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Assessing the impact of sustainable logistics service quality on relationship quality: Survey-based evidence in Egypt

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ABSTRACT

Logistics services support customer-relationship building in the supply chain and help the buying companies establish and maintain a sustainable competitive advantage. To empirically quantify the effect, we introduce the Sustainable Logistics Service Quality (SLSQ) scale and measure the impact of SLSQ on customer satisfaction and relationship quality in the Egyptian market. Our quantitative research builds on 421 responses collected from small and medium-sized enterprises in Egypt. The identified relationships are tested using maximum likelihood structural equation modeling (ML-SEM) and mediation analysis. The results show that customer satisfaction with SLSQ indeed positively affects single relationship quality second-order dimensions. We further tested the indirect relationships between customer satisfaction, dependence, trust, and commitment confirming the important mediating roles of dependence and trust for relationship quality building. While the study contributes to a better understanding of the underlying mechanisms to build relationship quality, it additionally provides recommendations to increase the performance of LSPs in emerging countries such as Egypt. Finally, the results are discussed against previous literature and concluded by showing limitations and potential future research avenues.

1. Introduction

Facilitating efficient and effective transportation and storage of goods, information, and services are increasingly recognized as key factors to foster sustainable economic development and competitiveness in emerging countries (Jia et al., 2018). Transformations concerning sustainability have been widely discussed in extant literature (e.g., Biggemann et al., 2014), as it is considered a primary future concern for many industries (Zhu et al., 2008). These require companies to reshape their business strategies and integrate sustainable practices at the operational level while developing new product and service designs (Yuen et al., 2017). In this vein, companies have started to apply sustainability policies when working with logistics service providers (LSPs), as efficient logistics services are considered a competitive advantage through decreasing the overall cost and CO_2 emissions and enhancing the buying company's service quality (Centobelli et al., 2017). Accordingly, LSPs have received increasing demands to apply sustainability practices in their operational activities while simultaneously achieving high-quality services, monetary savings, and customer satisfaction. However, if cost minimization is still the key objective in managing logistics services, the service quality level is hard to quantify, represented by a function of varying customer perceptions over time, the measurement process itself, and the availability of robust data (Limbourg et al., 2016).

Having a reliable measure for sustainable logistics service quality (SLSQ) in place is necessary for buying companies that aim to present better logistics services to their customers and measure the sustainable quality of their products and services (Kaswengi and Lambey-Checchin, 2020). Being measurable, logistics services support customer-relationship building and help companies establish and maintain a sustainable competitive advantage through customer satisfaction and loyalty (Balci et al., 2019; Khompatraporn and Somboonwiwat, 2017). LSPs should adopt sustainable logistics practices, especially downstream the supply chain (Graham et al., 2018), which is often associated with transport operation delays (Sanchez-Rodrigues et al., 2010), poor communication, and the lack of an effective carbon footprint management (Saberi, 2018). By increasing customer satisfaction with green and sustainable operations, LSPs integrating sustainability strategies can enhance the performance along the entire supply chain. Accordingly, strong relationships among

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LSPs and their customers enable supply chain actors to achieve synergies for sustainability and superior performance (Cao and Zhang, 2011).

Even though these aspects have been addressed in international research for some years, there is still a gap in the current knowledge on efficiently designing relationships and collaboration among LSPs and their customers. By carrying out an intensive literature review, Ren et al. (2020) particularly highlight gaps related to more global research to co-develop a comprehensive evaluation framework of logistics service performance; the interactive and dynamic relationships among sustainable development goals, green policies, the decision-making of the LSPs, and their customers; as well as application-oriented management research on advanced green logistics initiatives to promote sustainable logistics innovations. Against this background, and thus following the rationale that the fulfilled sustainability needs of the customer are associated with the buyer-service provider relationship, we empirically test a theoretical framework consisting of SLSQ, customer satisfaction, and single relationship quality constructs (Hennig-Thurau and Klee, 1997; Jaafar, 2006). To address essential items associated with the LSPs' sustainable service quality and its relationship to customer satisfaction, the present study answers the following research questions: *How does an LSP's sustainable service quality affect the buying firms' relationship quality building? Which role does customer satisfaction play?*

While marketing scholars have established relationship quality as an essential construct in relationship marketing to give an advantage to their partners over time through creating, developing, and maintaining committed, interactive, and profitable, it is hardly reflected in the logistics and supply chain domain (Qian et al., 2020a,b). Acknowledging that the relationships formed among supply chain parties are crucial to improve the (sustainable) supply chain performance (Nyaga and Whipple, 2011; Kam and Lai, 2018), recent research mainly focuses on combining the relationship quality and supply chain management (SCM) perspectives (cf., Qian et al., 2020a). Although service and relationship quality constructs are widely used in the extant literature, exploring sustainability factors in logistics service quality literature is still scarce. Including items regarding sustainable transportation, sustainable information sharing, health and safety training, and collaboration—we test the SLSQ's impact on customer satisfaction and relationship quality in the Egyptian market. Egypt particularly follows the United Nations Sustainable Development Goals (SDGs) and intends to show significant logistics performance developments in the future[1], therefore making it a suitable empirical field to test the proposed theoretical relationships of the SLSQ scale.

To systematically test the influence of SLSQ on relationship quality with empirical data, the present study proposes a theoretical framework combining logistics service quality (LSQ, cf. Mentzer et al., 1999), sustainable service quality (SSQ, cf. Gupta et al., 2018), and relationship quality (cf. Palmatier et al., 2006) constructs. Based on a quantitative questionnaire (N = 421) administered among Egyptian companies, the factors influencing relationship quality are examined with equation modeling and mediation analysis. While the present research contributes to a better understanding of the underlying mechanisms of SLSQ for relationship quality in an emerging countries context, it provides potential solutions for a sustainable transformation in the Egyptian logistics sector. Thereby, customer satisfaction constitutes a significant facilitator for increased relationship quality, contributing to improved working conditions in the logistics sector and a higher society's perception and appreciation of the activities related to the industry.

The remainder is structured as follows: Section 2 provides the literature background, while Section 3 builds the theoretical framework and proposes related hypotheses. Section 4 describes the applied research design. Next, Section 5 presents the empirical findings, while Section 6 elaborates on the results considering previous research. Finally, Section 7 concludes the study's findings and limitations, pointing toward future research avenues.

