in customers' appraisal of service quality attributes. A theoretical framework was developed to identify the types of interactions between service quality attributes. A survey was then administered to 203 shippers in Singapore. Subsequently, interactions between service quality attributes were empirically tested using customer satisfaction as the outcome criterion. As compared to linear models, the use of interaction models yielded a 10% increase in their explanatory power on customer satisfaction. Interactions between the service quality attributes generated additive, compensatory, or synergistic effect on customer satisfaction. The results imply that satisfaction derived from the appraisal of a service quality attribute is moderated by the perceived performance of other service quality attributes. To optimise customer satisfaction, interaction effects should be considered in the management of service features. This paper is one of the few studies that examines interactions in customers' appraisal of service quality attributes. The proposed framework contributes to new theories on consumer satisfaction evaluation and service quality management.

Keywords: service quality appraisal, customer satisfaction, interactions, shipping logistics

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2
3 **1. Introduction**
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5 Customer satisfaction results from the appraisal of service quality (SQ) attributes
6
7 (Oliver, 2010). Under the condition that these attributes reflect customers’ stated or
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9 implied needs, improving their performances can lead to customer satisfaction.
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11 Customer satisfaction is linked with numerous organisational benefits. For example, a
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13 satisfied customer is likely to perform repeated purchase of a service or recommend it to
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15 others (Chang, Wang, & Yang, 2009). Subsequently, these positive behaviours can
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17 contribute to the earnings of a service provider (Westlund, Gustafsson, Lang, &
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19 Mattsson, 2005). This flow of causality which begins with improving SQ and ends with
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21 gaining a profit was illustrated in the satisfaction-profit chain proposed by Anderson
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23 and Mittal (2000).
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28 Much attention has been paid to studying the relationship between SQ and
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30 customer satisfaction since the former is the only construct in the satisfaction-profit
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32 chain where service firms have control over its performance (Mi Dahlgaard-Park,
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34 Klefsjö, Bergquist, & Garvare, 2008). Studies on this relationship have been conducted
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36 at the global level (i.e. estimating the aggregated effect of SQ on customer satisfaction)
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38 or the attribute level (i.e. estimating the effect of each SQ attribute on customer
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40 satisfaction). At the attribute level, an important finding concerns the functional
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42 relationship between a SQ attribute and customer satisfaction (Ažman & Gomišček,
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44 2014). Depending on the functional form of a SQ attribute, it can have a linear, concave,
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46 convex, or an S-shaped effect on customer satisfaction (Mikulic & Prebezac, 2011). As
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48 a result, each category of SQ attributes necessitates a distinct course of actions for
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50 service providers to maximise customer satisfaction.
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55 However, although existing studies have provided valuable insights to the
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57 management of SQ, they have only examined the effect of each SQ attribute
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independently. Interactions between SQ attributes have received little attention, despite their potential contribution towards existing theories on customer satisfaction evaluation. Therefore, the aim of this study is to determine whether the effect of a SQ attribute on customer satisfaction is moderated by the perceived performance of other SQ attributes. In other words, this paper tests SQ attributes for interaction or multiplicative effects on customer satisfaction.

This study limits the scope of its analysis to pairwise interactions. Higher-order interactions and polynomials are excluded from this study to enable an in-depth analysis and discussion of a smaller pool of variables. This study also limits its analysis to the shipping industry since contents of SQ attributes were noted to differ across industries (Ladhari, 2009; Thai, 2008).

The present paper begins by synthesising the literature on SQ attributes and proposing a theoretical framework that identifies and explains the types of interactions between SQ attributes. It then presents five SQ attributes that are commonly used by researchers to evaluate SQ in shipping. Thereafter, using survey data collected from the users of shipping services in Singapore, the paper tests the SQ attributes for significant interactions using customer satisfaction as the outcome criterion. Finally, the paper discusses the results, implications of the findings, and directions for future research.

2. Literature Review

2.1 Classifying Service Quality Attributes

The literature on classifying SQ attributes can be organised into two underlying themes. The first theme classifies SQ attributes based on their qualitative role. A prominent model that subsumes under this theme was proposed by Grönroos (1984) who classified SQ attributes into broader categories of technical, functional, and image quality.

