THE MEDIATING ROLES OF SUPPLY CHAIN COLLABORATION AND LOGISTICS FLEXIBILITY ON SUPPLY CHAIN PERFORMANCE OF AUTO_PARTS MANUFACTURING FIRMS IN THAILAND.

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ABSTRACT

Due to the problems in supply chain management of many businesses in Thailand, it is decisive to understand which determinants may deal with this problem. This research aims to study the influence of supply chain integration (SCI) on supply chain performance (SCP) by considering the mediating effects of supply chain collaboration (SCC) and logistics flexibility (LGF). The study was based on the mixed-methods sequential explanatory design. Using a confirmatory factor analysis, the study investigated relational dimensions of SCP, SCC, LGF, and SCI. The research model comprised 4 latent variables measuring 13 observed variables. The only exogenous latent variable was SCI, while endogenous latent variables were SCC, LGF, and SCP. The respondents were selected using stratified random sampling. Data from a total 321 complete surveys were acquired from top executives working for auto-parts manufacturing firms in Thailand. Moreover, the guidelines to develop SCP were given, based on 5 in-depth interviews from both academicians and auto-parts manufacturer top executives. The hypotheses were tested on data collected by using structural equation modeling. The results supported that SCI enabled auto-parts manufacturing firms to enhance SCP effectively, and that SCC and LGF played a key role in mediating the effects of SCI on SCP. This research suggested that firms should consider policies or practices endorsing SCI, SCC, and LGF as they can improve SCP.

Keywords: supply chain performance, supply chain collaboration, logistics flexibility, supply chain integration

INTRODUCTION

Nowadays, entrepreneurs have changed the managerial approach in doing their business due to the globalization, leading to a reduction in difficulties on cross-border investment (Kuqi and Hasanaj, 2018). The businesspersons, consequently, need to improve their companies in highly competitive situation by increasing the sustainable competitiveness. The skills in investigating and assessing supply chain performance (SCP) to compare with the opearations of other companies in the same industry is the one of main success factors. However, in Thailand, it is difficult to motivate the companies to measure their SCP and the companies generally preserve the confidential SCP information as well. As a result, there is no official information in terms of SCP in Thailand (Division of Logistics, 2019).

The prior research, nevertheless, designate the difficulties in supply chain management (SCM) of businesses in Thailand (Namkam and Bunchareon, 2017; Pimonratnakan, 2016; Fakkong and Jarutheerasarn, 2015; Limpianchob et al., 2014; Duangsuwan, 2009;

Prommontree, 2013; Maneeratroongrot and Donkawa, 2013; Techatweewan, 2013; Chanklab, 2015; Tinnaphop et al., 2016; Thoucharee and Pitakaso, 2012; Chantanroj, 2009; Jinachan et al., 2016). Accordingly, it can be presumed that companies' SCP in Thailand might need to be developed. The study therefore aims to study the factors enhancing SCP of companies in Thailand, especially in automotive industry since it is interested because its direction of automotive sales has been growth continuously. The driving forces are the Thailand's economic development, low motorization rate of Thais, government policy motivating to buy automobiles, and many new automobile models that will be launched during 2020-2022. This reflects the expansion of automobile sales in both domestic and foreign markets. Likewise, there is the opportunity of Thai auto-parts manufacturer to export because in some countries, such as Australia, Toyota Motor Corporation plans to reduce automotive production capacity in Australian based manufacturing and then completely close it in 2019. Furthermore, tax rate reduced to zero percent due to AEC agreement supports ASEAN countries to import automobiles from Thailand. As a result, this study focuses on improving SCP of Thai auto-part manufacturers (Yongpisanphob, 2018).

