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RESEARCH ARTICLE

The Mediation Role of Supply Chain Practices and Logistics Integration on the Effect of Lean Supply Chain Strategy on Operational Performance

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Abstract
Supply chain strategy is the determinant of supply chain management (SCM) and product flow efficiency in the market. Lean supply chain strategy (LSCS), which is based on lean practices in production and supply chain, is a strategy that aims to prevent waste and increase efficiency. Although some studies in the literature examine the relationship of many elements of supply chain management with supply chain performance (SCP), and others examine the correlation of many lean manufacturing elements with performance, studies examining the LSCS-SCP relationship is limited. In addition, the number of studies examining the relationship of LSCS with supply chain practices and logistics integration (LI), as well as the number of studies examining LSCS, supply chain practices, LI, and SCP is much more limited.

The research aims to examine the effect of LSCS on the supply chain practices which consists of customer relations (CR) and strategic supplier relations (SSR) and the LI as well as, based on these variables, the effect of LSCS on SCP. Data were obtained from 294 companies in the manufacturing sector through questionnaires. A structural equation model, including LSCS, supply chain practices, LI, and SCP, was tested for the first time. In conclusion, the mediating effects of CR, SSR and LI was emphasized to be important in the impact of LSCS on SCP.

Keywords

Supply chain management, Structural eguation modeling, Supply chain strategy, Confirmatory factor analysis

Introduction

SCM which includes all businesses and flows from the first raw material manufacturer to the final consumer, has become a significant competition issue in recent years. Therefore, manufacturing companies have effectively included the SCM concept in the operations to reduce costs and improve service qualities for many years (Stank et al., 2001). It is a fact that competition is not between businesses but between supply chains (Lambert & Cooper, 2000). The supply chain has started to attract attention in academic fields and industry since the 1980s. SCM has become strategic for businesses and handled with a strategic perspective.

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Depending on this strategic perspective, supply chain strategy (SCS) deals with decisions, such as purchasing the raw material, transporting them to the company, providing the product manufacturing or service operation, ensuring products' distribution and follow-up to the customer, and in or out-sourcing the process of these transactions. These decisions are generally long-term decisions about supply chain design (Chopra & Meindl, 2007:20). There are some classifications related to supply chains that can also be examined in terms of SCS. Supply chains can be categorized as efficient and reactive (Chopra & Meindl, 2007). Another classification is performed as the lean strategy that focuses on waste reduction, the agile approach that focuses on quick response, and the lean-agile method, a mixture of both (Sharma & Kulkarni, 2016). It can be said that effective supply chains and lean supply chains include similar strategies. LSCS is defined as reducing the customer order and product delivery times, eliminating or reducing the factors causing production waste (Bhasin & Burcher, 2006). Agile supply chain strategy focuses on customer satisfaction and quickly responding to changing customer demands (Waters, 2003: 34).

The Lean-Agile supply chain is a system that combines the advantages of simplicity and agility (Ambe, 2014). The aim is to increase product diversity and efficiency together (Ramana et al., 2016).

There is extensive literature on the relationship between SCS and several dimensions of performance. Direct effects of SCS on SCP (Agarwal et al., 2006; Qi et al., 2009, Çiçekdağı, 2019) on firm performance (Çalışkan et al., 2016) are reported in the literature. Besides, indirect effects of SCS on SCP (Sun et al., 2009; Othman et al., 2012; Sukwadi et al., 2013; Ambe, 2014; Qrunfleh & Tarafdar, 2014; Rahimnia et al., 2014), on firm performance (Qi et al., 2011; Akçi, 2012; Qrunfleh & Tarafdar, 2014) on organizational performance (Jajja et al., 2013), on operational performance (Zhang & Qi, 2013), on financial performance (Qi, Huo et al.; 2017) are stated in the literature.

There are variables such as supply chain practices (Othman et al., 2012) and supply chain integration (SCI) (Qi, Huo, et al., 2017) in the indirect effect of SCS on performance. While supply chain practices include concepts such as CR and SSR, SCI coordinates the flows by ensuring their integrations within the chain (Krajewski, Ritzman, & Malhotra, 2013:356).

SCS focuses on business process integration along the value chain to provide optimum value to the end customer (Qrunfleh & Tarafdar, 2013). While SCI is classified as internal integration, supplier integration, customer integration (Ellinger et al., 2015; Kim, 2009), another classification type is information integration and logistics integration. One of the SCI-related elements is logistics integration (LI). The LI stands for specific logistics practices and operational activities that control the outward flow of value and material from supplier to customers (Prajogo & Olhager, 2012).

SCS includes taking strategic decisions about supply chain practices and SCI (Qrunfleh & Tarafdar, 2013). There are limited numbers of studies in the literature on the relationships between SCS, supply chain practices, and performance (Othman et al., 2012; Qrunfleh, 2010; Qrunfleh & Tarafdar, 2013). There are studies in the literature on the effects of SCS on supply chain practices and supply chain integration, the effect of supply chain practices on Supply chain performance (SCP) (Sundram et al., 2011), and the effect of LI on SCP (Prajogo & Olhager, 2012).

However, the number of studies examining the relationships between supply chain practices, SCI, and performance is limited (Ahmad & Saifudin, 2014; Kim, 2009; Kim, 2006). Studies examining the relationships between LSCS, supply chain practices (SSR and CR), LI, and SCP as a whole have not been found in the literature. Therefore, the research questions were formed as follows:

- Does LSCS affect SCI?
- Does LSCS affect SSR and CR?
- Does LSCS directly affect operational performance?
- Have SCI and supply chain practices mediation role on the effect of LSCS on performance?

This research examines the relationships between SSR, CR, LI and LSCS and the effects of these variables on performance. The data was collected using survey method. Convenience sampling method is applied. The obtained data were analysed with exploratory factor analysis, Confirmatory factor analysis, and Structural equation modelling (SEM) methods.

Definition of Concepts

LSCS

With the competitive conditions getting harder, companies today adopt a cost-oriented management approach to gain market advantage, preferring to reduce their costs in production for goods offered to the market. Customers don't want to pay for non-value-adding things and evaluate these operations as an extravagance. The lean manufacturing philosophy is based on excluding the activities that do not create value for the customer (Turan &Turan, 2019). Lean manufacturing is characterized as reducing the customer-order-time and product-delivery time by eliminating wasteful resources in the production flow (Bhasin & Burcher, 2006).