2. Sustainable logistics service quality

The crucial role of service quality has been confirmed for most industries and sectors such as banking, hospitality, education, health, and logistics (e.g., Kaswengi and Lambey-Checchin, 2020; Mentzer et al., 1999; Oyetunji et al., 2014; Samanhyia et al., 2014). Measured as the degree of difference between consumers' perceptions and expectations, service quality has a vital impact on business performance through reduced costs and increased customer satisfaction, customer loyalty, and profitability (Gurău, 2003; Parasuraman et al., 1988). Particularly in the logistics sector, service quality factors play an essential role; consequently, weaknesses in service quality factors will affect the company's performance and customer satisfaction (Yuen and Thai, 2015). In this vein, Bienstock et al. (1997) developed a suitable and reliable scale for measuring the service quality of physical distribution services. Building on their work, Mentzer et al. (1999) extended the use of the service quality concept into the LSQ scale, covering the LSPs' customer perceptions by suggesting nine theoretical dimensions (information quality, ordering procedures, order release quantities, timeliness, order accuracy, order quality, order condition, order discrepancy handling, and personnel contact quality). They empirically validated their LSQ scale using a single large LSP firm in the United States, namely the Defense Logistics Agency. Similarly, Stank et al. (1999) illustrated the use of the LSQ scale as an essential tool that makes a buying company more successful through its operational flexibility and improving the service level, which leads to competitive advantage. Moreover, Jaafar (2006) applied Mentzer et al.'s (1999) model to study the effects of the technical and functional quality dimensions of LSQ on customer satisfaction and the effects of the relationship quality dimensions on customer loyalty for third-party relationships.

In more recent years, buying companies have been making a considerable effort toward (environmental) sustainability to maintain a competitive advantage and reach new customer segments, particularly addressing the LSPs' sustainable service quality (Lieb and Lieb, 2010). Chaisurayakarn et al. (2014), for instance, investigated the issues of green service quality (GSQ) and LSQ and their impact on the Thai government's logistics performance index (TLPI) for logistics providers in Thailand. The results of their study indicated that LSQ has a significant positive effect on TLPI, and the effect is more pronounced when GSQ measures are included. Further, Gupta et al. (2018) proposed a framework to measure the LSPs' service quality and provided recommendations for LSPs to manage their operations and present a more sustainable service quality. Based on their case analysis, an LSP should implement sustainability practices to save resources as well as to recycle and reuse materials. In addition, the implementation of sustainable, tangible assets such as solar panels and rainwater collection should be fostered. García-Dastugue and Eroglu (2019) also investigated the logistics sector's service quality performance and environmental sustainability factors. Their study showed that environmental sustainability practices only enhance sales, while additional service quality enhances sales and reduces overall cost. Further, Ali et al. (2021) extended the main LSQ dimensions proposed by Mentzer et al. (1999) toward including image and social responsibility dimensions. Building on previous research, we propose the following SLSQ scale by combining LSQ and SSQ elements (Ali et al., 2021; Gupta et al., 2018; Jaafar, 2006; Mentzer et al., 1999, Mentzer et al., 2001) with the theoretical dimensions of personal contact quality, sustainable information quality, order condition, and timeliness as described in Table 1.

[1] https://mped.gov.eg/EgyptVision?lang=en.

Table 1
Theoretical dimensions of SLSQ.

Dimensions	Description
Personnel Contact Quality	Personal contact quality refers to the logistics service providers' ability to customer care and problem-solving. The customer service personnel should be knowledgeable, empathize with the customer's situation and help them resolve their problems (Mentzer et al., 2001). Considering sustainability, the service personnel should know about giving advice and tips to decrease environmental impacts through training programs (Wilding et al., 2012).
Sustainable Information Quality	Information quality provides customers with sufficient information given by suppliers, which is related to the variety of products and their availability (Mentzer et al., 2001). In addition, the role of Information and Communication Technologies (ICT) is to provide new low-cost and easy-to-use information tools, primarily through knowledge sharing to the firms that operate in the logistics service industry and have intentions to apply environmentally sustainable practice (Centobelli et al., 2017; Gruchmann, 2019).
Order condition	Order condition is related to the damage of products due to the handling throughout the transportation process (Novack et al., 1995). The LSPs should consider the packing and pack martial type, and the handling equipment should be friendly to the environment. At the same time, employee's health and safety programs assure reduced accident rates, such as through training (Wilding et al., 2012).
Timeliness	The most critical factor that customers always care about is timeliness because they prefer to get the product at the right time as promised (Hult et al., 2000). This performance dimension can be affected through problems during transportation that may delay the transportation time and back-order time when products ordered are not available in stock. Particularly, collaboration among the supply chain can improve the stock availability and service level.

3. Hypotheses development

Building on previous research, we developed a theoretical framework as depicted in Fig. 1 and proposed related hypotheses regarding service quality and relationship quality to be tested with empirical data from Egypt.

3.1. Customer satisfaction and relationship quality

In the extant literature, many researchers have illustrated the significance of logistics service performance as a central point to achieve customer satisfaction (Balci et al., 2019; Bienstock et al., 1997; Dadzie et al., 2005). Mentzer et al. (2001) stated that satisfaction is the outcome of logistics service quality. Further, logistics service quality and customer satisfaction are significant in competitive business environments, and they help build long-term relationships with customers (Caceres and Paparoidamis, 2007). Higher customer satisfaction also leads to better financial performance by lowering customer switching, achieving loyalty and word of mouth, and improving the company's reputation. Chaisurayakarn et al. (2014) emphasized that customer satisfaction and service quality promise future research directions in the logistics field. Therefore, research has increasingly focused on customer satisfaction explanations, not only from suppliers' perspectives but also from customers' viewpoints (Gruchmann et al., 2019). In this study, we assume that the new SLSQ scale positively affects customer satisfaction and, accordingly, formulated the following hypothesis: *Sustainable logistics service quality positively affects customer satisfaction (H1).*

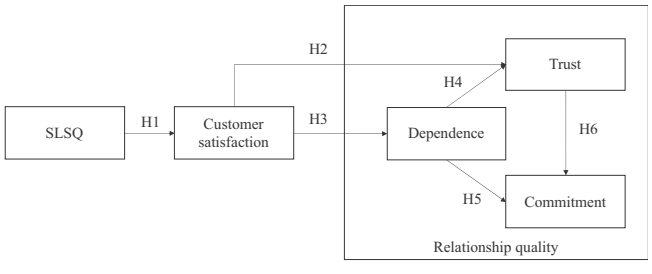

Fig. 1. Proposed theoretical framework.