Previous studies explored a diversity of studying logistics and supply chain factors that are able to enhance the SCP, for example SCM practices and supply chain integration (SCI) (Sundram and Bhatti, 2016), logistics flexibility (LGF) (Mander et al., 2017), supply chain collaboration (SCC) (Singhry and Rahman, 2018). Nevertheless, the following factors affecting to the SCP of a firm have been insufficiently studied and unclear, especially in context of Thailand since there are the existing gaps in the literatures. Firstly, an integrated model investigating the complicated relationship among SCI, LGF, SCC and SCP is still omitted. Although the current study depicted the moderating effects of technological and demand uncertainties on the relationship between SCI and customer delivery performance of first tier auto-part supplier in Thailand (Boon-itt and Wong, 2011). Exploring the matters of how the effect of SCI on SCP are mediated by SCC and LGF, along with the effect of SCI on SCC are mediated by LGF, are still unclear in the context of Thai automobile industry. Second, the current systematic review of supply chain flexibility suggested that more studies need to validate which flexibility components are advantageous for the particular industries, sectors, supply chain settings and designs and between the supply chain partners to deliver value to the customer and/or improve SCP (Mander et al., 2017). As a result, the study emphasizing the LGF in diverse flexibility dimensions. Third, many past studies concentrated on the SCC, particularly relationship context as reviewed by Hudnurkar et al. (2014). Besides, Jeenanunta et al., (2013) found that SCC focused on information sharing and decision synchronization with supply chain partners positively affected to SCP of Thai auto-parts and electronics manufacturing firms. Therefore, the study, proposing the different SCC dimensions, is essential. Forth, most often scholarly work on supply chain tends to overly focus on the measurement of firm operational and financial performance rather than SCP (Tarifa-Fernandez and Burgos-Jiménez, 2017). This study, therefore, inclines to explicitly focus on SCP. As a result, the main objective of this research is to extend these previous studies.

OBJECTIVE

The research aims to 1) study the levels of SCI, LGF, SCC, and SCP of auto-parts manufacturing firms in Thailand, 2) To study the effects of SCI, LGF, and SCC on SCP of auto-parts manufacturing firms in Thailand, the effect of SCI on LGF and SCC, and the effect of LGF on SCC, and 3) To study the mediating roles of SCC and LGF on the effect of SCI on SCP of auto-parts manufacturing firms in Thailand.

LITERATURE REVIEW

Supply Chain Performance

SCP is defined as the functioning assessment for each supply chain member and the full supply chain as a consequence of involvement in a relationship of supply chain (Gagalyuk et al., 2013). It also is defined as the advantages resulting from teamwork in supply chain, containing, cost reduction, competence enlargement, and cycle time development (Yul and Kyu, 2015). SCP metrics can be divided into efficiency (EFF) and effectiveness (ETN) as the key indicators (Caplice and Sheffi, 1994, 1995; Tan et al., 1998; Beamon, 1999; Li et al., 2006; Lee et al., 2007). Two dimensions for measuring EFF in supply chain are supply chain cash-to-cash cycle time, that assesses the time used for an asset made to flow back into a firm after the firm has been paid for raw materials, and supply chain agility, that assesses the time necessary for the supply chain to react to an unforeseen demand growth with no cost or service drawback. EFF in Supply chain is measured by order fulfillment lead time, that measures the time between order delivery and order entry, and perfect order fulfillment, that measures perfectly completed orders ratio over the total number of orders places. These two dimensions is developed from SCOR Version 12.0 Key Performance Indicators measuring the characteristics of supply chain responsiveness and reliability, in turn (Supply Chain Council, 2017).

Supply Chain Collaboration

SCC has been described in many dissimilar approaches, and fundamentally they has been conceptualized in terms of relationship importance and practice emphasis. SCC has been observed as a business operation where two or more separate organizations manage together in supply chain processes in the direction of shared objectives and joint profits (Cao and Zhang, 2011). SCC is the teamwork among autonomous, but connected firms to share capabilities and capitals to respond their customer requirements which change animatedly (Simatupang and Sridharan, 2008). The study measure SCC in 4Rs dimensions, based on Christopher (2016). First, responsiveness, as revealed by Cao and Zhang (2011), how supply chain members work closely to improve a comprehension of and respond to the market and competitive situation. Second, reliability, as described by Fawcett et al. (2011) is trustworthiness of one party in supply chain regarding the possibility that the accomplishment or results of another will be agreeable. Third, resilience, as explained by Lee et al. (2011) is behavioral uncertainty described as the probable characteristic in an unexpected circumstances for struggle expecting and comprehending partners' engagements. Finally, relationship, as suggested by Walter (2003), Cai et al. (2010), and Nyaga et al. (2010) is the association promoter of the customer, long term relationship & joint relationship effort, and Interpersonal relationship in order.

