On the relationships between logistics service deliverables, customer satisfaction and loyalty in industrial supply chains

Apostolos N. Giovanis*
Department of Business Administration,
Technological Educational Institute of Athens,
Agiou Spiridonos, 12210 Athens, Greece
E-mail: agiovanis@teiath.gr
*Corresponding author

Evangelos Tsoukatos
Department of Finance and Insurance,
Technological Educational Institute of Crete,
P.O. Box 128, 72100 Agios Nikolaos, Greece
E-mail: tsoukat@staff.teicrete.gr

Abstract: This study aims at identifying the main dimensions of logistics service quality (LSQ) and analysing their effects on satisfaction and loyalty in B2B settings. For this purpose an integrative structural model of logistics service performance impact on satisfaction and loyalty is proposed and tested in a self-built logistics setting. On evidence drawn, through a dedicated research instrument, from 213 companies in Greece, the effects of outcome and process elements of LSQ on satisfaction and loyalty are assessed. Results show that customers' perception about their suppliers' LSQ level is shaped by both outcome and process elements while outcome quality is further affected by process quality. Both dimensions impact satisfaction with outcome quality being the main driver. LSQ dimensions and satisfaction directly affect loyalty. Satisfaction's hypothesised enhancing role on the association between LSQ dimensions and loyalty is confirmed. Finally, several implications of the findings are discussed and further research directions are provided.

Keywords: logistics service quality; LSQ; technical/outcome quality; functional/process quality; satisfaction; loyalty; supply chain service management; self-built logistics management; partial least squares path modelling; PLS-PM; higher-order constructs.


Biographical notes: Apostolos N. Giovanis is Assistant Professor of Management at the Department of Business Administration, Technological Educational Institute (TEI) of Athens, Greece. He received his MSc and PhD in Management, both from Technical University of Crete, Greece. Prior to joining TEI of Athens, he has undertaken several managerial roles in the field of marketing management in the service industry. His research interests are
primarily in the areas of service management, service marketing, innovation management, and customer relationship management and his academic work has been published in several international refereed journals.

Evangelos Tsoukatos is Assistant Professor at the Technological Educational Institute of Crete, Greece. His PhD in Management Science is from Lancaster University Management School (LUMS), UK while his Masters and undergraduate degrees are from LUMS and Aristotelion University of Thessaloniki, Greece, respectively. Before joining academia, he practiced as Insurance and Management Consultant and in senior management positions. His research interests include services marketing, service quality, customer behaviour and culture’s effects on customers’ behaviour. He was awarded the ‘Brian Kingsman Prize for Best Doctoral Researcher’ and shares with Evmorfia Mastrojianni the 2011 Emerald Best Paper Award. He is a member of the EuroMed Business Research Institute co-chairing the Institute’s ‘Cross-Cultural Management’ research Committee.

1 Introduction

Amidst severe business antagonism in all industries, effective supply chain management (SCM) has gradually gained substantial significance vis-à-vis generating customer relationships, increased satisfaction and sustainable business profitability (Mentzer, 2001; Stank et al., 2003; Habib, 2010). Its importance towards creating and maintaining strategic competitive advantage for firms has become paramount with the specific objective of bettering responsiveness and flexibility of industrial firms (Yue, 2008). Vital aspect in the SCM paradigm is reliable, high-quality logistics services (LS) designed to implement operations of inter-organisational systems so that time and space constraints of products are efficiently overcome (Bienstock et al., 2008).

Effective LS is critical in business and, along with product quality and price, high quality LS performance drastically affects buyers’ value (Gil-Saura et al., 2008). Logistics service quality (LSQ) has gained in popularity and has become key research topic in the last two decades, mainly due to its close connection to customer satisfaction and loyalty (Gil-Saura et al., 2008; Taskin and Durmaz, 2010) that, in turn, lead to increased market share and business performance (Daugherty et al., 1998; Innis and La Londe, 1994; Stank et al., 2003; Zeithaml et al., 2006; Jones and Taylor, 2007; Zhang et al., 2010). Previous research points out to the importance of customers’ loyalty, in particular word-of-mouth communication, in new customers’ acquisition (McConnell and Huba 2007; DeWitt et al., 2008). In this respect, post-experience evaluations of LSQ significantly affect what customers are willing to communicate to others regarding purchasing from the same supplier or avoiding doing so respectively. In addition to attracting new business, word-of-mouth is proven to enhance the communicator’s own loyalty thus positively affecting existing customers’ behavioural loyalty intentions (Garnefeld et al., 2011).