SCS means a set of approaches that integrate suppliers, manufacturers, warehouses, and stores to produce and distribute products at the right time, at the right place, at the right qu-

ality, to minimize the cost and increase the level of satisfaction (Qrunfleh & Tarafdar, 2013). The lean supply chain has resulted from the relationship between quality and cost factors that affect competitiveness (Konecka, 2010). LSCS focuses on quality improvement in the supply chain to eliminate waste, aims to create cost-effectiveness in the supply chain with effective inventory management (Qrunfleh & Tarafdar, 2013).

SCI

SCI is divided into two as information integration and LI. LI means special logistics applications and operational activities that control the material flow from the supplier to the customer with the outward value flow (Prajogo & Olhager, 2012).

Supply Chain Practices

SSR

Supply chain practices are composed of SSR, CR, information sharing, information quality, lean applications and postponement (Li, Rao, et al., 2005; Qrunfleh, 2010). This research focuses on two of these applications; SSR and CR.

SSR is the long-term relationship between the suppliers of the organization. This relationship is designed to leverage participant organizations' strategic and operational capabilities to help them achieve significant benefits (Li, Rao, et al., 2005). SSR not only purchases goods and services from suppliers but also affects suppliers' systems and operational capabilities, adds value to goods and services, and improves the performance of the entire supply chain (Qrunfleh, 2010: 33).

CR

CR includes the activities carried out by employees to provide customer acquisition, increase customer satisfaction, establish long-term relationships with customers, ensure customer loyalty and develop different products than competitors (Li, Rao, et al., 2005). CR activities include the relationship not only with customers but also with suppliers and service providers (Alshurideh et al., 2019)

SCP

Today, with the effect of globalization, the perception of competition of enterprises is changing. Businesses try to gain a competitive advantage by managing performance well (Acar, 2010; Onay & Kara, 2009). Gunasekaran et al. (2001) defined SCP as overall efficiency and effectiveness of the supply chain. Gunasekaran et al. (2001) analysed SCP in three

dimensions; strategic, tactical and operational. Operational dimensions of SCP should contain are customer service and ability to responding change (Van Hoek, 1998; Beamon, 1999). Flynn et. al. (2010) measured SCP as operational performance and business performance.

Research Method

Research Purpose

In the literature, the relationships between SCS, supply chain practices, and performance (Othman et al., 2012; Qrunfleh, 2010; Qrunfleh & Tarafdar, 2013), between SCS, integration, and performance (Qi, Huo et al., 2017), between supply chain practices, integration, and performance (Ahmad & Saifudin, 2014; Kim, 2009; Kim, 2006) were examined. However, no study was found that investigated the relationships between LSCS, SSR and CR, LI, and SCP as a whole. This study aims to analyse the effects of LSCS, SSR, CR, and LI on SCP.

The research model created by conducting domestic and foreign literature research comprises valid and reliable scales suitable for the research purpose. According to the research model, the dependent variables are SSR, CR, LI, and SCP, and the independent variable is LSCS. The research model of this study can be seen in Figure 1.

The models and hypotheses developed for the research are as follows:

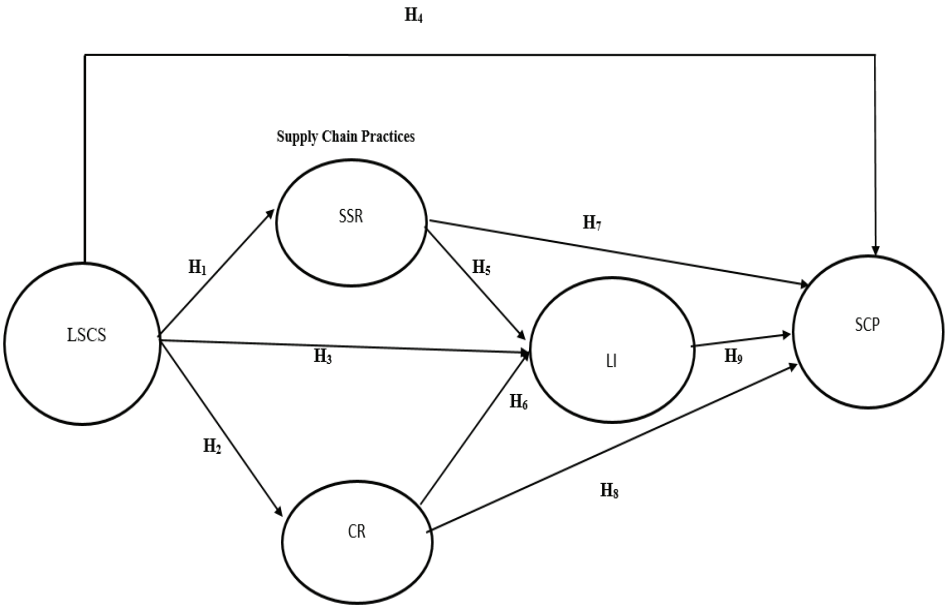


Figure 1. Research model

Qrunfleh (2010) states that LSCS has a significant relationship with SSR. Accordingly, the following hypotheses were suggested:

H_1: LSCS affects SSR.

H_2: LSCS affects CR.

In their study, Qrunfleh, Tarafdar & Nathan (2012) stated no direct effect between supply chain strategies and LI. However, Parast & Spillan (2014) found a positive relationship between logistics/supply chain strategy and LI/SCI in their study. Accordingly, the following hypothesis was proposed:

H_3: LSCS affects LI.

It is stated that supply chain strategies increase SCP and firm performance in the Qrunfleh study (2010), and LSCS does not have a significant positive effect on SCP in the Sukwadi, Wee and Yang study (2013). Othman et al. (2012) reported a significant impact between the SCP responsiveness of the LSCS and the SC responsiveness of the LSCS. Although there is no direct relationship between the SCS and performance, they stated that the effect increases with the mediation relationship of the supply chain practices. Accordingly, the following hypothesis was introduced:

H_4: LSCS affects SCP.