The construct *relationship quality* is used to explain the extent of the relationship's strength from a customer's perspective (Crosby et al., 1990). Crosby et al. (1990, p. 70) defined *high relationship quality* as when "the customer is able to rely on the salesperson's integrity and has confidence in the salesperson's future performance because the level of past performance was consistently satisfactory." At industrial levels, Holmlund (2008, p. 35) defined *relationship quality* as the "joint cognitive evaluation of business interactions by significant individuals in both firms in the dyad." Thereby, relationship quality from a buyer's or seller's perspective "emerges from the root of service quality" (Jaafar, 2006, p. 54). Relationship quality in a business-to-business (B2B) setting can be seen as a composite measure of the strength of the relationship between two parties, including factors such as trust, long-term orientation, communication, and commitment (Palmatier, 2008). Mentzer et al. (2001) already suggested combining the LSQ scale with other concepts for (sustainable) logistics services to measure customer satisfaction, as in this study. Many marketing studies used satisfaction as a mediator variable between service quality and behavioral intentions (Brady and Robertson, 2001; Olsen, 2002), but few have used it to measure the relationship quality in the logistics sector toward the link between LSQ, customer satisfaction, and relationship quality (Jaafar, 2006). We accordingly assume that customer satisfaction mediates the relationship between SLSQ and relationship quality.

3.2. Dimensions of relationship quality

Scholars and practitioners have defined and measured relationship quality in various ways (Qian et al., 2020a,b), and it has been applied to multiple research contexts (e.g., Ashnai et al., 2009; Ivens and Pardo, 2007; Liu et al., 2011; Pepur et al., 2013; Song et al., 2012; Vesel and Zabkar, 2010). Relationship quality is often acknowledged as a first-order and holistic construct composed of several second-order dimensions (cf., Palmatier et al., 2006; Nyaga and Whipple, 2011). Athanasopoulou (2009) reviewed the literature on relationship quality from 1987 to 2007 and found three main dimensions that have been used in many studies and validated in different contexts: trust, commitment, and satisfaction. Some studies replaced *satisfaction* with *dependence* and stated that dependence, commitment, and trust are essential factors of relationship quality (Sirdeshmukh et al., 2002; Kwon and Suh, 2004; Spekman and Carraway, 2006). More recent literature reviews by Qian et al. (2020) and Qian et al. (2021) additionally found long-term orientation, communication, collaboration, and integration as essential predictors for relationship quality in a supply chain context. While these constructs have a significant overlap with our operationalization of SLSQ, this study uses dependence, commitment, and trust as second-order relationship quality dimensions (cf. Henning-Thurai and Klee, 1997) explained through customer satisfaction with SLSQ.

Acknowledging that some scholars have separated the relationship quality constructs in their models (e.g., Palmatier et al., 2006), we formulated additional hypotheses regarding trust, dependence, and commitment. *Trust* is generally described as present when "one party has confidence in an exchange partner's reliability and integrity" (Morgan and Hunt, 1994, p. 23). Customers reach high trust levels when they feel that they can depend on the LSP and feel confident

about the partnership's reliability and capability, reflecting the meaning of trust (Singh and Teng, 2016). In this context, the customers of LSPs develop trust through intensive interaction with the LSP and when the company believes that LSPs will be beneficial (Sezen and Yilmaz, 2007). Accordingly, this study hypothesizes a relationship between customer satisfaction and trust and presents the following hypothesis: *Customer satisfaction with SLSQ positively affects trust (H2)*.

Dependence refers to the extent to which one party needs to maintain a relationship with the partner to achieve the desired goals (Nyaga et al., 2013; Qian et al., 2020a,b). Here, one firm may use its power to influence the other firm to act in a manner that it would not have done otherwise (Lai et al., 2012). With a high level of trust, the perceived risks will be reduced while confidence increases (Gao et al., 2005). To reduce risks, the dependent company may aim to maintain or increase dependence toward a trustable LSP and not take risky actions to threaten this relationship. Based on this rationale, we assume the following hypotheses: *Satisfaction with SLSQ positively affects the dependence of customers on LSPs (H3). Dependence of customers on LSPs positively affects their trust in LSPs (H4)*. We accordingly assume that dependence mediates the relationship between customer satisfaction and trust.

Commitment can be further defined as "an enduring desire to maintain a valued relationship" (Moorman et al., 1992, p. 316). Commitment is the consequence of dependence on and trust in LSPs (Gao et al., 2005). When a company has a high level of dependence, the company will keep working with the supplier, e.g., due to high switch costs. We accordingly assume that dependence is positively related to commitment. On the other hand, trust is assumed to affect commitment, according to Ganesan and Hess (1997), as it contributes to (1) reducing risk, (2) increasing the confidence of the customer that those short-term problems will be resolved over the long term, and (3) reducing the transaction costs. Most studies on channel relationships show strong empirical evidence for a positive path from trust to commitment (Moorman et al., 1993; Morgan and Hunt, 1994; Ganesan and Hess, 1997; Dubey et al., 2019). Based on the above explanation, we assume a positive relationship between dependence and customer commitment as well as between trust and customer commitment, and we formulated the following hypotheses: *Dependence on an LSP positively affects customer commitment (H5). Trust in an LSP positively affects customer commitment (H6)*. We accordingly assume that trust mediates the relationship between dependence and commitment.

4. Research design

This research uses numerical measurements and a statistical analysis to address the research questions through empirical assessments. A deductive approach has been adopted to derive hypotheses based on existing theories and test them (Papaioannou and Wilson, 2010). The following subsections describe the data collection and analysis using the Statistical Package for Social Sciences (SPSS, version 22, including Hayes PROCESS, version 4) and Analysis of a Moment Structures (AMOS, version 24) software packages as well as required quality measures.

4.1. Data collection

To collect the required data, we used a self-administrative questionnaire. The sample comprised 421 respondents from Egyptian companies. The questionnaire design was developed based on reflective, multi-item constructs and adapted from existing items and scales, where possible (Chaisurayakarn et al., 2014; Jaafar, 2006). The complete questionnaire is displayed in Table 2. It started with a cover page, which included a short introduction about the nature and purpose of the research. A five-point Likert scale (1 = strongly disagree, and 5 = strongly agree) was used throughout the questionnaire. An online self-completion and supervised questionnaire was used for this study to get the required responses (Ranchhod and Zhou, 2001). Although online questionnaires might suffer from low levels of internet knowledge and the lack of experience and knowledge of e-mail using of

Table 2
Questionnaire items.