Technical quality comprises outcome attributes that a customer receives from engaging a service provider. In the logistics service environment, order accuracy and order condition are examples of technical quality (Mentzer, Flint, & Hult, 2001). Functional quality consists of process attributes that specify the manner in which a service is delivered. It was suggested that functional quality consists of the five SQ attributes belonging to the SERVQUAL instrument (Kang & James, 2004). They are tangibles, reliability, responsiveness, assurances, and empathy (Parasuraman, Zeithaml, & Berry, 1988). Finally, image quality captures the dynamic aspect of a service perception process, and comprises customers' previous experiences and overall perception of a service provider (Grönroos, 2001).

There are other SQ models that subsume under this theme, but they are mainly variants or expansions of the discussed model. For instance, Brady and Cronin Jr (2001) proposed interaction quality, physical environment, and outcome quality whereas Sureshchandar, Rajendran, and Kamalanabhan (2001) suggested core service, human element of service delivery, systematisation of service delivery, tangibles of service, and social responsibility to operationalise SQ.

Recently, there have been attempts to compare the effects of technical and functional quality on customer satisfaction. Although the results have been mixed, Dabholkar and Overby (2005) found that technical quality is more closely linked with customer satisfaction. However, in service environments where technical quality is difficult to evaluate, for example due to an absence of a tangible product, consumers will appraise SQ with greater emphasis on functional quality (Kang & James, 2004).

The second theme organises SQ attributes based on their functional relationship with customer satisfaction. According to Kano, Seraku, Takahashi, and Tsuji (1984), the extensive SQ attributes can be classified into various linear and polynomial

functions such as (1) reverse quality, (2) indifferent quality, (3) must-be quality, (4) one-dimensional quality, and (5) attractive quality. Accordingly, these five categories exhibit a negative linear, constant, concave upward, positive linear, and convex upward effect on customer satisfaction. Kano (2001) also found that certain SQ attributes are dynamic, and their utility can diminish with time. For example, an attractive quality attribute may become less attractive to consumers over time and transforms into a one-dimensional quality attribute, and later into a must-be quality attribute (Witell & Löfgren, 2007). Therefore, a manager's tasks are to constantly review the life-stages of their service features or attributes, and direct his or her attention towards developing attractive quality attributes to maximise customer satisfaction.

2.2 Interactions between SQ Attributes

At present, existing studies that examine the relationship between a SQ attribute (X) and customer satisfaction (Y) can be modelled by Figure 1. As shown in the figure, existing studies have accounted for both linear and non-linear (i.e. polynomial) effects of a SQ attribute on customer satisfaction. The underlying assumption in most studies is that the effect of a SQ attribute on customer satisfaction is independent of the perceived performance of other SQ attributes. In other words, it has been assumed that the SQ attributes do not interact. To foreshadow, this paper challenges this assumption and presents a model that captures interaction effects between SQ attributes (Figure 2).

<Insert Figure 1 here>

Figure 2 shows an interaction model wherein the effect of X_1 on Y is moderated by the value of X_2 (Baron & Kenny, 1986). Three possible outcomes can be expected from such statistical interactions (Cohen, Cohen, West, & Aiken, 2013). This paper postulates that the joint effect of X_1 and X_2 could be additive, compensatory, or

synergistic. The statistical equation for each outcome is presented below to facilitate discussion.

<Insert Figure 2 here>

Addictive Model: $Y = b_0 + b_1X_1 + b_2X_2 + \varepsilon$ (1)

Compensatory Model: $Y = b_0 + b_1X_1 + b_2X_2 - b_3X_1X_2 + \varepsilon$ (2)

Synergistic Model: $Y = b_0 + b_1X_1 + b_2X_2 + b_3X_1X_2 + \varepsilon$ (3)

The additive model retains the existing assumption that the effect of a SQ attribute, which is express as b_1 , is not influenced by the value of another SQ attribute (X_2). In other words, there is no interaction between both SQ attributes. A typical example in the food and beverage industry would be regressing customer satisfaction (Y) on the tastiness of food (X_1) and the courtesy of employees (X_2). It is logical to expect that the level of satisfaction derived from the tastiness of the food (b_1) would neither decrease nor increase from the display of courtesy towards a customer. In this case, the effects of both SQ attributes are additive.

The compensatory model accounts for situations where high performance of a SQ attribute compensates for the low performance of another, and can trigger a level of customer satisfaction that is comparable to situations where both performances are high. The compensatory model introduces a negative interaction term ($-b_3X_1X_2$) into the equation which indicates trade-offs. Since the aforementioned term is a multiplication of X_1 and X_2 , the trade-off effect is most noticeable when the values of X_1 and X_2 are high. On the other hand, the effect is marginal when both values are low. However, taking into account of the full equation which includes the first-order terms, customer satisfaction can be optimised when a service provider chooses to maximise the performance of a single SQ attribute, and minimise the other. Alternatively, similar results can be achieved from averaging the performances of both SQ attributes.

