

THE EFFECTS OF SCM DRIVERS ON SCM FACILITATORS AND SCM PRACTICES: A STUDY OF THAI SMES

Therakorn Yardpaga¹, Phil Megicks², Paul Jones²

¹Sripatum Business School, Sripatum University, Bangkok, Thailand

²School of Management, University of Plymouth, Drake Circus, Plymouth, PL4 8AA

Contact email: therakorn.ya@spu.ac.th

Introduction

Firm today aims to deliver their products and services to their end-customer with new and more effective processes through the concept of supply chain management (SCM) (Poirier and Reiter, 1996). The SCM study includes the management of inter-organisational operations (Chen and Paulraj, 2004) and supply chain alignment (Wong et al., 2012), the process integration in supply chain (Yu et al., 2013), the partnership model (Lambert et al., 2004) and the information sharing (Lee and Whang, 2000, Li et al., 2006). The SCM study has been of substantial importance since mid 1980s (Cooper et al., 1997) and has recently become a topic of increasing interest to practitioners and academic researchers (Ardalan and Ardalan, 2009). While a lot of research on SCM has focused generally on larger firms or from larger organisations' perspective, this paper focuses on SCM in the context of Small and Medium Enterprises (SMEs).

SMEs are generally acknowledged as the elemental format for industrial and commercial development in most countries (Carson et al., 1995). Thai SMEs create jobs and contributes to Thailand's economic growth and enhances country's rural development (Thailand Business News, 2010). SMEs have realised that good SCM strategies are vital in order to compete under current complex and aggressive business environment to provide quality, time and cost advantages products and services (Thakkar et al., 2008).

The objective of this study is to identify, classify and prioritise key SCM drivers and SCM facilitators that supply chain practitioners must leverage to gain the benefits of SCM practices. Dittmann (2013) discussed the importance of SCM practices as a source of competitive advantage. For this advantage to be realised, firms must be properly organised and include SCM as part of the total business planning process. Therefore, the study also aimed to reveal the alignment and relationship among these SCM drivers, facilitators and practices. Having identified some of the supply chain challenges facing SMEs in Thailand, the research could define some supply chain strategies that the government and its agencies responsible for SMEs, and SMEs themselves may adopt. Such an understanding of SCM practices should be delivered through an establishment standard for the success and sustainability of SMEs in Thailand. The result of the study can be adapted to other developing countries.

Literature reviews

The literature supporting reasons of SCM implementation in SMEs may be classified as SCM drivers and SCM facilitators (Yardpaga et al., 2013). They may be termed SCM antecedents (Mentzer et al., 2001). As SCM may be implemented in different practices and have different impacts on firms' performance (Mentzer et al., 2001), this section will also review the literature related to SCM practices and its antecedents. In order to better understand the phenomenon, not only the relationships were explained but how the SCM drivers exerted it effect on SCM practices. Therefore, the mediation concept is also reviewed.

SCM practices and its antecedents

SCM drivers are strategic factors that help to determine an appropriate level of supply chain management practices. While SCM facilitators can be ideas, tools, actors and organisations that usually enhance supply chain implementation. For example, Mentzer et al. (2000) use the term "enablers" as the same meaning of facilitators, which include people, organisation and technology that

move SCM forward. (Mentzer et al., 2000, Mentzer et al., 2001, Bayraktar et al., 2009, Goh and Pinaikul, 1998, Fawcett et al., 2008, Fawcett et al., 2009, Tan et al., 2006).

SCM practices is a set of effective activities across the supply chain network. Cooper et al., (1997) explains framework of SCM that consists of business processes, management components and the structure of the supply chain. Process approach is the focus of every activity to meet customer's requirements. SCM practices, which embrace process approach, are integrating process across functions to produce a specific output for a particular customer or market. The Global Supply Chain Forum (GSCF) develops a process-based supply chain management framework, such as

- Customer relationship management
- Supplier relationship management
- Manufacturing flow management
- Product development and Commercialisation (Cooper et al., 1997)

In each process, this study will examine the supply chain flows including material flow, information flow and resources flow (Mangan et al., 2008).

Mediation analysis

Mediators are the intervening variables that are located causally between a predictor and a criterion (Baron and Kenny, 1986). Frazier et al. (2004) cited that mediators demonstrate “why” or “how” one variable predicts or induces an outcome variable. More specifically, a mediator is defined as a variable that explains the relationship between a predictor and a criterion. For example, Vickery et al. (2003) studied the top 150 independent first tier automotive suppliers to the big-three in North America and argued that the customer service was mediate the relationship between supply chain integration and firm performance.