	Item	Code	Reference
Sustainable Logistics Service Quality (SLSQ)	It is rare to receive a damaged product as a result of using sustainable means of transport by your LSP.	SLSQ2	Jaafar (2006)
	Using a re-route system enhances delivering orders in the right time.	SLSQ3	
	Trained LSP employees provide your company with better problem handling.	SLSQ4	
	Trained LSP employees provide your company with a better problem response.	SLSQ5	
	Trained LSP employees help in solving your problems in a reasonable time.	SLSQ6	
	Trained LSP employees help you to reduce accident rates.	SLSQ7	Ali et al. (2021)
	Your LSP personnel contact employees have enough knowledge and experience.	SLSQ8	
	Your LSP enhances environmental knowledge sharing with your company.	SLSQ9	
	You achieve a better performance when your LSP considers your complaints.	SLSQ10	
	Collaboration with your LSP improves your sustainable performance practices.	SLSQ11	
	Your LSP cooperates with your company to exchange environmental knowledge.	SLSQ13	
Customer satisfaction (CS)	I am delighted with the performance of my LSP.	CS1	Mentzer et al. (2001)
	The services offered by LSP meet my expectations.	CS2	
	The service provided to you through LSP is good.	CS3	
	Overall, I am satisfied with my LSP.	CS4	
Dependence (DEP)	It is prohibitively expensive to start dealing with a new LSP rather than the old one.	DEP1	Gao et al. (2005)
	It is difficult to receive the same services from other LSPs.	DEP2	
	The advantages gained from your current LSP are difficult to be substituted.	DEP3	
	It will be considered a great loss if you lose this LSP.	DEP4	
Trust (TRS)	You trust this LSP because it keeps your interests in mind.	TRS1	Jaafar (2006)
	Your LSP keeps its promises (i.e., price offers, marketing communications, etc.)	TRS2	
	Your LSP has a high level of honesty.	TRS3	
	Your LSP will remain very loyal to this relationship.	TRS4	
	Your LSP is trustworthy.	TRS5	
Commitment (COM)	You are willing to have a long-term relationship with your LSP.	COM1	Gao et al. (2005)
	You want to remain a customer of this LSP because you genuinely enjoy your relationship with it.	COM2	
	You are willing to invest more in this relationship.	COM3	
	Your positive thoughts towards this LSP are the primary driver to continue working with it.	COM4	

respondents (Ranchhod and Zhou, 2001), online surveys are broadly accepted in Egypt because of the increasing use of new modern communications technologies (cf., Easterby-Smith et al., 2012). The questionnaire was administered entirely in Arabic. The translation of the questionnaire into English was done through the back-translation technique (Malhotra et al., 2012); the questions were accordingly translated and then retranslated.

In addition, the researchers conducted a pretest to assure that the questionnaire was readable, understandable, answerable, and not complicated. The pretest involved five experts in the field of logistics and supply chain and resulted in minor changes in the wordings. After the pretest modifications, the questionnaire was distributed to the targeted respondents. In sum, 421 responses were collected. Table 3 gives an overview of the respondents' profiles. Most of the respondents worked as supervisors (N = 131; 31.1%) and had worked in their current positions for >6 years (N = 220; 52.3%). Similarly, most respondents had worked in their current company for >6 years (N = 289; 68.6%). Respondents who had been working with an LSP for >6 years (N = 240; 57%) made up the majority of the sample, as well as respondents working with food and beverages retailers (N = 208; 49.4%). Respondents working as retailers constituted the majority, with 58.7% of the sample.

Table 3
Respondents.

	Frequency	Percentage	Total
Job title			
Senior Executive	72	17.1	**421**
Area Manager	21	5.0	
Department Manager	88	20.9	
Supervisor	131	31.1	
Operations	109	25.9	
How many years have you been in your current position?			
<1 year	45	10.7	**421**
From 1 year to 2 years	35	8.3	
From 3 years to 4 years	50	11.9	
From 5 years to 6 years	71	16.9	
>6 years	220	52.3	
How long have you been working in this company?			
<1 year	38	9.0	**421**
From 1 year to 2 years	10	2.4	
From 3 years to 4 years	46	10.9	
From 5 years to 6 years	38	9.0	
>6 years	289	68.6	
How long have you been working with this LSP?			
<1 year	48	11.4	**421**
From 1 year to 2 years	46	10.9	
From 3 years to 4 years	52	12.4	
From 5 years to 6 years	35	8.3	
>6 years	240	57.0	
Company's industrial section			
Food and Beverages Retailers	208	49.4	**421**
Drug Retailers	16	3.8	
Food Producers and Processes	34	8.1	
Personal Care and Household Products	20	4.8	
Electronic and Electrical Equipment	13	3.1	
Chemical, Oil, and Pharmaceutical Products	11	2.6	
Automotive Industry	21	5.0	
Postal	25	5.9	
Utilities	24	5.7	
Health Services	13	3.1	
Maritime Industry	32	7.6	
Other	4	1.0	
Position in the supply chain			
Wholesaler/Distributor	125	29.7	**421**
Retailer	247	58.7	
Manufacturer	49	11.6	

4.2. Data analysis

Maximum likelihood structural equation modeling (ML-SEM) was used to find relationships between the study variables. SEM is a multivariate analysis technique that tests regression and covariance analysis and relationships between latent constructs (Loehlin, 1998). Thereby, SEM has become a quasi-standard in business research to analyze the cause-effect relations between latent constructs (Hair et al., 2011). This is also supported by the increasing number of studies in logistics and SCM using SEM (e.g., Jang et al., 2013). Before testing the proposed hypothesis, several quality measures considering reliability and validity were applied to the measurement model, including scale reliability, convergent validity, and discriminant validity. Further, Harman's one factor test was applied to avoid common method bias by loading all items into an exploratory factor analysis (EFA) (Podsakoff, 2003). Second, we conducted a confirmatory factor analysis (CFA) to purify the used scales, testing the five principal components of this study, namely SLSQ, customer satisfaction, dependence, trust, and commitment. In the structural model, the hypotheses of the study are tested, and the main results are reported. In the last step, we checked possible mediations of second-order constructs. Here, we analyzed the indirect relationship between SLSQ and relationship quality via customer satisfaction, customer satisfaction and trust via dependence, and between dependence and commitment via trust (Baron and Kenny, 1986).

5. Findings

The following section demonstrates the empirical relationships between SLSQ and single relationship quality dimensions through customer satisfaction. It also introduces the main findings and results after running the data analysis. The data analysis was conducted by applying several steps (i.e., descriptive analysis, construct measure assessment, CFA, testing the research hypotheses using ML-SEM, and mediation analysis).

5.1. Descriptive analysis

The descriptive analysis is presented for both the research variables and the respondent profiles. Descriptive statistics is a tool that explains and gives a distinct understanding of the features of a specific data set by giving short summaries of the respondents and how the diversification was applied to select a representative sample of the population under study. The mean and standard deviation of the research variables are represented in Table 4.