Logistics Flexibility

LGF is the company's capability to react speedily and professionally to requirements for distribution, services, and assistance. This is achieved by forecasting and monitoring the flow as well as storage of works, merchandises, and related materials from the production to the consumption. It comprises flexible actions within company and between its partners (Jafari, 2015). LGF allows greater consumer service by coordinating the delivery of goods with purchaser requests (Van Hoek, 2001). LGF has four dimensions, consisting of physical supply flexibility (PSF), purchasing flexibility (PCF), physical distribution flexibility (PDF), and demand management flexibility (DMF). First, PSF is the company capacity to deliver a

range of reserved supplies for producing, speedily and commendably. Second, PCF is the company capability to buy a range of reserved supplies by making agreement, speedily and commendably. Third, PDF is the company capability ability to modify the packing, inventory, warehousing, and conveyance of physical goods to meet consumer requirements, speedily and commendably. Forth, DMF is the company capability to respond to the range of consumer wants concerning deliver time, services, and expense, speedily and commendably (Zhang et al., 2005).

Supply Chain Integration

SCI refers to the degree to which a manufacturer strategically communicates (Crittenden, 1992) and interacts (Gimenez and Ventura, 2005) with its suppliers and customers as well as coordinately operate organizational procedures. The objective is to accomplish the resourceful flows of goods and facilities, data, cash and choices, to deliver supreme value to clients at high speediness and low budget and (Flynn et al., 2010). SCI comprises supplier integration (SPI), internal integration (INI), and customer integration (CTI). First, SPI refers to the degree to which a producer work together with its main suppliers to achieve consumer needs by determining managerial arrangements, plans, procedures, and tasks, mutually. Second, INI can be defined as the degree to which a producer builds its own administrative plans, processes, and tasks collaboratively and coordinately. Third, CTI refers to the organization's use of these customer contributions in the service delivery process.

Supply Chain Integration and Supply Chain Performance

Feng et al. (2017) provides an original experimental inspection of the effect of SCI on the performance of automobile manufacturers in China. As an active capability, SCI meaningfully and positively correlates to operational performance. Li (2015) also reveals the impact of SCI on operational performance of manufacturing companies in different countries. While, Zhao et al. (2015) represents that SCI is beneficial to financial performance of manufacturing firms' in China. Charterina et al. (2016) indicates that SPI focused on information-sharing practices positively influences on European Machine-tool firms' performance. Also, information sharing routines mediate in the impact of idiosyncratic investments on firm's performance. Consistently, Wong et al. (2015) depicts that the positive effect of SCI, based on information sharing, on the organizational performance. As information-sharing is a core of SCI, so SCI possibly has a positive impact on SCP. This study therefore proposes the following hypotheses:

H1: SCI positively affects SCP.

Supply Chain Integration and Supply Chain Collaboration

Yu et al. (2017) suggests that integration in terms of association between companies and clients is an important part in increasing collaboration. Moreover, Chou, et al. (2018) reveals that the integration, focused on information exchange or communication, positively influenced collaboration. Liu and Lee (2018) represents that SCI positively affected supply chain resilience. The structural capital is a whole system of appropriate associations among supply chain members. So, it is considered as the integration between supply chain partners. This study therefore proposes the following hypotheses:

H2: SCI positively affects SCC.