The literature provides several approaches regarding LSQ measurement (Feng et al., 2007; Gil-Saura et al., 2008). However, there is no consensus either on the concept’s components or on their role in the LSQ → Satisfaction → Loyalty chain, which is considered as appropriate tool for service evaluation (Brady et al., 2002; Huang et al., 2009). With respect to the former issue, most existing studies adopt an
aggregate measure for LSQ operationalisation (Davis-Sramek et al., 2008; Gil-Saura et al., 2008, 2010) or consider LSQ as second-order construct having the nine constructs proposed by Mentzer et al. (1999) as subdimensions (Bienstock and Royne, 2010; Huang et al., 2009). However, considering the outcome and process elements of LSQ individually, in comprehensive models, is critical for advancing understanding of how customer perceptions of LS quality are formed (Bienstock et al., 2008). In this respect, and following Grönroos’s (1984) Nordic model of service quality, as tailored by Mentzer et al. (1999, 2001) for logistics, LSQ evaluation is based on two dimensions: technical/outcome quality, addressing ‘what’ the core benefit of logistics service is, and functional/process quality, addressing ‘how’ the service is delivered.

As far as the links between LSQ and business performance outcomes such as customer satisfaction and loyalty are concerned, most literature follows Cronin and Taylor’s (1992) paradigm where the primary and direct link is from customer satisfaction to loyalty (Bienstock et al., 2008; Davis-Sramek et al., 2008, 2009; Gil-Saura et al., 2008, 2010), while service quality is antecedent of customer satisfaction. Theoretical justification for these links can be attributed to Bagozzi’s (1992) appraisal → emotional response → coping framework. However, several studies especially in the B2C service marketing literature provide evidence indicating that service quality does affect loyalty, albeit through satisfaction (Cronin et al., 2000; Brady et al., 2002). Operational literature has been lacking in research following an integrative LSQ, satisfaction and loyalty modelling approach.

In this study, an integrative model of self-built logistics service performance impact on customer satisfaction and loyalty in manufacturing supply chains is introduced and tested in a B2B research setting. On evidence from 213 business customers, operating in Greece, the effects of technical/outcome and functional/process elements of LSQ on customers’ satisfaction and loyalty are assessed.

The major contributions of this paper are addressing the LSQ dimensions and their importance in the LSQ – Satisfaction – Loyalty path, since customer satisfaction is key performance indicator in B2B supply chain industry and important driver of loyalty, which in turn leads to increased market share and profitability (Innis and La Londe, 1994).

The paper is organised as follows. In Section 2, relevant literature is reviewed and the proposed model and the study’s hypotheses are introduced. Section 3, deals with the study’s methodology while Section 4 presents and discusses analysis results and Section 5 deliberates on the implication of the study’s findings. Finally, Section 6 presents the study’s limitations and directions for further research.

2 Literature review and hypotheses development

2.1 Logistics service quality (LSQ)

Faced with challenges emanating from increased customers’ expectations of purchased products and services, business organisations worldwide are impelled to work towards reducing costs, improving quality and meeting customers’ growing demands. In this respect, firms are increasingly recognising effective SCM, which involves a number of operating areas such as manufacturing, marketing, selling and procuring, as driver and
antecedent of customers’ satisfaction and loyalty. In turn, delivering high-quality LS is key to efficient SCM (Stank et al., 2001). Bienstock et al. (2008) trace the origins of LSQ research to Perreault and Russ (1976) according to who effective logistics operations generate time, place, and form added value and therefore enhance product worth, a statement that was further extended to the well accepted nowadays (Kadadevaramath et al., 2010) seven Rs definition of effective logistics, that is delivering the right amount, the right product, at the right place, in the right condition, at the right time, with the right information, and at the right price (Shapiro and Heskett, 1985; Stock and Lambert, 1987; Coyle et al., 1992).

As regards LSQ conceptualisation and measurement, commendable is the work of Bienstock et al. (1997) on the combined grounds of the Nordic (Grönnroos, 1984) and the American (Parasuraman et al., 1988) service quality conceptualisations. Bienstock et al. (1997) diagnosed problems in applying the SERVQUAL metric (Parasuraman et al., 1988) in industrial service contexts due to the prominence of technical/outcome quality, as against functional/process quality, in evaluating industrial service transactions. Technical/outcome quality is about determining the extent to which the promised core benefit or outcome is delivered while functional/process quality addresses the service delivery process (Grönnroos, 1984; Parasuraman et al., 1988). SERVQUAL dimensions are profoundly functional/process oriented and cannot fully grasp the idiosyncrasies of the LSQ construct (Bienstock et al., 2008). Based on these findings and LSQ literature, Bienstock et al. (1997) developed and validated the 15-item physical distribution service quality (PDSQ) scale based on the value-added utilities of time, place, and form, and comprised of three technical/outcome dimensions of ‘physical distribution service quality’: timeliness (i.e., whether or not orders arrive on time, availability (i.e., of products in inventory that are available to fill orders, and condition (i.e., whether or not the products received undamaged).

Mentzer et al. (1999) and Mentzer et al. (2001) combined the physical distribution service (PDS) concept previously proposed by Mentzer et al. (1989) by incorporating in it the PDSQs (Bienstock et al., 1997) dimensions as well as additional functional/process dimensions such as personnel contact quality, order release quantities, information quality, ordering procedures, and order discrepancy handling. The proposed LSQ model included nine dimensions. Following the Nordic conceptualisation of service quality (Grönnroos, 1984), Bienstock et al. (2008) extended Mentzer et al.’s (2001) model by utilising this process/outcome dichotomy, which is of particular significance for the content validity of service quality.