5.2. Measurement model

First, we used the Kaiser Meyer-Olkin (KMO) measure of sampling adequacy. Second, we checked the indicator reliability following Hulland (1999) and used standardized indicator loadings ≥ 0.7 and checked loadings ≥ 0.4. for the recommended Cronbach's α level (Cronbach and Meehl, 1955). Items with communalities 0.4 and below were deleted. Composite reliability and average variance extracted (AVE) provided additional evidence on the internal consistency, reliability, and convergent validity. Fornell and Larcker (1981) stated that AVE for each construct should be higher than 0.50, but 0.4 is moderate and acceptable to provide sufficient convergent validity. The item loadings, their degree of adequacy, reliability, consistency, and validity are presented in Table 5.

Hair et al. (2014) suggested further that discriminant validity is achieved when the items have higher loadings in their originating factors than in other constructs. When the discriminate validity is high, it means that the construct is unique (Gefen and Straub, 2005). Therefore, the Fornell-Larcker criterion was used (Fornell and Larcker,

Table 4
Descriptive analysis.

Construct	Mean	Standard deviation	Frequency				
			1	2	3	4	5
Sustainable Logistics Service Quality	2.226	0.774	57	244	88	32	0
Customer Satisfaction	2.133	0.757	77	230	95	19	0
Dependence	2.223	0.722	40	276	80	21	4
Trust	1.988	0.818	116	218	66	18	3
Commitment	2.173	0.814	67	253	65	33	3
Relationship quality	2.012	0.715	81	278	38	24	0

Table 5
Reliability and convergent validity of measures.

Construct	Standardized loadings	KMO	AVE	Composite reliability	Cronbach's α
Sustainable Logistics Service Quality (SLSQ)		0.911	0.621	0.94	0.936
SLSQ2	0.684				
SLSQ3	0.774				
SLSQ4	0.754				
SLSQ5	0.854				
SLSQ6	0.658				
SLSQ7	0.880				
SLSQ8	0.832				
SLSQ9	0.833				
SLSQ10	0.797				
SLSQ11	0.760				
SLSQ13	0.816				
Customer Satisfaction (CS)		0.768	0.673	0.90	0.838
CS1	0.818				
CS2	0.847				
CS3	0.796				
CS4	0.821				
Dependence (DEP)		0.774	0.625	0.89	0.800
DEP1	0.802				
DEP2	0.816				
DEP3	0.811				
DEP4	0.731				
Trust (TRS)		0.883	0.684	0.92	0.883
TRS1	0.857				
TRS2	0.859				
TRS3	0.791				
TRS4	0.845				
TRS5	0.781				
Commitment (COM)		0.810	0.711	0.92	0.863
COM1	0.810				
COM2	0.846				
COM3	0.850				
COM4	0.867				

Notes: Thresholds: Cronbach's α ≥ 0.7; composite reliability ≥ 0.7; AVE ≥ 0.5.

1981), showing that the level of discriminant validity is acceptable (see Table 6). We conclude that all common quality standards are met based on these results. Finally, we performed Harman's one factor test. The one factor model in the EFA explained just 38% of the total variance in the variables, which did not account for the majority of the total variance. Second, we employed a CFA for the single-factor model. Following Podsakoff (2003), we controlled for the effects of an unmeasured latent factor and compared the standardized regression weights of a model having a common factor with common variance bias with a model without a common factor. The regression estimates in the two defined scenarios demonstrated no difference. Therefore, common method bias was not a severe threat to our data.

To provide an illustration, Appendix A1 shows the measurement model, where the model fit of the CFA was computed. Table 7 summarizes the model fit indices. These model fit indices are represented with the minimum discrepancy (CMIN/DF), the goodness of fit (GFI), adjusted goodness of fit (AGFI), Bentler-Bonett normed fit index (NFI), Bentler-Bonett non-normed fit index (TLI), comparative fit index (CFI), root mean square residual (RMR), and root mean square of approximation (RMSEA) values (Hair et al., 2011). Table 7 shows these indicator values in the CFA as well as the recommended values and related thresholds. The indices confirm that the data fit of the model is acceptable, acknowledging that NFI and TLI are only close to the recommended thresholds.

5.3. Testing the research hypotheses

Now, the proposed hypotheses were tested using ML-SEM. This subsection looks at each research hypothesis separately to test the constructs. The first hypothesis assumed a positive relationship between sustainable logistics service quality and customer satisfaction (H1). Subsequently, the relationships between customer satisfaction, trust (H2), and dependence (H3), as well as the dependence of the customers on LSPs and their trust in LSPs (H4), were tested. Lastly, we

Table 6
Construct correlations and discriminant validity: Fornell-Larcker criterion.

Construct	1	2	3	4	5	6
1. Sustainable Logistics Service Quality	**0.788**					
2. Customer Satisfaction	0.261	**0.821**				
3. Dependence	0.238	0.541	**0.791**			
4. Trust	0.177	0.458	0.549	**0.827**		
5. Commitment	0.098	0.442	0.533	0.549	**0.843**	
6. Relationship quality	0.212	0.513	0.657	0.736	0.713	**0.759**

Note: the square root of the AVE for each variable (values on the diagonal) is higher than any of the bivariate correlations between the latent variables (values under the diagonal).

Table 7
Fit indices and thresholds for the measurement model.

Measure	Results	Threshold
Chi-square/df	3.404	< 2 excellent; < 3 good; < 5 sometimes permissible
GFI	0.857	> 0.80
AGFI	0.820	> 0.80
NFI	0.879	> 0.90
TLI	0.896	> 0.95
CFI	0.911	> 0.95 great; > 0.90 traditional; > 0.80 sometimes permissible
RMR	0.040	< 0.09
RMSEA	0.079	< 0.05 good; 0.05–0.10 moderate; > 0.10 bad

analyzed the relationship between dependence on an LSP and customer commitment (H5) as well as trust in the LSP and customer commitment (H6). The ML-SEM model build is depicted in Appendix A2, while the path coefficients of the research hypotheses are shown in Table 8.