Supply Chain Integration and Logistics Flexibility

Muntaka et al. (2017) indicates that SCI positively affected on supply chain flexibility. Especially internal integration, Khalaf and Mohadem (2019) represents the connection between INI and production flexibility in the Egyptian industry. Chaudhuri et al. (2018) also demonstrates that Internal integration have a direct effect on manufacturing flexibility. Yu et al. (2018) depicts that SCI, focused on information sharing, positively affected to flexibility. Goyal, et al. (2018), moreover, reveals that supplier relationship and process simplification in process integration positively affects supply chain flexibility. As logistics is a part of supply chain management, this study, consequently, proposes the following hypotheses:

H3: SCI positively affects LGF

Logistics Flexibility and Supply Chain Performance

Yu et al. (2018) indicates that the level of supply chain flexibility, reactive flexibility and proactive flexibility, both increased operational performance of the firms. Besides, Muntaka et al. (2017) suggests that supply chain flexibility had the positive affect on business performance. As logistics is a part of supply chain management, logistics flexibility is possibly affected SCP. Aziz et al. (2017) demonstrates that LGF has significant effect on logistics performance of firms. It confirms that logistics flexibility helps firms to improve logistics performance in term of increasing service responsive, flexibility, efficiency, and quality. These facts indicated that Logistics flexibility capability has a significant positive effect on performance. This study therefore proposes the following hypotheses:

H4: LGF positively affects SCP

Logistics Flexibility and Supply Chain Collaboration

Ma et al. (2018) proposes that the flexibility an organization can enhance contextual resilience. Whereas, Yu et al. (2017) demonstrates that logistics flexibility has noteworthy positive impacts on the logistics service quality level the producer proposes, which improve relationship, respectively. This stronger effect is under an indeterminate situation. While, Chou (2017) depicts that the flexibility, including the response to requests, handling unanticipated problems, dealing with sudden service changes, and adapting to unforeseen changes in services positively influence reliability. More recently, Linnenluecke (2017) suggests that organizational flexibility research considered organizational flexibility as organizational responsiveness to external threats. As previous studies reviewed on the relationship of the flexibility and these scopes concerning SCC, this study, consequently, proposes the following hypotheses:

H5. LGF positively affects SCC.

Supply Chain Collaboration and Supply Chain Performance

Yunus (2018) reveals that supplier collaboration conveys fundamental innovation, whereas customer collaboration conveys incremental innovation. However, customer collaboration negatively impacts fundamental innovation. Both innovations additionally positively impacted company performance. Doganay and Ergun (2017) suggests that supply chain management requires managerial relationships between supply chain members so as to improve supply chain to attain eventually competitive advantage and customer satisfaction. SCC between partners is vital for inter organizational relationship of focal firms nowadays. Reliance based and longtime relationships with suppliers have many benefits for focal firms to achieve better SCP on the customer side of the chain. (Abdallah et al., 2017) depicts that reliability with suppliers has a positive impact on hospital SCP performance Moreover, Salam (2017) demonstrates that SCC positively influences operational performance in fast-

moving consumer goods businesses in Thailand. Thus, according to this line of reasoning, the following hypothesis is proposed:

H6: SCC positively affects to SCP.

The Mediating role of Supply Chain collaboration and Logistics Flexibility

The linkage of the two sub-hypotheses allows us to account for the mediation effect (Hayes, 2013). As a result, this study proposes the following hypotheses:

H7: SCC mediates the effect of SCI on SCP.

H8: SCC mediates the effect of LGF on SCP.

H9: LGF mediates the effect of SCI on SCP.

H10: LGF mediates the effect of SCI on SCP.

METHODOLOGY

Population and sample

The population in this study is top executives in 618 auto-parts manufacturers listed as the members of Thai Auto Parts Manufacturers Association or TAPMA. The study focused on TAPMA auto-parts manufacturers since they represented the reliable data about their firms available on TAPMA website since TAPMA were approved by the Ministry of Commerce. Moreover, they allowed the researcher to collect the data because they aim to research on auto-parts entrepreneurship, exchange or publicize the knowledge, and request from members information concerning their entrepreneurship (Thai Auto Parts Manufacturers Association, 2019).