Research methodology

To achieve the research objectives, i.e. developing SCM practices for Thai SMEs, the following research methods have been used. Firstly, literature reviews of both antecedents and consequences constructs that related to supply chain management practices is to be examined. Then, an empirical study of SCM implementation by using semi-structured interview has been conducted. The semi-structured interview has been widely adopted with deductive approach, as it is considered as the favoured strategy in business and management research (Saunders et al., 2007). An interview guide is prepared in order to confirm that the information obtained from experts are identical. The interviews are conducted with both SMEs and large firms in the same supply chain to verify SCM practices along the supply chain network. Resulting from the interview, mapping the practices and literatures has been framed as SCM practices for Thai SMEs with construct as in Figure 1

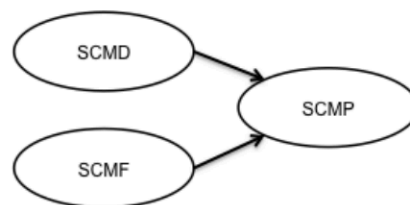


Figure 1 Relationship of SCM drivers and SCM facilitators to SCM practices

The methods used to investigate logistics and supply chain management were normally quantitative (Gammelgaard, 2004). This research employed mixed methods, integrating qualitative and quantitative research. The methodology entailed obtaining information directly from a group of individuals (Dane, 1990).

The purposive sampling was applied to this study because the researcher had a clear idea of the sample units needed (Saunders et al., 2007). Samples were selected from the members of The Federation of Thai Industries (FTI). The researcher selected only firms that fit the criteria of small and

medium size firms' definition, which have been classified by the number of full time employees. According to the definition of SMEs from The Federation of Thai Industries (FTI), the size for small business (S) is typically 50 or fewer employees, the size for medium business (M) is 51 to 200 employees and more than 200 employees will be classified as large business (L).

After four weeks of sending out the questionnaires, we got 129 responding answered questionnaires. Then we sent out two waves of reminding letters in the following months at four weeks interval. Finally, the survey produced 311 valid responses, resulting in a response rate of 11.5 per cent. This response rate was comparable to the previous study of SMEs in Thailand context, supply chain management – SMEs approach (Udomlearprasert et al., 2003) and provided adequate data for further analysis.

The nonresponse bias was examined by testing for statistically significant difference between early and late responses. The questionnaires returned after the last remind were considered the proxy for non respondents, while the early returned questionnaires were appraised as proxy for respondents (Arend and Wisner, 2005). The statistical *t* tests based on two groups showed non-significant results for the means of independents and dependents variable. The characteristics of respondents and their businesses are summarised and presented in table 1.

Demographic characteristics	Number of firms	Percentage
Number of year in operation		
• Less than 5 years	94	30.2%
• 5 to 10 years	104	33.5%
• More than 10 years	113	36.3%
Number of employee		
• Micro (Less than 25)	95	30.5%
• Small (25 to 50)	71	22.9%
• Medium (51 to 200)	145	46.6%
Total	311	100.0%

Table 1: Characteristics of respondents and their length in business operated

Findings

To confirm the effects of SCM drivers on SCM facilitators and SCM practices, the mediating relationship is explored according to Baron and Kenny's *casual steps strategy* (Preacher and Hayes, 2008). A mediating relationship happens when some variable influences the relationship between two other variables (Howell, 2002). According to our interviews, higher perception of SCM drivers leads firms to increase their SCM facilitators so as to gain a higher level of SCM practices. It was also explained in the interviews that SCM facilitators mediate the relationship between SCM drivers and SCM practices. The path diagram of the relationship, depicting a causal chain, is shown in Figure 6-1. This model shows two causal paths feeding into the outcome variable (SCMP): the direct impact of the independent variable (Path *c*) and the impact of the mediator (Path *b*). There is also a path from the independent variable to the mediator (Path *a*)

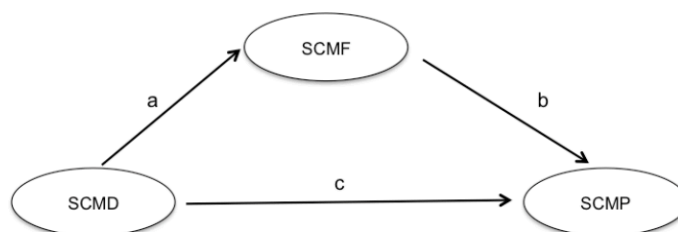


Figure 2: Mediator relationship path diagram

SCMF functions as a mediator when it satisfies the following criteria (Baron and Kenny, 1986):

- (a) variations in the level of SCMD significantly accounts for variations in SCMF;
- (b) variations in SCMF significantly account for variations in SCMP;

(c) when Path a and b are controlled, a previously significant relation between SCMD and SCMP is no longer significant, with the strongest demonstration of mediation occurring when Path c is zero. Furthermore, when Path c is reduced to zero, it can be concluded that a model has a single, dominant mediator. However, the most likely occurrence is that Path c is not zero but instead becomes weaker but still significant.