The results reveal a significant positive effect of SLSQ on customer satisfaction, as the estimate value is 0.403. Furthermore, the R^2 (coefficient of determinations) is 0.162, which means that the independent variable SLSQ explains 16.2% of the variation in customer satisfaction. Hypothesis H1 is therefore supported. The ML-SEM further reveals a significant positive effect of customer satisfaction on dependence, with an estimate value of 0.818 and an R^2 of 0.669, explaining 66.9% of the variation of dependence. In contrast, we found no significant effect of customer satisfaction on trust, as the corresponding p-value is 0.216. Therefore, hypothesis H2 is rejected, while H3 is supported. Concerning hypothesis H4, the ML-SEM model yields evidence that a significant effect of dependence on trust with an estimate value of 1.000 is present. Furthermore, the R^2 is 0.815, which means that the independent variable dependence explains 81.5% of the variation in trust. Therefore, hypothesis H4 is supported. The ML-SEM model further shows a significant positive effect of dependence on commitment with an estimate value of 0.329 as well as a significant positive effect of trust on commitment with an estimate value of 0.630 (R^2 = 0.879). Accordingly, hypotheses H5 and H6 are supported. The ML-SEM model showed acceptable model fit indices (CMIN/DF = 3.548; GFI = 0.856; CFI = 0.901; AGFI = 0.823; RMSEA = 0.078).

5.4. Mediation analyses

To test the role of customer satisfaction on relationship quality, a mediation analysis using a bootstrap method was conducted (Hayes, 2013). The bootstrapping method provides several advantages over the popular method by Baron and Kenny (1986) (Hayes and Rockwood, 2017). As recommended in the literature, a total of 5000 bootstrap samples and 95% bias-corrected and accelerated confidence intervals were used. In this method, the significance is indicated by the 95% confidence interval not crossing zero. Hayes and Rockwood (2017) particularly recommended reporting the partially standardized indirect effects (defined as the indirect effect divided by the standard deviation of the independent variable). In this model, the standardized indirect effect between SLSQ and relationship quality via customer satisfaction is significant (B = 0.252, 95% BCa CI [0.179, 0.319]). It can be noted that there is a significant positive effect of SLSQ on customer satisfaction and a significant positive effect of customer satisfaction on relationship quality, supporting H1. While we found an insignificant effect of SLSQ on relationship quality, we conclude that customer satisfaction fully mediates the relationship between SLSQ and relationship quality.

To further test mediation effects of dependence and trust, additional mediation analyses using a bootstrap method were conducted with a total of 5000 bootstrap samples and 95% bias-corrected and accelerated confidence intervals (Hayes, 2013). The standardized indirect effect of customer satisfaction on trust via dependence is significant (B = 0.423, 95% BCa CI [0.358, 0.487]).[2] The standardized indirect effect of dependence on commitment via trust is also significant (B = 0.450, 95% BCa CI [0.374, 0.520]). It can be concluded that dependence and trust exceed stronger indirect effects than the relatively small direct effects. Table 9 summarizes the results of the analyses.

6. Discussion

Answering the proposed research question about how an LSP's SLSQ affects a buying firm's relationship quality, the present study empirically investigated and confirmed the underlying mechanisms for relationship quality building with a data set collected in Egypt. Our findings uncovered the positive role of customer satisfaction on relationship quality and the mutual interplay between trust, dependence, and commitment. We particularly found empirical evidence on the mediating roles of dependence and trust for relationship quality building based on SLSQ. Interestingly, we found no support on H2 hypothesizing that customer satisfaction with SLSQ positively affects trust, at least in a short-term horizon, which is, however, mediated by dependence. Accordingly, intensive interactions between the buying company and LSP increase customer satisfaction (Sezen and Yilmaz, 2007) but have no significant, direct effect on trust in our study context. To build trust through customer satisfaction with sustainable logistics performance, dependence and trust on the supply chain partner must be in place, e.g., through long-term contractual agreements. Accordingly, we can show that LSP's sustainability performance is still just indirectly valued in the evaluation of the relationship quality with the end customer (see Table 9).

Our study contributes to an emerging body of research applying relationship marketing constructs in the SCM and logistics domain (Qian et al., 2020a,b). While previous studies have proposed several items to test LSQ, the present study empirically validated the SLSQ

[2] Please note that a path may be significant even when the zero-order correlation between X and Y is not significant (see Table 8) as dependence acts as a predictor for trust. Therefore, this path represents a partial regression coefficient that may be significant even when the zero-order correlation coefficient is not due to a suppression effect of the high correlations between dependence and trust (see Table 6).

Table 8
Path coefficients of the ML-SEM.

Hypothesized relationship	Hypotheses	Standardized coefficient	T-statistics	p-value	Result
Sustainable Logistics Service Quality → Customer Satisfaction	H1	0.403	6.957	< 0.01***	Supported
Customer Satisfaction → Trust	H2	-0.122	−1.238	0.216	Rejected
Customer Satisfaction → Dependence	H3	0.818	10.915	< 0.01***	Supported
Dependence → Trust	H4	1.000	8.406	< 0.01***	Supported
Dependence → Commitment	H5	0.329	3.168	0.02**	Supported
Trust → Commitment	H6	0.630	5.919	< 0.01***	Supported
Variance explained in the endogenous variables					
Customer Satisfaction	R^2 = 0.162				
Dependence	R^2 = 0.669				
Trust	R^2 = 0.815				
Commitment	R^2 = 0.879				

Note: *p < 0.1; **p < 0.05; ***p < 0.01.

Table 9
Mediation analyses.

Direct and indirect effects	Standardized effect	T-statistics	p-value	Result
Sustainable Logistics Service Quality → Customer Satisfaction	0.379	8.390	< 0.01***	Supported
Customer Satisfaction → Relationship Quality	0.663	17.080	< 0.01***	Supported
Sustainable Logistics Service Quality → Relationship Quality (direct)	0.037	0.950	0.343	Rejected
Sustainable Logistics Service Quality → Relationship Quality (indirect)	0.252	LLCL = 0.179 ULCL = 0.319	< 0.05**	Supported
Customer Satisfaction → Dependence	0.665	18.236	< 0.01***	Supported
Dependence → Trust	0.636	15.182	< 0.01***	Supported
Customer Satisfaction → Trust (direct)	0.182	4.355	< 0.01***	Supported
Customer Satisfaction → Trust (indirect)	0.423	LLCL = 0.358 ULCL = 0.487	< 0.05**	Supported
Dependence → Trust	0.757	23.715	< 0.01***	Supported
Trust → Commitment	0.595	14.591	< 0.01***	Supported
Dependence → Commitment (direct)	0.293	7.182	< 0.01***	Supported
Dependence → Commitment (indirect)	0.450	LLCL = 0.374 ULCL = 0.529	< 0.05**	Supported

Notes: *p < 0.1; **p < 0.05; ***p < 0.01.

scale and found eleven items sufficiently loading on this latent variable. Therefore, this study's core contribution is the empirical testing of the proposed theoretical framework in the Egyptian logistics market while confirming previous research for this emerging countries' context (e.g., Gao et al., 2005; Jang et al., 2013). Considering the average score of SLSQ in Egypt, however, we can see that the LSP companies continuously need to enhance their scores over time. To facilitate the logistics industry's sustainability goals, as set by the Egyptian government, the empirically confirmed framework entails evidence that the implementation of sustainable practices can be indirectly rewarded with a higher relationship quality among an LSP's customers. Furthermore, the SLSQ scale provides Egyptian companies with a list of sustainability practices that can be used in line with Egyptian culture and will break the reluctance of LSPs to take initiatives to apply these practices.