As Comrey and Lee (1992)'s suggest that the sample size appropriateness is assessed very unevenly on the scale of 50-very poor; 100-poor; 300-good; 500-very good; and 1,000 or more-excellent, this study used simple random sampling to select the 3 respondents per each auto-parts manufacturer to acquire the excellent sample size of 1,050 top executives in 350 TAPMA auto-parts manufacturers, arisen from stratified random sampling based on firm sizes – large firms and small-and-medium firms). Top executives were asked to answer online questionnaire since they could represent their firm as the representatives of unit of analysis. Finally, there were 321 responses from 107 firms. The response rate is 30.57%. This numbers of sample is acceptable as Kline (2011) recommend that the sample size of 10 respondents per estimated parameter is adequate. As a result, the minimum sample size of this study was 320 respondents because this study comprised 32 parameters. Furthermore, the 3 top executives and 2 academic experts were interviewed to give the opinions on the results gathered form quantitative method as this study was based on the mixed-methods sequential explanatory design

The research tools

The research tools were questionnaire and interview forms. For the questionnaire, the SCI nine items were used from the scale originally developed by Flynn et al. (2010) and Tseng and Liao (2015). The SCC twenty four items were based on Paulraj and Chen, (2007); Lotfi et al., (2013); Shin et al, (2018); Brandon-Jones et al., (2014); Wieland and Wallenburg, (2013); Cheng and Lu, (2017). The LGF twenty four items were used from the scale initially created by Zhang et al. (2005). The SCP ten items were based on the concepts of (Tsanos et al., 2014; Odongo et al., 2017; Lee et al. 2007). After the questionnaire passed Index of Item-Objective Congruence or IOC, it was tried out with 30 managers who were not the sample to inspect reliability by considering internal consistency based on Cronbach's alpha coefficient. For the Interview form, it was inspected by experts before collecting data.

Data analysis

Statistical Package for the Social Sciences (SPSS) 23 and Analysis of Moment Structures (AMOS) 22 were used to conduct the data analysis and hypotheses testing. Data was edited before analysis. The study replace missing data with maximum likelihood using the instruction "TYPE = MISSING H1" in AMOS (Muthén and Muthén, 2001). Data analysis of all background information of the sample was analyzed by frequency and percentage. Since all variables in research conceptual framework were continues variables, the study used Mean, S.D., Skewness, and Kurtosis to study the distribution characteristics of variables. The interpretation of mean in measuring SCI, LGF, SCC, and SCP was considered from 5 levels of estimation based on Best and Kahn (2009) approach.

The appropriateness of the meta-correlation was investigated by considering the Kaiser-Meyer-Olkin (KMO) value, > 0.5, and the Bartlett Test of Sphericity. They must have significant statistical significance (Sig.) 0.000, indicating that this set of variables is suitable for confirmatory factor analysis (CFA) (Steven, 2009). Multicollinearity by correlation coefficient (r) was used to find the liner relationship between the variables. The correlation value can be from negligible (±00.00-0.30) to Very high (±0.90-1.00) (Hickle et al, 2003). The correlation coefficients between variables in SEM not to exceed +0.80 was considered (Steven, 2009).

CFA was used to test the relationship between observed variables of 13 observed variables and 4 latent variables. The model fit measurement was based on the eight indices (chi-square: P>0.05, relative chi-square<2, GFI, AGFI, TLI, &CFI >0.95, RMR&RMSEA<0.05) to test the consistency of the model based on hypothesis and empirical data. The researcher used these indices to validate the conformance of the model. If the calculated values do not meet the criteria or are unacceptable, as suggest by Diamantopoulos and Siguaw (2000) the model must be adjusted.

RESULTS

4.1 Testing the measurement model

This study considered the normal distribution of values from the Skewness values of -3 to +3 and kurtosic values of 3. It also found that all factor loadings of 1st order CFA and Cronbach's Alfa coefficients were greater than 0.7, as shown in Table 1. These values were acceptable as proposed by Wiratchai (1999). The model fit measurement, besides, were passed in eight indices, as suggested by Diamantopoulos and Siguaw (2000). These indicated that the measurement models was acceptable.