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3 The concept of trade-off has been briefly mentioned in the literature, but from
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5 the perspective of a service provider. Yang (2005) stated that trade-offs are sometimes
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7 unavoidable in the provision of quality due to technical or financial constraints. He
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9 quoted an example that a car manufacturer has to forgo the installation of a luggage
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11 carrier for an automatic gearbox, although both are attractive quality attributes.
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13 However, the latter was implemented since it has greater impact on customer
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15 satisfaction, and could possibly compensate for the omitted attribute.
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19 Although the concept of trade-off has not been adequately discussed from the
20
21 customers' perspective, it is reasonable to expect trade-offs in customer satisfaction
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23 evaluation. In the context of shipping, trade-offs in customer satisfaction evaluation can
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25 be exemplified by the recent introduction of Daily Maersk (Port Technology, 2011). It
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27 is a premium shipping service that promises on-time delivery of cargoes. In the event
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29 when cargoes are not delivered on time as promised, shippers can seek compensation
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31 from the service provider. Very often, delays in deliveries are caused by poor schedule
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33 reliability due to unpredictable weather conditions at sea and other 'Acts of God'. From
34
35 the customers' or shippers' perspective, minor delays caused by poor schedule
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37 reliability are often expected as most shippers that select this mode of transportation
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39 understand the risk of late delivery. Although such delays may lead to dissatisfaction, it
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41 may be fairly compensated if claim procedures are fast and user-friendly. Based on the
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43 given example, it can be expected that poor performance of schedule reliability (X_1) can
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45 be adequately compensated by the speed and ease of claims (X_2), which is a component
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47 of service recovery. Likewise, high performances in both schedule reliability and claims
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49 handling will result in trade-off since a shipper is unlikely to benefit from both service
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51 features simultaneously.
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The synergistic model applies to situations where performances of both SQ attributes produce non-redundant and multiplicative effects on customer satisfaction. Due to the introduction of a positive interaction term in the equation, the total effect that X_1 and X_2 has on customer satisfaction is greater than the sum of their separate effects. As a result, their joint effect is described as synergistic. Under this model, customer satisfaction is optimised when a service provider maximises the performances of both SQ attributes. For instance, customer satisfaction is likely to be enhanced if their shipment is delivered on time, which can be a cumulative effect from the comprehensive understanding of customer's expectation from the shipping company's staff and their reflection into service design and delivery.

There have been a few discussions in the literature which suggest synergies in SQ appraisal. Synergies are occasionally cited between image quality and other quality attributes (Anatolevna Anisimova, 2007). First, good image directly influences customer satisfaction due to spill-over effects from previous transactions, or by simply being associated with a service provider. Next, it also functions as a magnifier of perceived technical and functional quality in a positive direction (Grönroos, 1984), which suggests synergistic interactions. This proposition is consistent with Andreassen and Lindestad (1998) who argued that corporate image has a halo effect on customers' satisfaction judgment.

Based on the above discussion, it is reasonable to expect interactions between SQ attributes, and specifically, these interactions influence customer satisfaction evaluation. To reiterate, such interactions could be additive (no interaction), compensatory (negative multiplicative), or synergistic (positive multiplicative). As compared to existing models (Figure 1), the introduction of the interaction model

(Figure 2) should theoretically provide better explanation of customers' appraisal of SQ attributes. Therefore, the following proposition and hypothesis are proposed.

Proposition: In customer satisfaction evaluation, the appraisal of a SQ attribute is influenced by its interactions with other SQ attributes. Such interaction could be additive, compensatory, or synergistic.

Hypothesis: Interaction models of SQ provide greater predictive power on customer satisfaction than first-order linear models.

Figure 3 synthesises the literature and illustrates how the paper's proposition fits into the current framework of service quality appraisal. Firstly, disconfirmation theory specifies the direction of customer satisfaction by comparing the perceived and expected service attribute or feature (Szymanski & Henard, 2001). Depending on the outcomes of such comparison, a customer may be dissatisfied, indifferent, or satisfied. Secondly, the magnitude of an outcome is influenced by the attractiveness or the functional form of a SQ attribute (Mikulic & Prebezac, 2011). For instance, customers will become extremely dissatisfied if a must-be quality attribute is missing. However, they will neither be dissatisfied nor satisfied (i.e. indifferent) even if a must-be quality attribute exceeds customers' expectations. Building from existing theories, this paper proposes that the magnitude of an outcome is also influenced by its interactions with the perceived performances of other attributes. In this study, the proposition will be validated by hypothesis testing.