From a managerial perspective, the SLSQ variables provide a holistic picture, including environmental aspects, social aspects related to employees' health and safety, as well as community and economic aspects. Sustainable transport, packaging, information, training, and collaboration are the main elements that SMEs in logistics should consider in the Egyptian market (Ali et al., 2021). Encouraging LSPs and other companies to apply these practices would decrease the pressure on the environment and decrease overall pollution. With a particular focus on collaboration, many activities tested in this study have already been studied in the literature, such as information sharing, technology, and training (Grzybowska et al., 2014). Our research thereby confirms previous research on collaboration in supplier-customer relationships, which benefits both parties and increases the overall logistics service quality. For instance, Gil-Saura et al. (2010) stated a positive relationship between increasing collaboration and logistics value. In addition, Carter and Dresner (2001) highlighted that long-term collaboration between parties is vital to make a sustainable co-partnership, value customers, and enhance the overall performance. Building on their research, we can show that those activities need to be accompanied by additional means of trust and dependence building, e.g., through long-term contractual agreements, to achieve a sustained competitive advantage.

Although our study did not take a specific sector focus, most respondents worked at retailers in the food and beverages industry. Accordingly, our results are not just valid in a B2B environment but also for business-to-customer (B2C) relationships. The present study thus provides evidence that consumer-choice-centered Logistics Social Responsibility (LSR) categories can resolve inevitable frictions and reward positive behavior for more sustainable consumer decision-making downstream the supply chain when more communication of sustainable logistics efforts to the end customer takes place, or the LSP directly acts as a supplier to the end customer (Gruchmann et al., 2019). Particularly upstream food supply chains, LSPs can act as intermediaries between farmers and retailers to lower the mutual dependence between buyers and suppliers and contribute to an overall higher sustainability performance in emerging countries (Silva et al., 2021). Here, end customer incentives for acting sustainably are directly provided to LSPs instead of being indirectly transferred to them.

From a political perspective, a central role of the government and its institutions is to supervise and monitor vital aspects of sustainable development, where the proposed SLSQ scale plays a supportive role. It is also the responsibility of the government apparatus to achieve sustainable development through participation. As the Egyptian state also acts as a public buying actor, the present work can be one of the primary references that the government, state agencies, and their institutions and companies could use in designing the purchasing strategies for logistics services. While aiming to complete the picture of how logistics companies can assess their sustainability performance, we tested the SLSQ scale to be suitable, particularly for the Egyptian culture. However, we expect that the SLSQ scale can be generalized to other developing countries in North Africa, such as Tunisia and Morocco, as the economic situations in these countries are similar, and they are classified as lower-middle-income countries (World Bank, 2021). Nonetheless, future research might also test the suitability of the SLSQ scale in these countries, while some modifications of the SLSQ scale can better suit these countries.

Researchers generally adopt two perspectives from a theoretical perspective by applying service quality theory (Brady and Robertson, 2001): the Nordic perspective and the American perspective. While we conducted the present study from the American perspective, as proposed by Parasuraman et al. (1988), we addressed the five primary dimensions of service quality measurement: (1) reliability through the ability to achieve the promised service correctly, (2) assurance through trust and confidence, (3) tangibles as the physical indication of the service, (4) empathy through the individualized care of the supplier, and (5) responsiveness through the employees' intentions to help customers. While the SERVQUAL framework by Parasuraman et al. (1988) has been adopted by many studies also in the logistics sector (Mentzer et al., 1999), our theoretical contribution is to combine their main theoretical dimensions with the debate on sustainability transformation while shedding light on their adoption by the LSPs in Egypt.

Further confirming previous research, our study provided evidence that the LSP's operational performance, such as quality, delivery, and innovation, is connected to its perception of the relational dimension of relationship quality with its supply chain partners (Qian et al., 2021). In contrast to service quality constructs frequently used in the logistics domain, we are among the first studies testing relationship quality constructs in the logistics sector exploring the moderating roles of trust and dependence for relationship quality building. Our research thereby contributes to a better understanding of the underlying mechanisms of SLSQ for relationship quality as well as to the general linkage between logistics and marketing research (Qian et al., 2020a,b). Future research particularly has to tackle related governance mechanisms to spread sustainable logistics practices upstream the supply chain, linking marketing and operational practices across the entire supply chain.