Adding to the multidimensional perspective of service quality, Dabholkar et al. (1996) and Brady and Cronin (2001) proposed perceptions of service quality to be multilevel. Kang (2006) and Collier and Bienstock (2006) followed a similar approach to identify the technical and functional dimensions of service quality and the components thought to make up each dimension in mobile telecommunications and e-retailing respectively. The present study adopts a similar approach representing LSQ technical/outcome and functional/process dimensions as higher-order constructs. Considering functional/process and technical/outcome quality as distinct concepts under a comprehensive model, constitutes a significant step towards advancing the sophistication of understanding the formation of customer perceptions of service quality (Bienstock et al., 2008).
2.2 Customer satisfaction and loyalty

Increased emphasis on SCM has triggered interest on understanding how business processes of SC participants affect SC overall performance (Jeong and Hong, 2007). The performance outcomes that are appropriate for measuring SC performance effectiveness are still under discussion. Nevertheless, SC success is no longer measured by a single entity’s performance but through the combined performance of multiple entities and operations comprising the supply chain network (Spekman et al., 1994). Furthermore, since the customer is the ultimate judge of service delivery performance (Parasuraman et al., 1988) meeting customers’ ever-evolving needs and expectations is bound to be paramount in SC. That is, customer satisfaction is key performance indicator.

The most widely used model of customer satisfaction is based on Oliver’s (1980) expectancy disconfirmation theory. Oliver (1980) suggests that customers purchase goods and services with pre-purchase ‘performance-specific expectations’ based on their previous experience and used as reference points against which the product/service’s performance, once purchased and used, is compared.

McDougall and Levesque (2000) see satisfaction to be defined by the extent to which customers’ actual usage experience matches their expectations of the service offered. In this respect, customer satisfaction is either seen under the transaction-specific perspective (cognitive dimension) or the cumulative perspective (affective dimension) (Söderlund, 1998). However, many studies in the field of service marketing support the affective perspective arguing that customer satisfaction is the customers’ total response to the purchase and after sales experience, since this perspective is more capable of evaluating the service performance of firms and predicting customers’ post-purchase behaviour (Parasuraman et al., 1988; Cronin et al., 2000).

The literature suggests that a strong link exists between customer satisfaction and loyalty (Fornell, 1992; Anderson and Sullivan, 1993; Jones and Sasser, 1995; Cronin et al., 2000). Customer loyalty is defined as a long-term commitment involving both a favourable attitude towards the selling firm and repeated patronage. Thus, loyalty is demonstrated by the purchasing pattern over time (Dick and Basu, 1994). Although many customers’ psychological processes may be associated with customer loyalty, customer satisfaction with company’s capabilities has been shown to have significant and positive impact on cognitive attitudes and repurchase intentions in the CS contexts (Innis and La Londe, 1994; Daugherty et al., 1998; Hu and Jen, 2010). Although in the service quality → customer satisfaction → customer loyalty path, customer satisfactions is considered as the main mediator between SQ and CL (Cronin and Taylor, 1992), research evidence exists on direct effects on the latter of service quality dimensions (Anderson and Sullivan, 1993; Zeithaml et al., 1996; Chumpitaz and Paparoidamis, 2004). This study examines both direct and indirect, through CS, effects of second order LSQ dimensions on CL.
Customer loyalty is paramount for sustainable financial performance of suppliers (Jones and Sasser, 1995), since high customer loyalty rates maintenance can substantially improve profits (Reichheld and Sasser, 1990; Zeithaml et al., 1996). Loyal customers are willing to buy more and repeatedly (Heskett et al., 1997), act as advocates of the provider through positive word-of-mouth and are less sensitive to price increases (Zeithaml et al., 1996). The relationship between physical distribution performance and demand is validated by Innis and La Londe (1994) through investigating the impact of customer service, satisfaction, and attitudes on repurchase intentions. At the same time, both customer loyalty and positive referrals also contribute to the reduction of costs and capital investments requirements (Oliver, 1999; Crosby and Johnson, 2005).

3 Conceptual model and research hypotheses

The model under examination in this study is presented in Figure 1. The theoretical foundations for the relationships depicted in this figure are summarised below on the grounds of the preceding review of relevant literature.