Kim (2009) has declared a positive relationship between supply chain practices and SCI in his work. Furthermore, Kim (2006) states a positive relationship between supply chain practices and SCI in small-scale enterprises and a negative relationship in large-scale enterprises. Accordingly, the following hypotheses were suggested:

H_5: SSR affects LI.

H_6: CR affects LI.

Sukwadi and Saifudin (2014) have found that SSR does not have a direct effect on SCP. Ahmad and Saifudin (2014) have found that supply chain practices do not directly impact SCP, but there is a relationship between supply chain practices and SCP through the mediating effect of LI. Qrunfleh (2010) has discovered a positive, significant relationship between SSR and SCP and that the harmony of supply chain practices improves SCP and firm performance. Sundram et al. (2011) have found that supply chain practices significantly impacts SCP. Othman et al. (2012) have found that there is a relationship between supply chain strategies and SCP when supply chain practices are the mediator variables. Gharakhani et al. (2012) have stated that supply chain practices positively affect innovation and corporate performance. Li, Nathan et al. (2006) have found that high levels of supply chain practices increase organizational performance. Accordingly, the following two hypotheses were proposed:

H_7: SSR affects SCP.

H_8: CR affects SCP.

Li, Yang et al. (2009) have stated that SCI positively impacts SCP through to the mediating effect of information technology. Moshkdanian & Author (2013) have found a forceful and positive relationship between LI and SCP, while Prajogo and Olhager (2012) have found a positive relationship between LI and performance. Osei (2017) has stated that a positive, significant relationship between internal and external integration also positively significantly affects business performance. Accordingly, the following hypothesis was suggested:

H_9: LI affects SCP.

The Sample

The population consists of enterprises with ten or more employees operating in the manufacturing sector in Edirne, Tekirdağ, and Kırklareli. Manufacturing sector is selected as lean manufacturing practices are more common in manufacturing sector. The survey method was utilized in the study. Since it was impossible to achieve the entire universe, a sample collection method from the main population was preferred. A total of 294 businesses were reached. The respondents were firm owners, general managers, plant managers and department managers as they have sufficient knowledge to answer the questions. 280 of the obtained questionnaires could be used. There are different approaches for determining the number of samples. According to Child (2006), the sample size should be five times the number of statements. According to Kline (1994), sample size should be at least twice and preferably ten times the number of items. In this study, since the number of statements was 24, the 280 samples were sufficient as it exceeds ten times the statement number. Participants in the study were selected with the non-random convenience sampling method.

Measurement

The questionnaires are developed in light of previous literature studies. A five-part questionnaire is prepared through the literature examination. A pilot study is conducted before starting the actual survey. The pilot questionnaire ensured us to make some corrections and changes to increase the consistency and comprehensibility between the statements. The data is collected by face-to-face surveys between June 2017 and May 2018.

The scales used in this study were obtained from the literature. The LSCS scale developed by Qi, Boyer & Zhao (2009), including seven statements, is used to measure the LSCS. Five LI statements are obtained from Prajogo & Olhager (2012). The scale developed by Tarafdar & Qrunfleh (2017) is used to measure the SSR and CR variables. SCP statements are obtained from Flynn, Huo & Zhao's (2010) research. They measure SCP as operational performance and business performance. In this research operational performance items of Flynn, Huo & Zhao's (2010) is used to measure SCP. Although the operational performance scale comprised six statements, one was excluded from the study because it was not intelligible for the

participants in the pilot study, and the current SCP scale consists of five statements. Each statement is tested with a 5-point Likert scale. Some statements used for measurement are "The products offered to our customers are standard and impossible to personalize", "The distribution of incoming and outgoing products is in integration with suppliers", "We measure and evaluate customer satisfaction" and "Order delivery time is short in our supply chain". The last part covered the statements about determining the demographic characteristics of the companies. Ethics committee approval of this study was received from Trakya University Social and Human Sciences Research Ethics Committee under the permission number 2017.05.03 dated 10.05.2017.

Findings

According to the findings of the research; while 31.1% of the enterprises taking part in the research were in the food sector, 25% are in the textile sector, and the rest are in other sectors. 68.2% of the enterprises are 21 years old or more, 11.1% are between 16 and 20 years, 6.4% are between 11 and 15 years, 6.4% are between 6 and 10 years, and 7.9% are between 1 and 5 years. In terms of the number of employees, 38.2% are medium-sized enterprises (50-249 employees), 33.2% are large-scale enterprises (250 or more employees), 28.6% are small-scale enterprises (10-49 employees). Classification according to number of employees are conducted using KOSGEB classification (https://www.kosgeb.gov.tr). 85% of the enterprises participating in the research are full-national capital enterprises, 8.2% are full-foreign capital enterprises, 2.9% are national-capital-dominated enterprises, 2.5% are foreign capital-dominated enterprises, and 1.4% are half-domestic half-foreign capital enterprises. Of the business managers participating in the research, 45.7% are department managers, 22.5% are business managers, 16.4% are business owners/partners, and 15.4% are other managers.

Exploratory Factor Analysis and Reliability Analysis

Exploratory factor analysis, Confirmatory factor analysis, and SEM methods are used in the research. First, the dataset is checked for normal distribution. In this study, the LI2, CR1, SCP3, SCP5 kurtosis values in the scale are above 2, however skewness and kurtosis values of the other variables are between +2 and -2. If the values are within this range, the data are considered normally distributed (George & Mallery, 2016:114). Therefore, the data could be said normally distributed.

The result of the Kaiser-Meyer-Olkin (KMO) test used to evaluate the suitability of the data set for factor analysis was 0.811. As a result of the factor analysis, the statements are grouped under five factors.

Some items on the scale were excluded because of cross-loading on other factors. Particularly, LSCS2, LSCS3, LSCS5 items were removed from the LSCS scale. In previous studies,

items related to this scale were also removed for these reasons (Qi, Boyer & Zhao, 2009). The result of exploratory factor analysis is seen on Table 1 which demonstrates Cronbach's α and Average Variance Explained (AVE) as well. While factor loadings in the scale were generally between 0.515 and 0.722 in the LSCS, the lowest was 0.704, and the highest was 0.881 in other scales. According to Table 1 Cronbach's α values are between 0,528 and 0,805. Cronbach's α value more than 0.6 can be regarded as a satisfactory reliability (Malhotra & Birks, 2000: 307). The only factor with a Cronbach's α value under 0.6 is LSCS (0,528) which is very close to 0,6.