Table 1. Testing results of the measurement model

	Items' no.	$\bar{X}$	SD	Interpret	1st order loading	α	Remarks
Supply Chain Performance							
Efficiency	5	4.23	0.64	High	(0.72-0.93)	0.76	Acceptable
Effectiveness	5	4.26	0.60	High	(0.74-0.99)	0.74	Acceptable
Supply Chain Collaboration							
Responsiveness	5	4.30	0.60	High	(0.71-0.79)	0.71	Acceptable
Reliability	5	4.22	0.52	High	(0.87.0.93)	0.78	Acceptable
Resilience	5	4.44	0.69	High	(0.71-0.98)	0.75	Acceptable
Relationship	5	4.32	0.60	High	(0.71-0-77)	0.71	Acceptable
Logistics Flexibility							
Physical Supply Flexibility	6	4.26	0.67	High	(0.79-0.94)	0.75	Acceptable

	Items' no.	$\bar{X}$	SD	Interpret	1st order loading	α	Remarks
Purchasing Flexibility	6	4.13	0.58	High	(0.79-0.95)	0.78	Acceptable
Physical Distribution Flexibility	6	4.11	0.61	High	(0.80-0.91)	0.76	Acceptable
Demand Management Flexibility	6	4.21	0.45	High	(0.79-0.95)	0.81	Acceptable
Supply Chain Integration							
Supplier Integration	4	4.21	0.65	High	(0.73-0.82)	0.73	Acceptable
Internal Integration	4	3.99	0.65	High	(0.73-0.83)	0.79	Acceptable
Customer Integration	4	4.12	0.55	High	(0.87-0.98)	0.77	Acceptable

Moreover, the measurement models of SCP, SCC, LGF, and SCI were considered in terms of Reliability, convergent validity, and discriminant validity with the criteria of CR>.70; Convergent validity: AVE>.50; Discriminant validity: AVE>MSV. CR = composite reliability; AVE = average variance extracted; MSV = maximum shared variance; ASV = average shared variance (Hair et al. 2010), as shown in table 2. After that, the Goodness of fit by 2nd order CFA depicted passing values based on indices suggested by Diamantopoulos and Siguaw (2000), as shown in Table 3.

Table 2. Reliability, convergent and discriminant validity

	CR	AVE	MSV	ASV
Supply Chain Performance (SCP)	0.837	0.520	0.491	0.476
Supply Chain Collaboration (SCC)	0.801	0.507	0.438	0.426
Logistics Flexibility (LGF)	0.843	0.525	0.476	0.464
Supply Chain Integration (SCI)	0.859	0.578	0.493	0.480

Notes: Threshold of reliability: CR>.70; Convergent validity: AVE>.50; Discriminant validity: AVE>MSV. CR = composite reliability; AVE = average variance extracted; MSV = maximum shared variance; ASV = average shared variance.

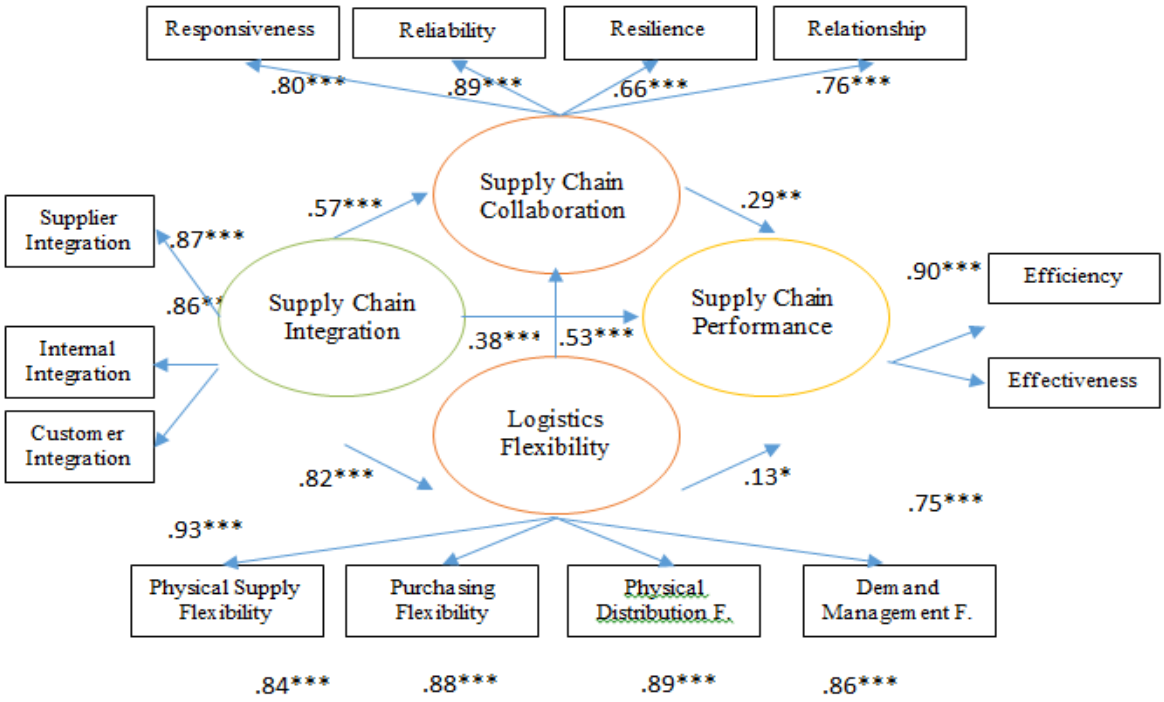
Table 3. Goodness of fit by 2nd order CFA