Figure 1  Conceptual model
In terms of LSQs dimensions specification, technical/outcome quality and functional/process quality are specified as second-order latent constructs modelling a level of abstraction higher than first-order constructs (Wetzels et al., 2009). According to McKenzie et al. (2005), the utilisation of higher-order constructs allow for more theoretical parsimony and reduce a model’s complexity. Borrowing from Mentzer et al. (2001) and Bienstock et al. (2008), the technical/outcome quality dimension is conceptualised across four sub-dimensions: order availability, timeliness, order accuracy, and order condition, while the functional/process quality dimension across the four sub-dimensions: ordering procedures, personnel contact quality, information quality, and order discrepancy handling. On the grounds of the aforementioned theoretical propositions, it is hypothesised that:

H1 Technical/outcome quality is a second-order construct having product availability (H1a), order accuracy (H1b), timeliness (H1c), and order condition (H1d) as its sub-dimensions.

H2 Functional/process quality is a second-order construct having ordering procedures (H2a), personnel contact quality (H2b), information quality (H2c), and order discrepancy handling (H2d) as its sub-dimensions.

Empirical studies in operations, marketing, and logistics provide considerable support for links between technical/outcome quality, functional/process performance quality and customer satisfaction (Crosby et al., 1990; Cronin and Taylor, 1992; Innis and La Londe, 1994; Youngdahl and Kellogg, 1997; Daugherty et al., 1998; Gil-Saura et al., 2008; Davis-Sramek et al., 2008, 2009). In marketing, Cronin and Taylor (1992) identified service quality as antecedent of customer satisfaction while in logistics elements of technical/outcome and functional/process performance quality relative to logistical services were found to positively affect customer satisfaction (Mentzer et al., 1999, 2001). A synthesis of these findings leads to the next two model hypotheses:

H3 In supply chains relationships technical/outcome quality performance positively affects customer satisfaction.


In an effort to improve understanding of how logistics service customers form their LSQ perceptions and satisfaction with LS delivered, Mentzer et al. (2001) conceptualised LSQ as a process. In their process LSQ model, customers’ perceptions of LS quality affect both directly and indirectly customer satisfaction. Indirect effects occur through customer perceptions of logistics outcome quality. Bienstock et al. (2008), Stank et al. (1999) and Hu and Jen (2010) confirmed this relationship in the operations management literature, concluding that the more a supplier comprehends its customer needs the best is prepared to manage the operational means of meeting them. This leads to the following hypothesis:

H5 In supply chains relationships functional/process quality performance positively affects technical/outcome quality performance.

The literature reveals a strong link between customer satisfaction and loyalty in both B2C and B2B settings (Fornell, 1992; Anderson and Sullivan, 1993; Innis and La Londe, 1994; Jones and Sasser, 1995; Bienstock et al., 2008; Gil-Saura et al., 2008). Overall customer satisfaction with companies’ performance is shown to have significant and
positive impact on repurchase intentions and positive referrals (Cronin and Morris, 1989; Youngdahl and Kellogg, 1997; Daugherty et al., 1998). These findings provide the theoretical basis for the following hypothesis:

H6 In supply chains relationships customer satisfaction positively affects customer loyalty.

Although ample evidence exists in the literature on the existence of significant, two-way relationships between service evaluations and their outcomes such as WOM, referral and retention, the links between service quality and outcome measures are still not clear. Cronin et al.’s (2000) review reveals little uniformity on whether service quality directly or indirectly affects customer’s post-purchase behaviour. The majority of previous studies on B2B relationships are categorised under the structure type known as ‘satisfaction’ model (Cronin et al., 2000), where the primary and direct link is from customer satisfaction to outcome measures such as loyalty (Gil-Saura et al., 2008, 2010; Bienstock et al., 2008; Davis-Sramek et al., 2008, 2009). Partial examination of simple bivariate links between service quality dimensions and customer loyalty may either mask or overestimate true relationships due to omitted variable bias. To address this issue Cronin et al. (2000) proposed a model where service quality and satisfaction directly lead to customer loyalty simultaneously. This leads to the final two hypotheses:

H7 In supply chains relationships technical/outcome quality performance positively affects customer loyalty.

H8 In supply chains relationships functional/process quality performance positively affects customer loyalty.

4 Research methodology

4.1 Research instrument development

Empirical data for assessing the proposed LSQ scale’s properties and for testing suggested hypotheses was collected through a self-administered questionnaire that was constructed on the theoretical grounds of existing related literature.

More specifically, LSQ dimensions were assessed on adapted items borrowed from Bienstock et al. (2008, 2010). As regards dimensions and items introduced by Mentzer et al. (2001), the process sub-dimension of order release quantities is overlapping with Bienstock et al.’s (2008, 2010) logistics outcome sub-dimension of availability. Similarly, the outcome quality sub-dimension of order quality in Mentzer et al.’s (2001) model is identical in meaning to Bienstock et al.’s (2008, 2010) order accuracy. Customer satisfaction and loyalty items were drawn from Stank et al. (1999) and Gil-Saura et al. (2010) measures. Likert scales anchored at (1) ‘strongly disagree’ and (5) ‘strongly agree’ are used for all items to ensure statistical variability. Finally, a series of classification variables are included such as company size, respondent duties and company yearly revenues.