Tablo 1

Rotation Sums of Squared Loadings

	Items	LSCS	LI	Supply Chain Practices		SCP	Initial Eigenvalues	Variance Explained (%)
				SSR	CR			
LSCS1	Our supply chain supplies predictable products.	0.717						
LSCS4	Our supply chain provides customer with standardized products	0,612						
LSCS6	Our supply chain selects the suppliers based on their performance on cost and quality	0.515					1.491	9.896
LSCS7	Our supply chain structure seldom changes	0.722						
LI1	Inter-organizational logistic activities are closely coordinated.		0.704					
LI2	Our logistics activities are well integrated with suppliers' logistics activities		0.802					
LI3	We have a seamless integration of logistics activities with our key suppliers		0.855				5.642	18.965
LI4	Our logistics integration is characterized by excellent distribution, transportation, and/or warehousing facilities		0.774					
LI5	The inbound and outbound distribution of goods with our suppliers is well integrated		0.740					
SSR2	We solve problems jointly with our suppliers			0.855			1.122	8.531
SSR3	We introduce our key suppliers in our planning and goal-setting activities			0.791				
CR2	Measure and evaluate customer satisfaction				0.854			
CR3	Determine future customer expectations				0.881		1.667	13.504
CR4	Facilitate customers' ability to seek assistance from us				0.775			

	Items	LSCS	LI	Supply Chain Practices		SCP	Initial Eigenvalues	Variance Explained (%)
				SSR	CR			
SCP1	Our company can quickly respond to changes in market demand.					0.776		
SCP2	Our company can quickly modify products to meet our major customer's requirements.					0.828		
SCP3	Our company can quickly introduce new products into the market.					0.757	1.895	14.755
SCP4	The lead time for fulfilling customers' orders (the time which elapses between the receipt of customer's order and the delivery of the goods) is short.					0.724		
Cronbach's Alpha		0.528	0.877	0.698	0.873	0.805		
				0.752				

These values showed that all of the scales were reliable enough for this study.

Confirmatory Factor Analysis

In testing the structural equation models, goodness-of-fit evaluation criteria are taken into account. The factors are found to be statistically significant because the p values of the factors were $p<0.05$. Confirmatory factor analysis criteria taken into account and the criteria values obtained after Confirmatory factor analysis are shown on Table 2.

Table 2

Generally Accepted Goodness of Fit Criteria

Goodness-of-Fit Criteria	LSCS	LI	Supply Chain Practices	SCP	All Variables	Measures of Good Fit	Measures of Acceptable Fit
CMIN/Df	2.433	1.388	3.150	1.886	2.428	$0 \leq \chi2/df \leq 2$	$2 \leq \chi2/df \leq 5$
GFI	0.991	0.994	0.982	0.997	0.900	$0.95 \leq NFI \leq 1.00$	$0.90 \leq NFI < 0.95$
CFI	0.966	0.998	0.985	0.998	0.917	$0.95 \leq NFI \leq 1.00$	$0.90 \leq NFI < 0.95$
RMSEA	0.072	0.037	0.080	0.056	0.072	$0 \leq RMSEA \leq 0.05$	$0.05 \leq RMSEA \leq 0.08$
NFI	0.946	0.99	0.97	0.995	0.868	$0.95 \leq NFI \leq 1.00$	$0.90 \leq NFI < 0.95$

Reference: Hooper et al., 2008

Discriminant and Convergent Validity

Discriminant validity and convergent validity are tested and results can be seen on Table 3. The bold values on the diagonal are root square of AVE values. The values in the cells are correlation coefficients on the top and square of correlation coefficients in brackets.

Table 3
Discriminant Validity of the Measurement Model

Variables	Lean Supply Chain Strategy	Logistics Integration	Strategic Supplier Relationship	Customer Relationship	Supply Chain Performance
Lean Supply Chain Strategy (LSCS)	**0.502**				
Logistics Integration (LI)	0.301 (0.090)	**0.757**			
Strategic Supplier Relationship (SSR)	0.097 (0.009)	0.521 (0.271)	**0.755**		
Customer Relationship (CR)	0.269 (0.072)	0.495 (0.245)	0.333 (0.110)	**0.841**	
Supply Chain Performance (SCP)	0.185 (0.034)	0.416 (0.173)	0.314 (0.098)	0.367 (0.134)	**0.737**
Composite Reliability	0.570	0.870	0.721	0.879	0.827

In order for Convergent Validity to be acceptable, Composite Reliability values should be at least 0.6 (Hair, Hult et al., 2014:102). Here, the Composite Reliability values are within the acceptable range for the variables other than LSCS. Since the LSCS value are very close to the limit of 0.60, the Composite Reliability values could be suggested to be appropriate. In addition, it is acceptable when factor loads are not below 0.40 (Hair, Hult et al., 2014: 104). In this case, the model could generally be said to have Convergent Validity.

For the test of discriminant validity, correlations between factor loads obtained as a result of Confirmatory factor analysis should be less than 0.90 (Kline, 2011: 116). In the current study, the model is discriminately valid.

Structural Equation Modelling Test

In order to test the hypotheses, the research model created was tested with the AMOS 23 package program. The results are demonstrated in Table 4.