To satisfy these initial conditions of Baron and Kenny, Table 3 shows simple correlations among SCMD, SCMF and SCMP. The results demonstrate that SCMD is correlated with SCMF and with SCMP, and SCMF is also correlated with SCMP. These relationships satisfy Baron and Kenny's basic prerequisites. The next step is to use both SCMD and SCMF as predictors of SCMP. This is shown in Table 2

Correlations			
	SCMD	SCMF	SCMP
SCMD	1	0.715**	0.462**
SCMF	0.715**	1	0.450**
SCMP	0.462**	0.450**	1

Table 2: Correlations among variables
Note: ** Correlation is significant at the 0.01 level (2-tailed).

Coefficients						
Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	0.873	0.3		2.906	0.004
	SCMD	0.657	0.072	0.462	9.146	0.000
	(Constant)	0.494	0.315		1.569	0.118
2	SCMD	0.406	0.101	0.286	4.026	0.000
	SCMF	0.345	0.099	0.246	3.472	0.001

Table 3: SCMP coefficients
Note: Dependent Variable: SCMP

In this situation the direct path from SCMD to SCMP remains significant, and the mediating path from the independent variable to the mediator to the dependent variable has to be tested for significance. The regression coefficients and their standard errors for the paths in the mediating chain are shown in Table 4.

Path a			Path b		
SCMD	→	SCMF	SCMF	→	SCMP
β_a		0.7262	β_b		0.3449
S_a		0.0404	S_b		0.0993
t		17.9761**	t		3.4721**

Table 4: Regression coefficients and standard errors for the two parts of the mediating path
Note: ** Significant at the 0.01 level (2-tailed).

The regression coefficient for the path SCMD → SCMF → SCMP is equal to $\beta_a \times \beta_b$, where a and b refer to the relevant paths. (Path c is the direct path from SCMD to SCMP.) The standard error of this two-part path (Howell, 2002) is given by

$$S_{\beta_a\beta_b} = \sqrt{\beta_a^2 S_b^2 + \beta_b^2 S_a^2 - S_a^2 S_b^2}$$

where β_a and β_b are the paths, and S_a and S_b are the corresponding standard errors of the standardised regression coefficients for those paths. The standard error of the combined path is calculated as:

$$S_{\beta_a\beta_b} = \sqrt{\beta_a^2 S_b^2 + \beta_b^2 S_a^2 - S_a^2 S_b^2}$$

$$\begin{aligned}
&= \sqrt{0.7262^2(0.0993^2) + 0.3449^2(0.0404^2) - (0.0404^2)(0.0993^2)} \\
&= \sqrt{0.0054} \\
&= 0.0733
\end{aligned}$$

The path *c* coefficient is calculated by multiplying the beta values of path *a* and path *b* (0.7262 X 0.3449 = 0.2505). Dividing by its standard error (0.0733) gives the *t* ratio:

$$t = \frac{\beta_a \beta_b}{S_{\beta_a \beta_b}} = \frac{0.2505}{0.0733} = 3.42$$

According to Sobel (1982), this *t* value is asymptotically normally distributed for large samples, and would lead to the rejection of the null hypothesis at $\alpha = 0.05$ when the value exceeds ± 1.96 . In this study the path is clearly significant as confirmed by our interview findings. Therefore, it can be concluded that there is a convincing evidence of a strong mediating pathway from SCMD through SCMF to SCMP.

Conclusions

The research applied the *causal steps strategy*, familiarized by Baron and Kenny (1986), in which the researcher estimated the paths of the model using ordinary least square regression and determined the degree to which several conditions were met. The results of the study revealed that there was a convincing evidence of a strong mediating pathway from the SCM drivers through the SCM facilitators to the SCM practices. This urged researchers to be more sensitive to the statistical data analysis technique used (Hayes, 2013). It contributed to conceptual clarity in summarising empirical study.

The study examined causal relationship of supply chain management practices in Thai SMEs context. The model was developed from literature review and confirmed by supply chain executive experts through interviews. In general, data from self-responded questionnaire survey provided empirical evidence supporting the causal model. This study appears to confirm that the antecedents of SCM, which include SCM drivers and SCM facilitators, have a significant relationship to SCM practice for Thai SMEs. This research attempted to enhance the understanding of how Thai SMEs perceived with supply chain management.