In order to maintain the instrument’s technical and conceptual equivalence a translation and back-translation strategy was applied for developing the Greek version. The former version of the questionnaire was given to three industry experts to evaluate the preliminary design of the survey instruments. Based on their comments and
suggestions, some of the wording and format of the questionnaire were modified to enhance its readability. Finally, a factor analysis that was performed on data from a pilot sample of 60 industrial customers confirmed all hypothesised LSQ factors all having Cronbach’s alpha values well above the commonly accepted threshold value of 0.70.

4.2 Data collection and sample profile

The study’s universe consists of Greek manufacturing companies operating in the Attica region (the region around Athens, the capital of Greece) and engaged in purchasing activities. The database of eligible companies, including 1,006 entries, was retrieved from http://www.icaphbusiness.gr by selecting the appropriate NACE (National Classification of Economic Activities) codes. The fieldwork was conducted during the last two months of 2011. Initially, an e-mail, along with the questionnaire, was sent to operations/purchasing managers of all eligible companies, where the study’s objectives were introduced and respondents’ participation necessity was explained. This initial step yielded 184 usable responses (18%). After a reminder, 29 more usable responses were received for a total of 213 usable responses and an overall response rate of 21%.

Most respondents (54%) reported their position as related to purchasing activities. A relatively big proportion (18%) refused to report their duties, while the remaining (28%) reported their titles as senior managers, middle managers, or business owners. The majority of firms (88%) are industrial goods companies while the rest are consumer goods companies. The largest percentage of organisations (71%) were SMEs, reporting between 10 and 250 employees, 18% reported more than 250 employees and 11% did not report number of employees. Finally, 49% of firms reported annual revenues less than €1.000.000, 38% between €1.000.000 and €50.000.000, and 6% in excess of €50.000.000. 7% of firms failed to report their annual revenues.

4.3 Data analysis and results

The method of partial least squares (PLS) analysis (Gefen et al., 2000), an implementation of structural equation modelling (SEM), was applied to test the measurement model through determining the internal consistency, reliability and construct validity of the multiple-item scales used to operationalise its variables. PLS is a component-based SEM technique capable of testing the psychometric properties of scales used to estimate the parameters of structural models (Fornell, 1987). PLS-PM is preferred over covariance-based SEM techniques such as AMOS and LISREL because its sample size and residual distributions requirements are less strict (Chin et al., 2003) and it is especially capable of testing large and complex models (Bollen and Lenox, 1991), such as the proposed, with ten first-order and two second-order reflective constructs.

The sample size of \( n = 213 \) is adequate for PLS implementation. In general, the most complex regression in PLS implementation will involve either the indicators of the most complex formative construct or the largest number of antecedent constructs leading to an endogenous construct. Based on Barclay et al. (1995), sample size should be at least equal to the greatest between the numbers of predictors multiplied by ten in either of the above rules. In our case, since there are no formative constructs, 60 cases are adequate for PLS implementation.

Data analysis employed a two-phase approach suggested by Anderson and Gerbing (1988) in order to assess the reliability and validity of measures before using them in the
research model. The first phase includes the measurement model analysis, while the second examines the structural relationships among latent constructs.

4.4 Assessment of measurement scales

Testing the measurement model involves estimation of internal consistency, convergent and discriminant validity of the study constructs, indicating the strength measures used to test the model (Fornell, 1987). As shown in Table 1, all reliability measures (i.e., Cronbach’s alpha and composite reliability-CR) are well above the recommended level of 0.70 indicating adequate internal consistency (Gefen et al., 2000).

Table 1 Psychometric properties of the constructs

<table>
<thead>
<tr>
<th>Latent variable</th>
<th>Item</th>
<th>MV</th>
<th>SD</th>
<th>Loadings</th>
<th>Critical ratio</th>
<th>Cronbach’s alpha</th>
<th>CR</th>
<th>AVE</th>
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<td>Ordering procedures</td>
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<td>Satisfaction</td>
<td>S1</td>
<td>4.05</td>
<td>0.75</td>
<td>0.928</td>
<td>74.509</td>
<td>0.910</td>
<td>0.943</td>
<td>0.847</td>
</tr>
<tr>
<td></td>
<td>S2</td>
<td>4.03</td>
<td>0.73</td>
<td>0.928</td>
<td>66.216</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>S3</td>
<td>3.98</td>
<td>0.89</td>
<td>0.904</td>
<td>68.447</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loyalty</td>
<td>L1</td>
<td>3.67</td>
<td>1.04</td>
<td>0.786</td>
<td>21.234</td>
<td>0.915</td>
<td>0.934</td>
<td>0.703</td>
</tr>
<tr>
<td></td>
<td>L2</td>
<td>3.71</td>
<td>0.93</td>
<td>0.762</td>
<td>15.522</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>L3</td>
<td>3.64</td>
<td>1.10</td>
<td>0.844</td>
<td>39.363</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>L4</td>
<td>4.04</td>
<td>0.95</td>
<td>0.889</td>
<td>45.554</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>L5</td>
<td>4.00</td>
<td>0.91</td>
<td>0.877</td>
<td>43.778</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>L6</td>
<td>3.97</td>
<td>0.92</td>
<td>0.865</td>
<td>47.565</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: MV: mean value; SD: std. deviation; CR: composite reliability
On the relationships between logistics service deliverables, customer satisfaction and loyalty

As it can also be seen in Table 1, latent constructs show adequate convergent validity. Based on Fornell and Larcker (1981), convergent validity is adequate when constructs present an average variance extracted (AVE) greater than or equal to 0.5. Convergent validity can also be verified when items loading on their associated factors are well above 0.7, which is true in our case (Gefen et al., 2000).