<Insert Figure 3 here>

3. Methodology

3.1 Measures

A measurement model consisting of five latent SQ attributes was developed to measure

SQ in shipping. They are value, transport service, customer service, tangibles, and image. Their respective indicators are presented in Table 1. The indicators were mainly adapted from the studies of Kannan, Bose, and Kannan (2011) and Yuen and Thai (2015). The indicators were selected based on the following reasons. Firstly, they were derived and consolidated from an extant body of SQ literature. Secondly, they were modified to fit into the context of shipping. Lastly, the indicators encompass contemporary views of SQ in shipping such as firms’ carbon footprint and involvement in corporate social responsibility.

<Insert Table 1 here>

The operational definitions of the five SQ attributes are provided in the subsequent paragraphs. Value refers to the overall transport cost that is borne by shippers for engaging a shipping firm. It directly contributes to the cost competitiveness of the shippers. This includes the basic freight component and other surcharges that may vary with prevailing market conditions. Value also encompasses the flexibility of the freight which is measured by a shipping firm’s willingness to negotiate and offer a discount, or delay freight payment.

Transport service refers to the logistics performances of a shipping service. This includes service frequency, service speed, transit-time reliability, on-time delivery, and conditions of the shipments.

Customer service refers to the attitude and behaviour of the employees while interacting with customers. This aspect of SQ is measured by courtesy, personal attention, empathy, responsiveness, and ability to handle customers’ complains.

Tangibles refer to the physical facets of SQ where transactions or interactions occur. It comprises the conditions and availability of equipment (i.e. containers), close-proximity and well-furnished offices, and professional appearance of employees.

Corporate image refers to the overall impression made on the minds of the customers about a firm. In this study, functional measures were used to operationalise corporate image. These include the shipping firm's reputation in the trade, number of ISO certifications, financial stability, safety record, and involvement in corporate social responsibility activities.

Customer satisfaction was operationalised by three indicators developed by Ryan, Buzas, and Ramaswamy (1995). According to Gronholdt, Martensen, and Kristensen (2000), the indicators have been widely acknowledged and adopted by researchers in the measurement of customer satisfaction.

3.2 Survey Design

The developed indicators were incorporated into a survey questionnaire. The questionnaire comprises four sections. The first section introduces survey participants to the topic of SQ and customer satisfaction. It also highlights the objectives and significance of this research. In addition, it instructs the participants to complete the questionnaire using the container shipping company which they engage regularly as a reference. In the event that participants do not engage a fixed container shipping company, they were advised to refer to the container shipping company which they had recently engaged.

The second section requires participants to evaluate the SQ of the specified shipping company. As shown in Table 1, SQ was measured using five SQ attributes consisting of 24 indicators. The participants were required to rate the performance of each indicator on a Likert scale ranging from '1 - strongly disagree' to '7 - strongly agree'.

The third section measures participants' satisfaction with the service provided by the shipping company. Each indicator was measured on a different scale. The first

indicator assesses customers' overall satisfaction with the service. It was measured using a scale which ranges from '1 - completely dissatisfied' to '7 - completely satisfied'. The second indicator evaluates the degree to which customers' expectations are met. It was measured using a scale which ranges from '1 – much less than expected' to '7 – much more than expected'. Finally, the third indicator compares the gap between the received and ideal service. It was measured using a scale which ranges from '1 – very far away' to '7 – very close'.

The fourth section comprises demographic questions relating to the participants and their company. Information such as functional area, designation, and years of experience in the industry was collected. Mainly nominal and interval scales were used in this section.

3.3 Sample design and data collection

The targeted group for the survey is the users of container shipping services. This study includes both manufacturers and freight forwarders which are located in Singapore as its targeted population. A combined population size of 2,433 companies was obtained from the online member listing of The Green Book Directory.

For data collection, an online survey was administered to the targeted population. Attributing to the perceptual nature of self-administered surveys, which are subjected to common method bias, a procedural remedy involving the temporal separation of measurements was performed. This technique introduces a time lag between the measurement of the exogenous (x) and endogenous (y) variables (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). In this study, a time lag of at least one month was introduced between the measurement of SQ attributes and customer satisfaction.