Index	P value	x^2/df	CFI	GFI	AGFI	RMSEA	Critical N	SRMR	Remarks
	>0.05	<2	>0.95	>0.95	>0.95	<0.05	>300	<0.05	
SCP	0.55	1.58	1.00	0.99	0.97	0.016	785	0.04	pass
SCC	0.69	1.25	1.00	0.98	0.96	0.000	622	0.02	pass
LGF	0.54	1.34	1.00	0.98	0.96	0.000	549	0.03	pass
SCI	0.72	1.66	1.00	0.99	0.98	0.023	568	0.04	pass

Notes: SCP: Supply Chain Performance, SCC: Supply Chain Collaboration, LGF: Logistics Flexibility, and SCI: Supply Chain Integration

4.2 Testing result of the causal relationship model

Path analysis by structural equation modeling was used to test the 10 hypotheses comprising the proposed model of the effects of SCI, LGF, and SCC on SCP of auto-parts manufacturing firms in Thailand, the effect of SCI on LGF and SCC, and the effect of LGF on SCC, including the mediating roles of SCC and LGF on the effect of SCI on SCP of auto-parts manufacturing firms in Thailand. The model fit analysis results were acceptable (Chi-square= 63.414; degree of freedom=44; P=0.59; relative chi-square=1.441; GFI=.971; AGFI=.940; TLI=.991; CFI =0.95; RMR=.008; RMSEA=.037). The results are presented in Figure 1.



Note: *** = p < 0.001, ** = p < 0.01, * = p<0.05,
Model fit summary: Chi-square = 63.414; degree of freedom=44; P=0.59; relative chi-square=1.441; GFI=.971; AGFI=.940; TLI=.991; CFI =0.95; RMR=.008; RMSEA=.037

Figure 1. Path analysis results

Table 4 shows the whole results for total effects, direct effects, and indirect effects. As suggested by Henseler et al. (2009), these results supported all hypotheses as the t-values were greater than 1.96 (T-value higher than 1.96 is the minimum level to accept hypotheses), as shown in Table 5, and p-values were below 0.05. Moreover, indirect effects through mediating variables, namely; SCC and LGF were also significant for both cases.

Table 4. Total effects, direct effects, and indirect effects

DV	**SCC**				**LGF**				**SCP**			
IV	TE	DE	IE	S.E.	TE	DE	IE	S.E.	TE	DE	IE	S.E.
SCI	.877	.569	.320	.075	.821	.821	-	.055	.888	.526	.353	.101
SCC	-	-	-		-	-	-		.291	.291	-	.097
LGF	.375	.375	-	.062	-	-	-		.239	.129	.109	.062

Note: TE: total effect, DE: direct effect, IE: indirect effect, S.E.: standard error

SCC is a mediating variable between SCI and SCP. SCI, furthermore, is a mediating variable between LGF and SCP, as shown in Figure 2. In addition, LGF is a mediating variable between SCI and SCP. LGF, likewise, is a mediating variable between SCI and SCC, as shown in Figure 3.