Table 2 reflects the discriminant validity of constructs, by indicating inter-construct correlations and the square root of AVE on the diagonal. All values on the diagonal are greater than those in corresponding rows meaning that all measurement variables load more highly on their own constructs than on other constructs (Fornell and Larcker, 1981). Thus, logistics service evaluation is explained sufficiently by the revealed latent variables’ structure (convergent validity), and this structure includes all unique manifest variables (discriminant validity).

### Table 2  Discriminant validity assessment

<table>
<thead>
<tr>
<th></th>
<th>L</th>
<th>S</th>
<th>OC</th>
<th>T</th>
<th>OA</th>
<th>PA</th>
<th>OD</th>
<th>IQ</th>
<th>PQ</th>
<th>OP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loyalty</td>
<td>0.84</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Satisfaction</td>
<td>0.75</td>
<td>0.92</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Order condition</td>
<td>0.53</td>
<td>0.59</td>
<td>0.84</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Timeliness</td>
<td>0.55</td>
<td>0.62</td>
<td>0.55</td>
<td>0.87</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Order accuracy</td>
<td>0.58</td>
<td>0.60</td>
<td>0.53</td>
<td>0.49</td>
<td>0.82</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Product availability</td>
<td>0.49</td>
<td>0.55</td>
<td>0.39</td>
<td>0.42</td>
<td>0.49</td>
<td>0.80</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Order discrepancy handling</td>
<td>0.48</td>
<td>0.51</td>
<td>0.45</td>
<td>0.51</td>
<td>0.43</td>
<td>0.47</td>
<td>0.88</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Information quality</td>
<td>0.47</td>
<td>0.54</td>
<td>0.49</td>
<td>0.41</td>
<td>0.52</td>
<td>0.37</td>
<td>0.53</td>
<td>0.87</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personnel contact quality</td>
<td>0.54</td>
<td>0.61</td>
<td>0.50</td>
<td>0.56</td>
<td>0.56</td>
<td>0.47</td>
<td>0.57</td>
<td>0.52</td>
<td>0.86</td>
<td></td>
</tr>
<tr>
<td>Ordering procedures</td>
<td>0.62</td>
<td>0.56</td>
<td>0.47</td>
<td>0.53</td>
<td>0.59</td>
<td>0.47</td>
<td>0.54</td>
<td>0.55</td>
<td>0.60</td>
<td>0.89</td>
</tr>
</tbody>
</table>

### 4.5 Assessment of higher-order constructs

In Table 3, the CR and AVE measures of second-order constructs are indicated. These exhibit CRs equal to or greater than 0.856 and AVE greater than 0.599, well above the recommended thresholds of 0.7 and 0.5 respectively, providing evidence of reliable second-order constructs (Wetzels et al., 2009). Finally, all second-order constructs loadings on first-order constructs are equal to or exceed 0.704 and are significant at $\alpha = 0.01$. All these support the validity of H1 and H2 that customer’s perception of LSQ dimensions’ performances is based on their perception about their pre-specified sub-dimensions’ performances.

### Table 3  Assessment of higher-order constructs of the LSQ dimensions

<table>
<thead>
<tr>
<th>Sub-dimension</th>
<th>Loadings</th>
<th>Critical ratio</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process quality (CR = 0.888 AVE = 0.664)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OD</td>
<td>0.801</td>
<td>30.778</td>
<td>[0.753–0.861]</td>
</tr>
<tr>
<td>IQ</td>
<td>0.785</td>
<td>23.378</td>
<td>[0.697–0.839]</td>
</tr>
<tr>
<td>PQ</td>
<td>0.835</td>
<td>37.454</td>
<td>[0.785–0.879]</td>
</tr>
<tr>
<td>OP</td>
<td>0.837</td>
<td>35.471</td>
<td>[0.780–0.881]</td>
</tr>
<tr>
<td>Outcome quality (CR = 0.856 AVE = 0.599)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OC</td>
<td>0.793</td>
<td>24.472</td>
<td>[0.720–0.861]</td>
</tr>
<tr>
<td>T</td>
<td>0.795</td>
<td>22.517</td>
<td>[0.711–0.852]</td>
</tr>
<tr>
<td>OA</td>
<td>0.799</td>
<td>25.591</td>
<td>[0.711–0.854]</td>
</tr>
<tr>
<td>PA</td>
<td>0.704</td>
<td>15.229</td>
<td>[0.581–0.774]</td>
</tr>
</tbody>
</table>

Note: CI: confidence interval
4.6 Hypotheses testing

The PLS method was also used to confirm the hypothesised relations between constructs in the proposed model. The significance of paths included into the proposed model was tested using a bootstrap resample procedure with 500 replications. Smart-PLS software was used to conduct the PLS analysis (Ringle et al., 2005). In assessing the PLS model, the squared multiple correlations ($R^2$) of all endogenous latent variables were initially examined and the significance of the structural paths was evaluated.