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3 Data collection was performed during the period from September 2014 to
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5 January 2015. At the beginning of September 2014, an invitation was sent to the
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7 targeted population via electronic mails to request for their participation in the online
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9 survey. They were given an option to accept or decline the request. Those who accepted
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11 the invitation were directed to a website for the completion of section 2 and 4 of the
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13 survey questionnaire. At the beginning of October 2014, a reminder was sent to the
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15 participants who had accepted the invitation. Subsequently, at the beginning of January
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17 2015, a follow-up electronic mail was sent to all respondents for the completion of
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19 section 3 of the survey questionnaire. A reminder was sent two weeks later, and all
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21 responses were collated and analysed at the end of January 2015.
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25 From the survey administration, a response rate of approximately 10% is
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27 achieved. Table 2 summarises the demographic profile of the respondents. The statistics
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29 show a fairly distributed number of responses from both manufacturers (55.7%) and
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31 freight forwarders (44.3%). In addition, the majority of the respondents hold at least a
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33 managerial title in their respective companies (79.3%) and possess at least five years of
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35 working experience in the industry (78.8%). These indicate that the respondents are
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37 fairly qualified to answer the survey questions on behalf of their company.
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41 <Insert Table 2 here>
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44 **3.4 Data analysis method**

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46 Since the measurement items for the SQ attributes and customer satisfaction have been
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48 predefined in this study, confirmatory factor analysis (CFA) was first conducted to
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50 assess the validity and reliability of the indicators.
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54 Thereafter, total-item aggregation on the latent variable's indicators was
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56 performed. This technique involves averaging each of the construct's items to form a
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58 scale. The end result is that only one scale is used to represent each construct (Coffman
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60

& MacCallum, 2005). Although there are disadvantages for using total-item aggregation which generally leads to overestimation of results, this step is necessary for the study of a large number of interaction variables.

Simple linear transformation using grand mean centring was then carried out on each scale. This transformation involves subtracting the score of each scale with its mean (Field, 2013). Performing grand mean centring can improve the interpretation of the results which were generated from subsequent analysis. Furthermore, it minimises multicollinearity which is often associated with studies on interactions (Cohen et al., 2013).

Subsequently, hierarchical regression analysis was conducted. This was noted to be the most common method in testing interactions (Frazier, Tix, & Barron, 2004). The rationale for adopting hierarchical regression analysis is highlighted as follows. Firstly, it is suitable for testing the hypothesis of this study, which involves comparing the predictive power of linear and interaction models. Since both models are nested, an f-test can be conducted to formally test the hypothesis. Secondly, hierarchical regression analysis involves a block-wise entry of predictors into the regression model. In this study, first-order predictors (i.e. SQ attributes) were entered into the regression model followed by interaction predictors. The rationale for this approach is to first control for all independent, linear effects of the SQ attributes. Subsequently, interaction variables can be analysed to detect significant synergies or trade-offs between SQ attributes, and examine their partial effects on customer satisfaction. Lastly, the use of hierarchical regression analysis in the study of interactions is often followed by simple slope analyses (Field, 2013). A simple slope analysis depicts the interaction effect of two predictors on a two-dimensional graph. It clearly shows how the effect of a predictor on a criterion varies with the value of another predictor. In the context of this study,

performing simply slope analyses will offer detailed insights into the interactions between SQ attributes.

4. Results and Discussion

4.1 Confirmatory Factor Analysis

A six-factor model consisting of the following latent constructs, value, transport service, customer service, tangibles, image, and customer satisfaction, was constructed in a manner such that the indicators were loaded on their respective constructs.

Subsequently, CFA using maximum likelihood was conducted to estimate the model.

The estimation was performed using LISREL 8.80, which is a statistical software for performing structural equation modelling.

From the estimation, a chi-square fit index of 862.03 with 288 degrees of freedom was reported. Root mean square error of approximation (RMSEA), standardised root mean square residual (SRMR), and Tucker-Lewis index (TLI) are 0.066, 0.045, and 0.92 respectively. All fit indices are within the acceptable limits specified by Hu and Bentler (1999), suggesting that the six-factor model fits the data adequately.

The reliability of each construct was further examined using Cronbach's alpha which is a measure of internal consistency (Schmitt, 1996). Table 3 shows the descriptive statistics, reliability, and correlations of the constructs. All Cronbach's alpha values are above the recommended value of 0.7 which provide good evidence that the indicators for each construct are reliable (Hair, Black, Babin, Anderson, & Tatham, 2010). Thus, the paper can proceed with its focal analyses.