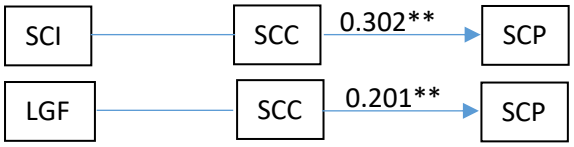


Figure 2. The mediating effects of supply chain collaboration (SCC)

Figure 3. The mediating effects of logistics flexibility (LGF)

As shown in Table 4, H1-H3, H5, H7-H10 could be supported with statistical significance of p<0.001. While, H6 could be support with statistical significance of p<0.01. Whereas, H4 could be supported with statistical significance of p<0.05. These results were in line with the guidelines provided from both 2 academic experts and 3 executives of auto-parts manufacturing firms who depicted the importance of integration, flexibility, and collaboration among supply chain partners so as to enhance SCP.

Table 5. Hypothesis testing results

Hypothesis	Path	(β)	T-Value	Results
H1	Supply Chain Integration ⟶ Supply Chain Performance	0.526***	5.094	Supported
H2	Supply Chain Integration ⟶ Supply Chain Collaboration	0.569***	7.877	Supported
H3	Supply Chain Integration ⟶ Logistics Flexibility	0.821***	17.188	Supported
H4	Logistics Flexibility ⟶ Supply Chain Performance	0.129*	2.060	Supported
H5	Logistics Flexibility ⟶ Supply Chain Collaboration	0.375***	5.392	Supported
H6	Supply Chain Collaboration ⟶ Supply Chain Performance	0.526**	2.814	Supported
H7	Supply Chain Integration ⟶ Supply Chain Collaboration ⟶ Supply Chain Performance	0.302**	2.802	Supported
H8	Logistics Flexibility ⟶ Supply Chain Collaboration ⟶ Supply Chain Performance	0.201**	2.798	Supported
H9	Supply Chain Integration ⟶ Logistics Flexibility ⟶ Supply Chain Performance	0.107*	2.049	Supported
H10	Supply Chain Integration ⟶ Logistics Flexibility⟶ Supply Chain Collaboration	0.312***	5.083	Supported

Note: *** = p < 0.001, ** = p < 0.01, * = p<0.05; Threshold of acceptable hypothesis: T-value>1.96

CONCLUSION AND FUTURE WORK

This study has highlighted the roles of SCC and LGF on the effect of SCI on SCP of auto-parts manufacturing firms in Thailand. Findings of the study have investigated that SCC and LGF are important in auto-parts manufacturers. It has major contribution to SCP. Better SCC and LGF practices promote firm development which eventually rises SCP. The findings has been consistent with previous studies on positive relationship of SCI with SCP (Feng et al., 2017; Charterina et al., 2016), LGF (Khalaf and Mohadem, 2019; Chaudhuri et al., 2018), and SCC (Chou, et al., 2018; Wu, 2018), including the positive effects of SCC (Yunus, 2018; Doganay and Ergun, 2017) and LGF (Yu et al., 2018; Muntaka et al., 2017) on SCP. Moreover, these was in line with the past research on the impact of LGF on SCC (Ma et al., 2018; Yu et al., 2017).

For that reason, it is proved that SCC and LGF is one of the important instruments to enhance SCP through SCI. Consequently, auto-parts manufacturers should develop a good

SCC and LGF strategies. Moreover, the Thailand government sectors, such as Department of Primary industries and Mines, Department of Industry Promotion etc. could use the results of this study as the guidelines for holding logistics and supply chain management training programs, giving firms the depth advices in terms of logistics and supply chain management, and developing SCP indicators and measurement system. For future work, The results of this study will benefit educational job by encompassing validations and information in increasing SCP influenced by SCC, LGF, and SCI in other industries, including others developing countries that have similar characteristics with Thailand. Furthermore, other variables that might increase SCP should be studied, such as cultural intelligence, as conceptualized by (Aunyawong et al., 2018).

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