The assessment of the proposed SEM is presented in Table 4 where the standardised path coefficients, representing the direct effects of the constructs, their statistical significance, and the proportion of explained variance for each endogenous construct are given. Moreover, the significance of all possible indirect effects in the proposed structural model was also given in Table 5. The product of coefficients strategy (Preacher and Hayes, 2004) was preferred for the indirect path coefficients calculation, over Baron and Kenny’s (1986) approach, because of its better statistical validity.

Both supplier’s outcome and process quality influence customer satisfaction. However, outcome quality presents stronger influence on satisfaction than process quality, as indicated by model’s coefficients of $\beta = 0.583$ ($t = 8.406$) for outcome quality, and $\beta = 0.227$ ($t = 3.277$). Moreover, process quality affects customers’ perceptions of outcome quality ($\beta = 0.775$, $t = 17.838$). Therefore, hypotheses H3, H4, and H5 are confirmed. Furthermore, process quality not only directly affects customer satisfaction but also indirectly through outcome quality, since the relevant path coefficient ($\beta = 0.452$, $p < 0.05$) is statistically significant. As far as the direct determinants of customers’ loyalty are concerned, both LSQ dimensions and customers’ satisfaction affect business customer’s attitudinal loyalty, confirming the validity of proposed hypotheses H6, H7, and H8. More specifically, satisfaction is the most important factor of customer loyalty ($\beta = 0.481$, $t = 7.027$), followed by outcome quality ($\beta = 0.197$, $t = 2.476$), and process quality ($\beta = 0.168$, $t = 2.383$).

Table 4 Assessment of the structural equation model

| Effects                        | Std. coefficient | Std. error | $t$     | $Pr > |t|$ | $R^2$ | Hypotheses validation |
|--------------------------------|------------------|------------|---------|---------|-------|------------------------|
| Outcome quality $\rightarrow$ Satisfaction | 0.583            | 0.069      | 8.406   | 0.000   | 0.597 | H3 supported            |
| Process quality $\rightarrow$ Satisfaction   | 0.227            | 0.069      | 3.277   | 0.001   |       | H4 supported            |
| Process quality $\rightarrow$ Outcome quality | 0.775            | 0.043      | 17.838  | 0.000   | 0.601 | H5 supported            |
| Satisfaction $\rightarrow$ Loyalty           | 0.481            | 0.069      | 7.027   | 0.000   | 0.605 | H6 supported            |
| Outcome quality $\rightarrow$ Loyalty        | 0.197            | 0.080      | 2.476   | 0.014   |       | H7 supported            |
| Process quality $\rightarrow$ Loyalty        | 0.168            | 0.071      | 2.383   | 0.018   |       | H8 supported            |

In terms of the indirect effects of LSQ dimensions on loyalty through satisfaction, both found to be statistical significant, as indicated by the relevant coefficients of $\beta = 0.480$ ($p < 0.05$) for process quality, and $\beta = 0.281$ ($p < 0.05$) for outcome quality.
Table 5  
Bootstrap results for indirect effects

<table>
<thead>
<tr>
<th>From</th>
<th>To</th>
<th>Effects</th>
<th>Std. error</th>
<th>Lower bound (95%)</th>
<th>Upper bound (95%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process quality</td>
<td>Satisfaction</td>
<td>0.452*</td>
<td>0.055</td>
<td>0.346</td>
<td>0.570</td>
</tr>
<tr>
<td>Process quality</td>
<td>Loyalty</td>
<td>0.480*</td>
<td>0.053</td>
<td>0.399</td>
<td>0.588</td>
</tr>
<tr>
<td>Outcome quality</td>
<td>Loyalty</td>
<td>0.281*</td>
<td>0.054</td>
<td>0.179</td>
<td>0.390</td>
</tr>
</tbody>
</table>

Notes: Values are calculated through a bootstrapping routine with 1,000 samples.  
* \( p < 0.05 \) – if confidence interval does not contain 0, then the estimate is significant at the 5% level.

The proposed model accounted for 59.7% of the variance in technical/outcome quality, 60.1% of the variance in satisfaction, and 60.5% of the variance in loyalty. The relatively high values of coefficients of determination (\( R^2 \)) indicate that sizeable portions of variance in endogenous variables are explained by the chosen independent variables.