Table 4
Model Parameter Estimates

Structural Equations	Standard Coefficients (β)	Non-Standard Coefficients	Standard Error	Critical Rate	P
(H1)LSCS →SSR	0.212	0.14	0.066	2.158	*
(H2)LSCS →CR	0.335	0.27	0.081	3.357	***
(H3)LSCS→LI	0.17	0.15	0.078	0.196	0.057
(H4)LSCS→SCP	0.04	0.04	0.093	0.452	0.651
(H5)SSR →LI	0.341	0.44	0.089	4.919	***
(H6)CR → LI	0.35	0.37	0.076	4.900	***
H7)SSR → SCP	0.070	0.10	0.098	1.071	0.284
(H8)CR → SCP	0.199	0.25	0.095	2.577	**
(H9)LI → SCP	0.271	0.31	0.102	3.079	***

*p≤0.05 ** p≤0.01 ***p≤0.001

The fit indices of the model (CMIN=312.717, df=123, $\chi 2/df=2.542$, p=0.000, GFI=0.894, CFI=0.909, RMSEA=0.074 and NFI=0.861) met the fit criteria. However, when the regression weights and significance values of the paths in the model were examined, some paths are seen to be insignificant (p>0,05). These paths represent the hypothesis H_3, H_4 and H_7 which are not accepted. These insignificant paths are excluded from the model, and the model is reanalysed, and the modification indices are applied. Figure 2 shows the resulting new structural equation model.

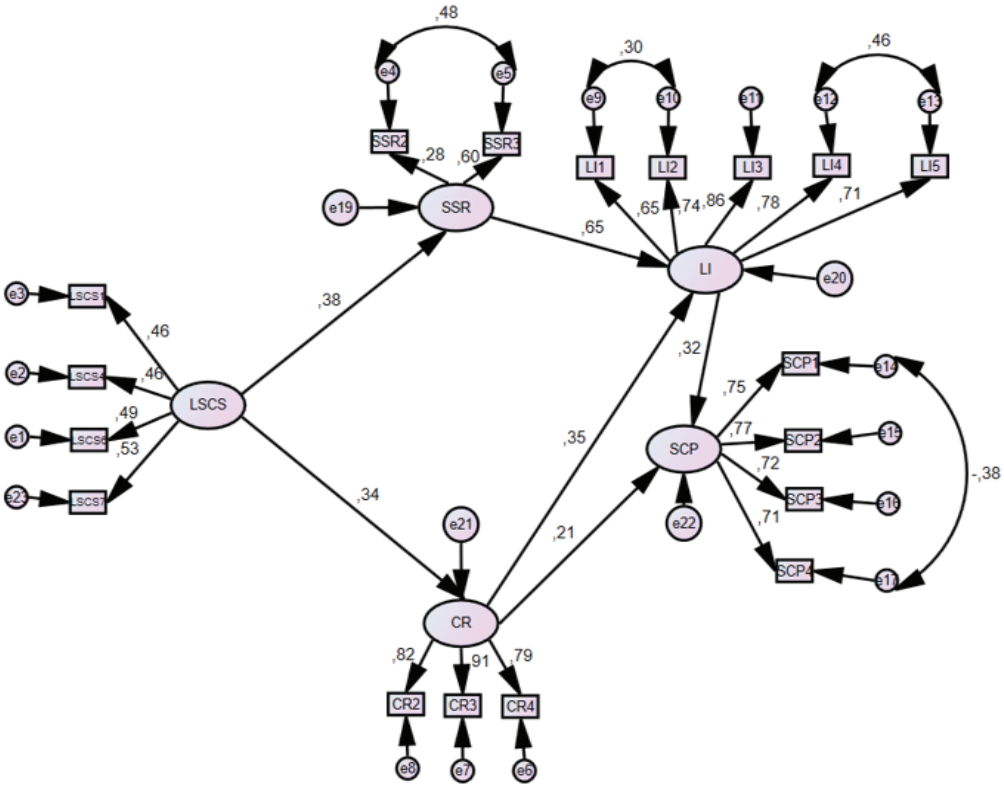


Figure 2. modified structural equation model.

All paths are found significant according to the regression weights (estimates) and significance values of the final model obtained in the analysis result. The fit indices of the model (CMIN=314.041, df=125, $\chi 2/df=2.512$, p=0.000, GFI=0.893, CFI=0.910, RMSEA=0.074, NFI=0.860) met the fit criteria.

Table 5
Model Parameter Estimates

Structural Equations	Standard Coefficients (β)	Non-Standard Coefficients	Standard Error	Critical Rate	P
(H1)LSCS → SSR	0.376	0.14	0.065	2.126	*
(H2)LSCS → CR	0.336	0.27	0.081	3.366	***
(H5)SSR→LI	0.652	1.55	0.760	2.044	*
(H6)CR → LI	0.353	0.38	0.076	4.936	***
(H8)CR → SCP	0.206	0.26	0.090	2.821	**
(H9)LI → SCP	0.320	0.37	0.091	4.062	***

*p≤0.05 ** p≤0.01 ***p≤0.001

Mediation Variable Testing in Structural Equation Modelling

In the structural equation model, the sum of the direct and indirect relationships shows the total effect. Depending on these indirect effects, the significance of the mediating effect was also measured with the Sobel Test.

• Mediating Role of SSR in the Effect of LSCS on LI

There is no direct effect between LSCS and LI. However, the total impact with the SSR variable was 0.364. Therefore, SSR has a mediating effect between LSCS and LI. It is statistically significant since p=0.034 between LSCS and SSR and p≤0.001 between SSR and LI. This mediation is not significant according to the Sobel Test (p=0.138).

• Mediating Role of CR in the Effect of LSCS on LI

There is no direct effect between LSCS and LI. However, the total effect with the CR variable is 0.364. Therefore, CR had a full mediator effect between LSCS and LI. It is statistically significant because p≤0.001 between LSCS and CR and p≤0.001 between CR and LI. According to the results of the Sobel test, the LSCS variable indirectly significantly affects LI through CR (p=0.005).

• Mediating Role of CR in the Effect of LSCS on SCP

There is no direct effect between LSCS and SCP. However, since the total effect with the CR variable was 0.186, CR has a full mediator effect between LSCS and SCP. It is statistically significant since p≤0.001 between LSCS and CR, p=0.005 between CR and SCP. According to the results of the Sobel test, the LSCS variable affected SCP indirectly significantly through CR (p=0.0290).

• Mediating Role of LI in The Effect of SSR on SCP

There is no direct interaction between SSR and SCP. However, since the total effect with

the LI variable is 0.208, the LI variable has a full mediation effect between SSR and SCP. It is statistically significant because p=0.041 between SSR and LI and p≤0.001 between LI and SCP. This mediation is not significant according to the Sobel Test (p=0.068).