<Insert Table 3 here>

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4.2 Hierarchical Regression Analysis

Customer satisfaction was regressed on the predictors in a block-wise fashion with all first-order variables being analysed followed by interaction variables. Table 4 presents the results from hierarchical regression analysis using SPSS 20. The current paper first discusses the results of Model 1 and subsequently, Model 2. Since a substantial number of interaction variables had been added to Model 2, only significant interaction effects were reported.

<Insert Table 4 here>

4.2.1 First Order Regression Analysis

With reference to the results of Model 1, linear effects of the five SQ attributes are significant ($p < 0.05$) and explain approximately 61% of the variances in customer satisfaction ($R^2 = 0.611$). The score is considered common and acceptable in the field of consumer psychology which involves modelling consumer behaviour and satisfaction (Cronin, Brady, & Hult, 2000).

In descending order of their effect on customer satisfaction, the SQ attributes are transport service, value, image, customer service, and tangibles. The rankings concur with the results of Meixell and Norbis (2008) and Yuen and Thai (2015) with the exception that value was found to be more important in this study. Regardless, the current rankings are more closely aligned with the findings of Dabholkar and Overby (2005) who reported that technical quality has a stronger influence on customer satisfaction, as compared to functional quality. In general, shipping is a business-to-business industry. As such, business customers who also represent the economic interest of their firms or shareholders could be more transactional and performance-driven. Therefore, it can be inferred that in the context of shipping, customer satisfaction is

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3 better predicted by technical quality attributes such as transport service and value as
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5 compared to functional quality attributes such as customer service and tangibles.
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8 9 4.2.2 Interaction Regression Analysis

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11 The addition of interaction variables has improved the explanatory power of the model
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13 by approximately 10% (new $R^2 = 0.674$). Since Model 1 is nested in Model 2, the
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15 significance of the change in F-value (ΔF) can be used to formally test the hypothesis of
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17 this study. As shown in Table 4, the change is significant ($\Delta F = 10.267$, $p < 0.05$) which
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19 indicates that the interaction model provides greater predictive power on customer
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21 satisfaction than the first-order linear model. Therefore, the hypothesis of this study was
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23 accepted.
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27 A mix of significant and non-significant interaction terms was observed in the
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29 model. In addition, interaction terms, which are significant, exhibited either a positive
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31 or negative effect on customer satisfaction. These findings support the paper's
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33 proposition that interactions occur in customers' appraisal of SQ attributes, and such
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35 interactions could be additive, compensatory, or synergistic.
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39 There are three SQ attributes that show significant interaction relationships.
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41 They are transport service, value, and image. To illustrate the interaction relationships,
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43 simple slope analyses were conducted on two of the most significant interaction terms
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45 which are between value and transport service as well as between value and image
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47 (Figure 4). As shown in both graphs, the predictors were transformed into interval
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49 variables with 'low' representing observations that are one standard deviation below
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51 scale mean, 'high' representing observations that are one standard deviation above scale
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53 mean, and 'mean' representing observations that are within one standard deviation from
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55 the scale mean.
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With reference to Figure 4(a), the interaction between value and transport service is a typical example of trade-off where satisfaction from the performance of either SQ attribute can fairly compensate for the other. This compensatory or replicative effect is validated by the relatively short vertical distance from point ‘a’ to ‘b’. This indicates that the increase in customer satisfaction is marginal comparing between performing well in only one SQ attribute and the two of them simultaneously.

It is noted that high performances of both SQ attributes still provide maximum level of customer satisfaction. However, the outcome is not optimal due to trade-offs. The negative interaction between value and transport service is consistent with the literature on trade-offs in logistics management (Christopher, Peck, & Towill, 2006) and customer satisfaction evaluation (Cronin et al., 2000; Szymanski & Henard, 2001). For instance, a shipper who is cost-conscious may ignore certain differentiating features such as speed of a transportation service. Similarly, a shipper who values responsive transportation service may ignore its cost.

Figure 4(b) illustrates a synergistic interaction between image and value. This synergistic effect is captured by the considerable increase in vertical distance from point ‘a’ to ‘b’. The contributions of both SQ attributes are noted to have non-replicative and multiplicative effects on customer satisfaction. This finding is aligned with Andreassen and Lindestad (1998) who stated that image has a halo effect on the appraisal of SQ attributes. However, such effect is more noticeable in the appraisal of value and transport service.