5  Discussion of findings and implications

5.1  Discussion of results

The aim of this study was to advance understanding of the role of LSQ dimensions on business customer’s satisfaction and loyalty. The study’s major contributions are the investigation of LSQ dimensions formation and the applicability of an integrative model of the relationships between the concepts inherent in the quality-satisfaction-loyalty chain in the manufacturing supply chain context (Cronin et al., 2000). A comprehensive framework was developed and PLS-PM analysis was conducted to empirically validate the proposed model.

The recommended framework of this study confirmed a reliable and valid conceptualisation of LSQ consisting of two second-order dimensions: outcome quality and process quality. This basic dichotomy parallels technical versus functional B2C service quality proposed by Grönroos (1984) and found in other studies (Bienstock et al., 2008, 2010; Stank et al., 1999).

Findings show that both technical/outcome and functional/process LSQ dimensions impact satisfaction, while outcome quality partially mediates the relationship between process quality and satisfaction. These results are consistent with the findings of Stank et al. (1999), Davis-Sramek et al. (2009) and Bienstock et al. (2008).

Findings also revealed customer satisfaction as the most important antecedent of business customers’ loyalty, but in contrast to most previous studies (Bienstock et al., 2008, 2010; Stank et al., 1999; Gil-Saura et al., 2008; Stank et al., 1999), not the only one. Both LSQ dimensions directly affect customer loyalty in addition to being indirectly affecting it through satisfaction. These findings are in accordance with findings reported by Cronin et al. (2000) in the context of B2C service marketing, Collier and Bienstock (2006) in the e-retailing context, and Huang et al. (2009) in LSQ evaluation for online shopping, which have proved that customer loyalty is better predicted/explained by comprehensive modelling approaches. However, LSQ dimensions’ direct effects on customer loyalty are much lower that indirect ones, which reveals the mediating effect of affective customer satisfaction between LSQ and customer loyalty.
5.2 Managerial implications

There are several important implications of the study’s findings for supply chain managers. LSQ is currently an important element of strategic management for companies wishing to outperform, since it could be a differentiator for manufacturers in market conditions characterised by evolving supply chains, global competition, lack of product differentiation and intense price competition (Davis-Sramek et al., 2009). This study provides a clear conceptualisation of LSQ considering its process and outcome dimensions separately. This association is crucial for practitioners in advancing their understanding of how customer’s perception of service quality is shaped.

The present study shows that outcome quality is the main driver of customer satisfaction followed by process quality. As manufacturing companies recognise that customer satisfaction from order delivery represents a significant buying process element, they should respond appropriately by developing their technical capabilities towards producing value to suppliers through increasing their ability to outperform their competitors in relevant activities. However, suppliers should not disregard the importance of LSQ soft elements’ development, because business customers’ evaluation of process quality can bias future evaluations of outcome quality and its total effect on customer satisfaction (0.679) is greater than the relevant effect of technical elements (0.583).

Moreover, given that LSQs technical elements could be easily copied by competitors, the consideration of functional elements of quality in suppliers strategic positioning will offer them significant opportunities in improving their customers attitudes about the services they receive (Huang et al., 2009).

In terms of business customers’ loyalty, suppliers are suggested to collectively improve LSQ elements and satisfaction rather than one at a time. The strategy of improving only one variable and ignore the other will lead to incomplete results (Cronin et al., 2000). Suppliers need to know that gaining customer loyalty needs more than simply delivering the order. They need to be concerned with how the order is received by the customer and how the customer interacts with them. When business customers make an order to their supplier, they expect their products to be delivered subject to the specifications denoted by them and they need to be able to interact effectively with supplier’s available contact points. If one or both LSQ dimensions fail to meet customers’ expectations, then not only will service evaluation be negatively affected but also satisfaction and ultimately future behavioural intentions of customers.

6 Limitations and directions for future research

The current study has a number of limitations that need to be addressed in future research. First, rigorous tests for non-response bias are necessary, although appropriate comparisons were conducted across the two wave responses. These could be achieved by contacting a random sample of non-respondents and asking them to respond to selected survey items and comparing these to respondents’ respective answers. Second, the fact that the study sample includes manufacturing companies operating in the Attica region may affect the generality of the results. There are different territories in Greece exhibiting diverse problems, which might alter results. Third, the findings and implications of this study were obtained on the grounds of a cross-sectional study, which reduces the ability to reflect time-based changes of the research constructs.
In future research efforts, other constructs related to relationship quality (i.e., trust, commitment) showing significant explanation power of loyalty can be incorporated into the proposed model, so as to enhance its predictive performance and provide better understanding of business customer’s decision-making process. Moreover, it should be investigated whether the relationships reported herewith are generalisable across different industrial segments such as wholesaling, retailing, TPL, etc., different companies’ sizes, and companies’ technology level. The understanding of the above moderators’ effects in the proposed model relations will help suppliers in their efforts to improve the effectiveness of their LS.

References


On the relationships between logistics service deliverables, customer satisfaction and loyalty