- **Mediating Role of LI in The Effect of CR on SCP**

While the CR variable directly affected the SCP variable at a value of 0.206, the total effect with the LI variable is 0.319. In this case, the LI variable has a partial and significant mediation effect of 0.113 between CR and SCP. It is statistically significant because p≤0.001 between CR and LI, p≤0.001 between LI and SCP, and p=0.005 between CR and SCP. According to the results of the Sobel test, the CR variable directly and significantly affected the SCP through LI (p=0.0016). The strong customer relations of the companies will increase the supply chain performance indirectly and directly through logistics integrations.

Discussion

This study investigates the effect of the Lean supply chain strategy on SCP. In this context, it also examined the impact of the lean supply chain strategy on SSR and CR, the supply chain applications. The research findings are related with the literature from several following dimensions:

- LSCS is determined to have a significant direct effect on SSR which is consistent with the literature as Qrunfleh (2010) stated that lean supplier practices have a direct effect on SSR.
- A significant direct effect of LSCS on CR is determined which is consistent with Othman et al. (2012) whom stated that supply chain applications (customer relations, strategic supplier relations) have a mediating effect between supply chain strategies and supply chain performance.
- No significant direct effect of LSCS on LI is determined. Qrunfleh, Tarafdar & Nathan (2012) have stated that LSCS does not affect LI directly, however LSCS affects LI through the moderation role of the information system.
- No significant direct effect of the LSCS on the SCP is detected. Sukwadi et al. (2013) have stated that LSCS do not have a significant positive effect on SCI, while Çiçekdağı (2019) has found that LSCS has a significant and positive relationship with SCP in their research on food logistics in hotel businesses. Besides, Othman et al. (2012) have stated a significant effect between LSCS's SCP responsiveness and LSCS's supply chain responsiveness. Çalıskan et al. (2016) have also declared that there is a direct effect between SCS and performance. However, although there is no direct relationship between SCS and performance, it is stated that the effect increases with

the mediating relationship of supply chain practices between SCS and performance.

- A statistically significant positive effect of SSR on LI is detected. A statistically significant positive effect of CR on LI is detected. Kim (2009) stated a positive relationship between Supply chain practices and SCI.
- No statistically significant direct effect of the SSR on the SCP is detected. However, this effect is insignificant. While Ahmad & Saifudin (2014) have suggested no direct effect but a relationship through LI, Qrunfleh (2010) and Sundram et al. (2011) have argued that there is a direct effect. In this case, generally, an impact can be said to exist.
- There is a significant positive effect of CR on SCP. It is revealed that CR was substantial to increase SCP. Qrunfleh (2010) has stated that there is a significant positive relationship between CR and SCP. Sundram et al. (2011) have stated that supply chain practices (SSR, CR, information sharing, information quality, product delay, vision and purpose acceptance, risk and reward sharing) has a significant impact on SCP.
- A statistically positive effect of LI on SCP is detected. Prajogo & Olhager (2012) have stated that there is a positive relationship between LI and performance. Toker&Pınar (2020) determined that customer and supplier integration has a positive and significant effect on business performance, and internal integration insignificantly affects business performance. In particular, they emphasized the high positive impact of customer integration on business performance.
- SSR has a mediating effect on the effect of LSCS on LI. However, this effect is insignificant.
- The CR has a full mediator effect on the effect of LSCS on LI.
- CR has a significant full mediation effect between LSCS and SCP. Similarly, Othman et al. (2012) reported that supply chain practices mediate the relationship between chain strategies and SCP
- LI has a full mediation effect on the effect of SSR on SCP. In the study of Ahmad & Saifudin (2014), supply chain practices (SSR, CR, information sharing) has no direct effect on SCP. However, when LI is the mediating variable, its effect becomes significant.
- While the CR directly affects the SCP, the total effect of the CR on the SCP increases with the LI variable. In this case, partial mediation effect of LI variable is seen between CR variable and SCP.

- LI's effect on the SCP is significant. In addition, the mediating effect between CR and SCP is also significant. Therefore, LI studies should be given importance.

Conclusions

According to the findings LSCS effects both SSR and CR which shows that these supply chain practices are influenced by supply chain strategy at least LSCS. Practices such as supplier selection and evaluation or customer relationship management are tied to LSCS and the managers should focus on their supply chain strategy to improve their supply chain practices. It is recommended to develop lean practices in order to improve SSR and CR. The managers need to realize that quality and cost factors alone are not enough in the SCP development, and LI is also substantial. LSCS is related to SSR, but neither LSCS nor SSR alone affects SCP. SSR shows its effect on SCP via LI. That's why LI is crucial. For these reasons, the companies need to develop strategies to increase supply chain performance, review supply chain practices and integration, and use effective information technologies to provide efficient customer satisfaction and LI. Using a system providing a rapid information flow to the production facility as soon as a product reaches the customer is recommended. In order to develop long-term relationships with few suppliers, it is suggested to make virtual cooperation or face-to-face meetings depending on the company's conditions.

Since it is a new research area in Turkey, no study has addressed all the LSCS, SSR, CR, LI, and SCP factors. The research is limited to small-scale, medium-sized, and large-scale manufacturing companies in Edirne, Tekirdağ, Kırklareli. Most companies in the region are in the food and textile sectors. Therefore, it is difficult to determine other sectors' specific relations. Company officials can hardly allocate time to respond to the survey. The non-random convenience sampling method was applied in this study. Therefore, it could not be generalized as a limitation.

This research is significant because it was carried out in a new field in our country. The value of the study is academically high. This study will contribute to the deficiency in the national literature, and the findings will be a valuable resource for similar studies in the future. Researchers who will work on this subject can work sectoral in other regions, especially on large-scale companies. They can compare their studies (conducted with the same or different scales) with this study. In addition, they can include other variables such as agile supply chain strategy and supply chain orientation, which can affect supply chain performance, into the model.