A matrix that specifies the types of interaction among the five SQ attributes is presented in Table 5. As shown in Table 5, it is noted that a SQ attribute can exhibit all three interaction relationships. This applies to both value and transport service which trade off with each other, exhibit additive relationships with customer service and

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3 tangibles, and synergise with image. This is to be contrasted with customer service and
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5 tangibles which only exhibit additive relationships with other SQ attributes. Next,
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7 although value and transport service were found to be highly correlated with customer
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9 satisfaction (refer to Table 4), they trade off with each other. Therefore, it is
10
11 recommended that shipping firms focus on improving the performance of either value
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13 or transport service. The decision should be based on a firm's value proposition i.e.
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15 whether it seeks to satisfy a shipper based on low-cost or responsive transportation
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17 services. Alternatively, two types of services with each focusing on maximising value
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19 or responsiveness of transport services can be offered to shippers to optimise customer
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21 satisfaction. Finally, equal attention should be devoted to improving tangibles, customer
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23 service, and image since no evidence of trade-offs was found in their interactions with
24
25 other SQ attributes. Their interaction with other SQ attributes either produced a
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27 synergistic or an additive effect on customer satisfaction.
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32 <Insert Table 5 here>
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35 36 5. Conclusion and Recommendation

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38 Previous studies have assumed that customers' appraisal of a SQ attribute is
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40 independent of the perceived performance of other SQ attributes. The purpose of this
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42 paper is to test this assumption by examining interactions between service quality
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44 attributes in customer satisfaction evaluation. A framework that synthesises the
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46 literature and identifies the types of interactions in the appraisal of SQ attributes was
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48 introduced. To test for interactions, a survey was first administered to 203 users of
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50 shipping services located in Singapore. Subsequently, confirmatory factor analysis and
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52 hierarchical regression analysis were conducted on the collected data.
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56 In general, the results show that the effect of a SQ attribute on customer
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58 satisfaction is moderated by the perceived performance of other SQ attributes. As
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3 compared to linear models, interaction models accounted for an additional 10% in their
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5 explanatory power on customer satisfaction. This improvement is significant, which led
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7 to the acceptance of the study's hypothesis. In addition, it was also found that
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9 interactions between SQ attributes could be additive, synergistic, or compensatory,
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11 which support the theoretical framework and proposition of this study.
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14 There are also other findings that are specific to the sample used in this research.
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16 It was found that responsive transportation service and value, which are both technical
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18 quality dimensions, are the main drivers of customer satisfaction in the shipping
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20 industry. The importance of technical quality can be explained by the nature of shipping
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22 which is a business-to-business industry. As compared to end consumers, the users of
23
24 shipping services could be more transactional and outcome-oriented. Next, it appears
25
26 that the users of shipping services wish to be satisfied based on either cost or responsive
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28 transportation services since significant trade off was found between the two attributes.
29
30 Lastly, although the remaining SQ attributes such as image, customer service, and
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32 tangibles were noted to be secondary drivers of customer satisfaction, no signs of trade-
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34 offs were detected in their interactions. Their effects on customer satisfaction were
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36 noted to be complementary.
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40 There are a few limitations that are worth noting in this research. These
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42 limitations are chiefly statistical in nature. First, only pairwise interactions were studied.
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44 Complex interaction relationships that involve more than two SQ attributes were not
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46 examined in this research. Second, high power, or large sample size, is often required to
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48 detect significant interaction relationships (Aguinis & Stone-Romero, 1997). Although
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50 the sample size in this research is considerably large, it may not be able to detect true
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52 interaction relationships that have small effect size. Therefore, any interaction
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relationship which was found to be insignificant in this study should be interpreted with caution.

In spite of the limitations, the proposed framework is generic and can be applied across various service environments or industries. It has important implications for the study of consumer psychology and management of SQ attributes. Specifically, the research contributes to existing knowledge on consumers' appraisal of SQ attributes which was previously assumed to be performed independently. The results indicate that the appraisal of SQ attributes is performed simultaneously, and there may be losses or gains in customer satisfaction from their interactions. The results also offer new insights into the management of SQ attributes. For example, in the event when SQ attributes trade off with each other, a service firm should consider averaging the performances of both SQ attributes to reduce the effects of trade-offs on customer satisfaction. On the other hand, in the event when both SQ attributes synergise with each other, a service firm should consider maximising both performances to capitalise on their synergistic effects.

The paper recommends additional research on examining the interaction effects of SQ attributes on customer satisfaction, which is currently lacking in the literature. Similar studies could be replicated or conducted on other service sectors to confirm the results.