7. Limitations and future research directions

By answering the proposed research question and employing a quantitative research design, the present study provided valuable insights, especially for logistics and purchasing managers, to facilitate organizational change within and across company borders. Despite its contribution, the present study is not free from limitations. First, our study must account for a limited number of constructs. Additional dimensions can be added to the SLSQ, of which the adaptation of the proposed scale provides a future research direction. While the conceptual model offers sound comprehension, the sample size, which is adequate to test the conceptual model, poses certain empirical limitations. To assure consistent responses from the sample, the companies achieved additional information to fill in the questionnaire, e.g., to evaluate their primary LSP that the company has a long-term contract to determine the change in the service after applying sustainability practices. Second, the analysis is restricted to evaluating prior defined or assumed relationships by testing hypotheses rather than discovering unexpected patterns. However, the preliminary analyses did not indicate a structure inherent to the data at hand that is departing from the model. Third, our research design builds on the assumption that the observations in the data set are drawn from the same distribution. This is justified because we consider Egypt a case study that provides heterogeneous conditions. Studies aiming to replicate such heterogeneous environments could adopt a multi-group analysis or a finite-mixture approach. Nonetheless, a promising research direction might employ homogenous industry sectors across different countries or replicate the study in other countries. Finally, the present study used the SLSQ scale from a management perspective and focused on the points that could be added from this perspective only. Therefore, it is considered a research limitation, and future researchers should use the technical side of SLSQ and use calculations and equations to achieve the best performance of LSPs.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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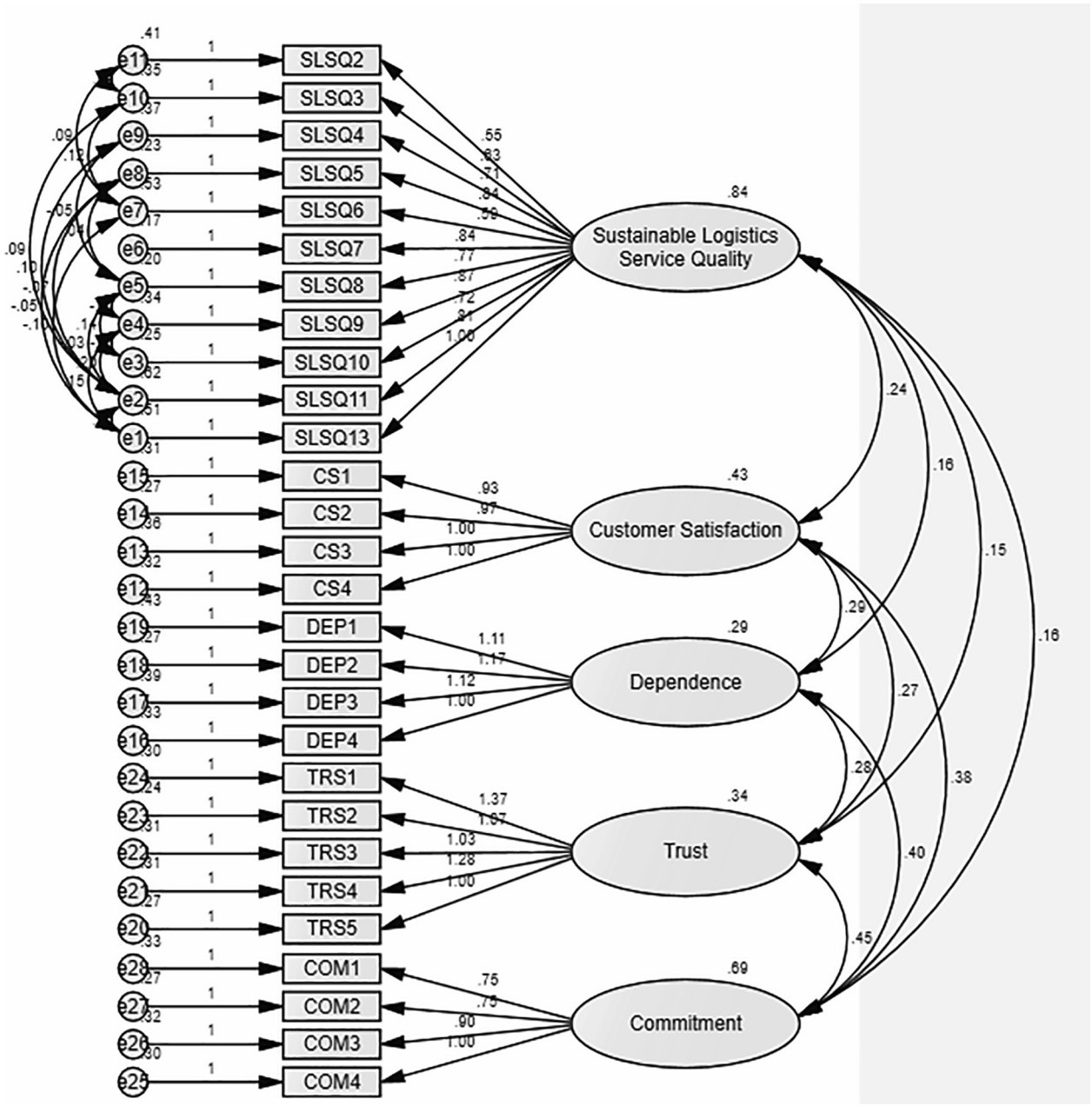
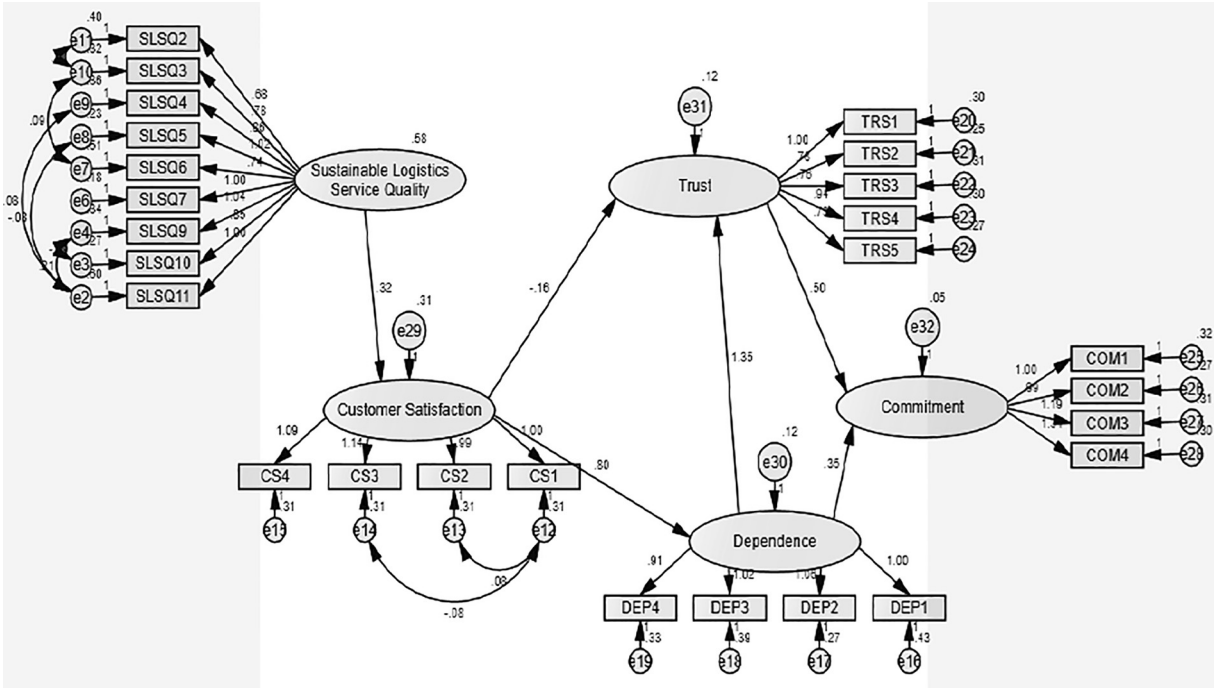
Appendix A1. CFA for the measurement model



.

Appendix A2. *ML-SEM model*:



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