It is recommended that the manufacturing enterprises operating in our country consider these factors, and the effective use of these factors will contribute to their businesses. This study may be a pioneer for others to be carried out in our country, both manufacturing and

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References

Acar, A. Z. (2010). Lojistik Yeteneklerin, Strateji-Performans İlişkisi Üzerindeki Rolü: KOBİ'ler Üzerinde Bir Saha Araştırması. *Atatürk Üniversitesi İİBF Dergisi,* 24(4), 1-21

Agarwal, A., Ravi, S. & Tiwari M.K. (2006). Modelling the Metrics of Lean, Agile and Leagile Supply Chain: An ANP-Based Approach. *European Journal of Operational Research,* 173, 211-225

Ahmad, N. & Saifudin, A. M. (2014). Supply Chain Management in Telecommunication Industry: The Mediating Role of Logistics Integration. *In the 4th International Conference on Technology and Operations Management Supply.* Kuala Lumpur, Malaysia, 648–653

Akçi, Y. (2012). *Çevre Belirsizliği Altında, Rekabet Stratejleri İle Tedarik Zinciri Stratejilerinin Firma Performansına Etkisi: İmkb İmalat Sektörü Uygulaması.* Doktora Tezi, Dumlupınar Üniversitesi Sosyal Bilimler Enstitüsü, Kütahya

Alshurideh, M., Alsharari, N. M. & Al Kurdi, B. (2019). Supply Chain Integration and Customer Relationship Management in the Airline Logistics. *Theoretical Economics Letters*, 9, 392-414

Ambe, I. M. (2014). Alignment of Supply Chain Strategies and Practices Of Locally Made Vehicles In South Africa. *International Business & Economics Research Journal,* 13(3), 637-652

Beamon, B.M., (1999). Measuring supply chain performance. *International Journal of Operations & Production Management*, 19 (3), 275–292

Bhasin, S. & Burcher, P. (2006). Lean Viewed as A Philosophy. *Journal of Manufacturing Technology Management*, 17(1), 56-72

Child, D. (2006). *The Essentials of Factor Analysis.* Third Edition, London: Continuum

Chopra, S. & Meindl, M. (2007). *Supply Chain Management: Strategy, Planning, and Operation.* Third Edition, New Jersey: Pearson Prentice Hall

Çalışkan, A., Karacasulu, A. T. & Öztürkoğlu, Y. (2016). Hızlı Moda Markalarında Çevik ve Esnek Tedarik Zinciri Yönetimi. *Manisa Celal Bayar Üniversitesi Sosyal Bilimler Dergisi*, 14 (4), 49-74

Çiçekdağı, M. (2019). *Otel İşletmelerinde Gıda Lojistiği Ve Tedarik Zinciri Yönetimi Stratejileri: Bir Araştırma.* Doktora Tezi, Selçuk Üniversitesi Sosyal Bilimler Enstitüsü, Kahramanmaraş

Ellinger, A. E., Chen, H., Tian, Y. & Armstrong, C. (2015). Learning Orientation, Integration, and Supply Chain Risk Management in Chinese Manufacturing Firms. *International Journal of Logistics: Research and Applications,* 18(6), 476–493

Flynn, B., Huo, B. & Zhao, X. (2010). The Impact of Supply Chain Integration on Performance: A Contingency and Configuration Approach. *Journal of Operations Management,* 28, 58-71

George, D. & Mallery, P. (2016). *IBM SPSS Statistics 23 Step by Step A Simple Guide and Reference*. 14th edition, New York: Routledge

Gharakhani, D., Mavi, R. K. & Hamidi, N. (2012). Impact of Supply Chain Management Practices on Innovation and Organizational Performance in Iranian Companies. *African Journal of Business Management*, 6(19), 5939-5949

Gunasekaran, A., Patel, C. & Tirtiroglu E. (2001). Performance Measures and Metrics in a Supply Chain Environment, *International Journal of Operations and Production Management,* Vol. 21, No ½, 71-87.

Hair, J. F., Hult, G. T. M., Ringle, C. M. & Sarstedt, M. (2014). *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM).* Second Edition, USA: SAGE Publication

Hooper, D., Coughlan J. & Mullen, M. (2008). Evaluation Model Fit: A Synthesis of the Structural Equation Modelling Literature. *7th European Conference on Research Methodology for Business and Management Studies.* 19-20 June 2008, 195-200

Jajja, M. S.S., Brah, S. A. & Hassan, S. Z. (2013). Supply chain strategy, core Operations and Performance: Learning from India and Pakistan. *44th Annual Meeting of Decision Sciences Institute,* 1-7

Kim, S. W. (2009). An Investigation on the Direct and Indirect Effect of Supply Chain Integration on Firm Performance. *Int. J. Production Economics,* 119, 328–346

Kim, S. W. (2006). Effects of Supply Chain Management Practices, Integration and Competition Capability on Performance. *Supply Chain Management: An International Journal,* 11(3), 241–248

Kline, P. (1994). *An Easy Guide to Factor Analysis.* New York: Routledge

Kline, R. B. (2011). *Principles and Practice of Structural Equation Modeling.* Third Edition, New York: The Guiltford Press

Konecka, S. (2010). Lean and Agile Supply Chain Management Concepts in the Aspect of Risk Management. *Logforum.* 6(4), 3, 23-31

KOSGEB, https://www.kosgeb.gov.tr/Content/Upload/Dosya/kobi_tanimi.pdf, erişim tarihi 28.12.2021

Krajewski, L., Ritzman, L. P. & Malhotra, M. K. (2013). *Üretim Yönetimi Süreçler ve Tedarik Zincirleri.* Ankara: Nobel Akademik Yayıncılık (Çeviri Editörü: Sema Birgün)

Lambert, D. M. & Cooper M. C. (2000). Issues in Supply Chain Management. *Industrial Marketing Management*, 29(1), 65-83

Li, S., Rao, S. S. Ragu-Nathan, T.S., & Ragu-Nathan, B. (2005). Development and validation of a measurement instrument for studying supply chain management practices. *Journal of Operations Management*, 23, 618–641

Li, S., Ragu-Nathan, B., Ragu-Nathan, T.S. & Rao, S. S. (2006). The Impact of Supply Chain Management Practices on Competitive Advantage and Organizational Performance. *Omega,* 34, 107-124

Li, G., Yang, H., Sun, L. & Sohal, A. S. (2009). The Impact of IT Implementation on Supply Chain Integration and Performance. *Int. J. Production Economics,* 120, 125-138