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TABLES

Table 1. Indicators of SQ attributes

Attribute	Indicators	Definition
Value	VA1 Low freight	Competitiveness of basic freight rate
	VA2 Credit facilities	Extensiveness of credit facilities e.g. loan term
	VA3 Freight flexibility	Willingness to negotiate rates and offer discounts
	VA4 Freight Surcharges	Competitiveness of freight surcharges such as container detention tariff, delivery order fee, currency adjustments, and bunker adjustments
Transport Service	TR1 Service frequency	Frequency of shipment
	TR2 Service speed	Speed of shipment
	TR3 Service reliability	Transit-time reliability of shipment
	TR4 On-time delivery	On-time pickup and delivery of cargo
	TR5 Product quality	Condition of shipment
Customer Service	CS1 Courtesy	Being polite and courteous to customers
	CS2 Personal attention	Providing individualised attention to customers
	CS3 Empathy	Dealing with customers' problems empathetically
	CS4 Complaint handling	Willingness to hear and respond to customers' complains
	CS5 Responsiveness	Promptness in dealing with customers' demands
Tangibles	TA1 Container condition	Issuance of cargo worthy and sea worthy containers
	TA2 Container availability	Availability of empty containers
	TA3 Physical facilities	Well-furnished and visually-appealing offices
	TA4 Professional appearance	Neatly dressed and professional appearance of employees
	TA5 Proximity	Convenient location of offices
Image	IM1 Reputation	Reputation in the trade
	IM2 ISO certification	ISO and other quality certifications
	IM3 Financial stability	Financial stability of the container carrier
	IM4 Safety record	Safety record on transportation of cargo

	IM5 Corporate Social Responsibility	Participation in social and environmental initiatives
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Table 2. Demographic Profile of Respondents

Demographic characteristics	Frequency	Percentage (%)
<i>Industry</i>		
Manufacturers	113	55.7
Freight forwarders	90	44.3
<i>Job title</i>		
Vice-president and above	9	4.4
Director and assistant director	42	20.7
Manager and assistant manager	110	54.2
Non-management staff	42	20.7
<i>Department</i>		
Operations and Logistics	118	58.1
Procurement	21	10.3
Quality improvement	17	8.4
Sales	15	7.4
Others	32	15.8
<i>Years of experience</i>		
<5 years	62.0	21.2
6 – 10 years	49.0	43.8
11- 15 years	38.0	22.7
15 and above	34.0	12.3

Table 3. Mean, standard deviation, reliability, and correlation of constructs

Construct	1	2	3	4	5	6
1. Value	(0.87)					
2. Transport	0.31	(0.85)				
3. Customer	0.16	0.35	(0.82)			
4. Tangible	0.40	0.31	0.54	(0.89)		
5. Image	0.52	0.53	0.28	0.40	(0.74)	
6. CustSat	0.56	0.61	0.45	0.50	0.61	(0.83)
Mean	3.59	4.25	4.06	3.47	3.83	4.18
SD	2.13	1.98	1.84	1.46	2.04	1.93

Note: Values in parenthesis are Cronbach's alpha values

Table 4. Hierarchical regression results

Model	(1) Linear		(2) Interaction	
	b_i	Sig.	b_i	Sig.
<i>Predictors</i>				
value	0.258	0.000	0.226	0.000
transport	0.304	0.000	0.355	0.000
customer	0.189	0.001	0.093	0.101
tangibles	0.145	0.049	0.198	0.007
image	0.193	0.001	0.185	0.001
transport x value			- 0.154	0.000
image x value			0.113	0.000
image x transport			0.053	0.046
<i>Summary statistics</i>				
n	203		203	
ΔF	61.867		10.267	
Sig. of ΔF	-		0.000	
R^2	0.611		0.674	
ΔR^2	-		0.063 (~10%)	

Table 5. Nature of interaction between SQ attributes

SQ attribute	Value	Transport	Customer	Tangibles	Image
Value	-				
Transport	T	-			
Customer	A	A	-		
Tangibles	A	A	A	-	
Image	S	S	A	A	-

Note: T indicates trade-off effect, A indicates additive effect, and S indicates synergistic effect

FIGURES

Figure 1. Linear and Non-linear Appraisal of SQ Attributes

Figure 2. Interactive Appraisal of SQ Attributes

Figure 3. Service Quality Appraisal Process

Note: Solid lines reflect existing knowledge and theories relating to service quality appraisal. Dashed lines indicate the paper's proposition.

Figure 4(a) Compensatory Model

Figure 4(b) Synergistic Model

Figure 4. Regression of customer satisfaction on service quality attributes at three levels of value