Malhotra, N.K. & Birks, D. F. (2000). *Marketing Research An Applied Approach*. European Edition, Pearson Education Limited

Moshkdanian, F., & Author, C. (2013). Impact of Supply Chain Integration on the Performance of Bahman Group. *Interdisciplinary Journal of Contemporary Research in Business*, 5(1), 184–193

Onay, M. & Kara, H. S. (2009). Lojistik Dış Kaynaklama Uygulamalarının Örgüt Performansı Üzerine Etkileri. *Ege Akademik Bakış Dergisi***,** 9(2), 593-622

Osei, M. B. (2017). *The Impact of Supply Chain Integration On Firm Performance: The Food Retail Sector In Turkey. Master Thesis,* Anadolu University, Institute of Social Sciences, Eskişehir

Othman, A. A., Yusoff, R.Z., Ismail, M.A. & Husin,R. (2012). Supply-Chain Strategy and Performance:

Mediating Effect of Supply-Chain Practices. *The 3rd International Conference on Technology and Operations Management, "Sustaining Competitiveness through Green Technology Management,* Bandung – Indonesia. July 4-6, 217-224

Parast, M.M. & Spillan, J. E. (2014). Logistics and Supply Chain Process Integration as a Source of Competitive Advantage an Empirical Analysis. *The International Journal of Logistics Management,* 25(2), 289-314

Prajogo, D & Olhager, J. (2012). Supply chain Integration and Performance: The Effects of Long-Term Relationships, Information Technology and Sharing, and Logistics Integration. *Int. J. Production Economics,* 135, 514–522

Qi, Y., Boyer, K. K. & Zhao, X.(2009). Supply Chain Strategy, Product Characteristics, and Performance Impact: Evidence from Chinese Manufacturers. *Decision Sciences,* 40(4), 667-695

Qi, Y., Zhao, X. & Sheu, C. (2011). The Impact of Competitive Strategy and Supply Chain Strategy on Business Performance: The Role of Environmental Uncertainty. *Decision Sciences Journal,* 42(2), May 2011, 371-389

Qi, Y., Huo, B., Wang, Z. & Yeung, H. Y. J. (2017). The Impact of Operations and Supply Chain Strategies on Integration and Performance. *Int. J. Production Economics,* 185, 162-174

Qrunfleh, S. M. (2010). *Alignment of Information Systems with Supply Chains: Impacts on Supply Chain Performance and Organizational Performance.* Doctor of Degree*,* The University of Toledo

Qrunfleh, S., Tarafdar, M. & Ragu-Nathan, T. S. (2012). Examining Alignment Between Supplier Management Practices and Information Systems Strategy. *Benchmarking: An International Journal*, 19 (4/5), 604-617

Qrunfleh, S. & Tarafdar, M. (2013). Lean and Supply Chain Strategies and Supply Chain Responsiveness: The Role of Strategic Supplier Partnership and Postponement. *Supply Chain Management: An International Journal,* 18 (6), 571-582

Qrunfleh, S. & Tarafdar, M. (2014). Supply Chain Information Systems Strategy: Impacts on Supply Chain Performance and Firm Performance. *Int. J. Production Economics*, 147, 340-350

Rahimnia, F., Keyvanipoor, P. & Moghadasian, M. (2014). Analysis of BSC Perspectives as Related to the Alignment of Environmental Uncertainty and Supply Chain Strategy. *Benchmarking: An International Journal,* 21(6), 903-916

Ramana, V., Rao, K. N. & Kumar, J. S. (2016). A Critical Review on Supply Chain Strategies and their Performance. *International Journal of Engineering Science and Computing,* 6(5), 4525-4545

Sharma, P. & Kulkarni, M. S. (2016). Bayesian Belief Network for Assessing Impact of Factors on Army's Lean–Agile Replenishment System. *J. Military Stud,* 7(1), 11–23

Stank, T. P., Keller, S. B. & Daugherty, P. J. (2001). Supply chain collaboration and logistical service performance. *Journal of Business logistics,* 22(1), 29-48

Sukwadi, R., Wee, H. M. & Yang, C. C.(2013). Supply Chain Performance Based on the Lean–Agile Operations and Supplier–Firm Partnership: An Empirical Study on the Garment Industry in Indonesia. *Journal of Small Business Management,* 51(2), 297–311

Sun, S. Y., Hsu, M. H.& Hwang, W. J. (2009). The Impact of Alignment Between Supply Chain Strategy and Environmental Uncertainty on SCM Performance. *Supply Chain Management: An International Journal,* 14/3, 201–212

Sundram, V. P. K., Ibrahim, A. R. & Govindaraju, V. G. R. (2011). Supply Chain Management Practices In

the Electronics Industry in Malaysia Consequences for Supply Chain Performance. *Benchmarking: An International Journal,* 18(6), 834-855

Tarafdar, M. & Qrunfleh, S. (2017). Agile Supply Chain Strategy and Supply Chain Performance: Complementary Roles of Supply Chain Practices and Information Systems Capability for Agility. *Int. J. Production Economics,* 55(4), 925-938

Terjesen, S., Patel, P. C. & Sanders, N. R. (2011). Managing Differentiation-Integration Duality in Supply Chain Integration. *Decision Sciences,* February 2011, 1-37

Toker, K. & Pınar, R. İ. (2020). Entegre Tedarik Zincirlerinin İşletme Performansı Üzerindeki Etkisi. *Hacettepe Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi*, 38(4), 823-846

Turan, H. & Turan, G. (2019). Enerji Yönetiminin Başarısında Yalın Altı Sigmanın Etkisi. *Atlas International Refereed Journal on Social Sciences***,** 5(17), 112-121

Waters, D. (2003). *Logistics: an Introduction to Supply Chain Management.* Gordonsville. VA, USA: Palgrave Macmillan

Van Hoek, R.I., (1998). Measuring the Unmeasurable-Measuring and Improving Performance in the Supply Chain. *Journal of Supply Chain Management,* 3 (4), 187–192

Zhang, M. & Qi, Y. (2013). Impact of Supply Chain Strategy on Mass Customisation Implementation and Effectiveness: Evidence from China. *Int. J. Information and Decision Sciences,* 5(4), 393-413