This study, like others, has limitation. The list of members of The Federation of Thai Industries (FTI) was used as representative of Thai SMEs; thus, the results are generalizable only to the extent that FTI members resemble the population of Thai SMEs. The response rate was also somewhat low; however given the subject matter and complexity, this is reckoned acceptable. Another limitation of this study is the use of respondents from various industries. It should be accepted that different supply chain environment in each industry could impact the respondent's answer to the questionnaires. The focus research from particular industry may solve this issue but it makes the results less generalizable.

The extension of this study can be conducted by doing sample case analysis within Thai SMEs to achieve higher understanding of how supply chain management practices are implemented, which exact SCM drivers and SCM facilitators are involved by these SCM practices, and what are the performance outcomes from them.

Reference:

- ARDALAN, A. & ARDALAN, R. 2009. A data structure for supply chain management systems. *Industrial Management & Data Systems*, 109, 138-150.
- AREND, R. J. & WISNER, J. D. 2005. Small business and supply chain management: is there a fit? *Journal of Business Venturing*, 20, 403-436.
- BARON, R. M. & KENNY, D. A. 1986. The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistics considerations. *Journal of Personality and Social Psychology*, 51, 1173-1182.

- BAYRAKTAR, E., DEMIRBAG, M., KOH, S. C. L., TATOGLU, E. & ZAIM, H. 2009. A casual analysis of the impact of information systems and supply chain management practices on operational performance: evidence from manufacturing SMEs in Turkey. *International Journal of Production Economics*, 122, 133-149.
- CARSON, D., CROMIE, S., MCGOWAN, P. & HILL, J. 1995. *Marketing and entrepreneurship in SMEs: an innovative approach*, London, Prentice Hall.
- CHEN, I. J. & PAULRAJ, A. 2004. Toward a theory of supply chain management: the constructs and measurement. *Journal of Operations Management*, 22, 119-150.
- COOPER, M. C., LAMBERT, D. M. & PAGH, J. D. 1997. Supply chain management: more than a new name for logistics. *The International Journal of Logistics Management*, 8, 1-14.
- DANE, F. C. 1990. *Research methods*, Pacific Grove, California, Brooks/Cole Pub. Co.
- DITTMANN, J. P. 2013. *Supply chain transformation : building and executing an integrated supply chain strategy*, New York, McGraw-Hill.
- FAWCETT, S. E., ALLRED, C., MAGNAN, G. M. & OGDEN, J. 2009. Benchmarking the viability of SCM for enterpreneurial business model design. *Benchmarking: An International Journal*, 16, 5-29.
- FAWCETT, S. E., MAGNAN, G. M. & MCCARTER, M. W. 2008. Benefits, barriers, and bridges to effective supply chain management. *Supply Chain Management: An International Journal*, 13, 35-48.
- FRAZIER, P. A., TIX, A. P. & BARRON, K. E. 2004. Testing moderator and mediator effects in counseling psychology research. *Journal of counseling psychology*, 51, 115-134.
- GAMMELGAARD, B. 2004. Schools in logistics research?: a methodological framework for analysis of the discipline. *International Journal of Physical Distribution & Logistics Management*, 34, 479-491.
- GOH, M. & PINAIKUL, P. 1998. Logistics management practices and development in Thailand. *Logistics Information Management*, 11, 359-369.
- HAYES, A. F. 2013. *Introduction to mediation, moderation, and conditional process analysis: a regression-based approach*, New York, Guilford Publications, Inc.
- HOWELL, D. C. 2002. *Statistical methods for psychology*, Pacific Grove, California, Thomson Learning, Inc.
- LAMBERT, D. M., KNEMEYER, A. M. & GARDNER, J. T. 2004. Supply chain partnerships: model validation and implementation. *Journal of Business Logistics*, 25, 21-42.
- LEE, H. L. & WHANG, S. 2000. Information sharing in a supply chain. *International Journal of Manufacturing Technology and Management*, 1, 79-93.
- LI, S., RAGU-NATHAN, B., RAGU-NATHAN, T. S. & SUBBA RAO, S. 2006. The impact of supply chain management practices on competitive advantage and organizational performance. *Omega*, 34, 107-124.
- MANGAN, J., LALWANI, C. & BUTCHER, T. 2008. *Global logistics and supply chain management*, Chichester, England, John Wiley & Sons Ltd.
- MENTZER, J. T., DEWITT, W. J., KEEBLER, J. S., MIN, S., NIX, N. W., SMITH, C. D. & ZACHARIA, Z. G. 2001. What is supply chain management? In: MENTZER, J. T. (ed.) *Supply chain management*. Thousand Oaks, California: Sage Publications, Inc.
- MENTZER, J. T., FOGGIN, J. H. & GOLICIC, S. L. 2000. Collaboration: The enablers, impedements and benefit. *Supply Chain Management Review*, 4, 52-58.
- POIRIER, C. C. & REITER, S. E. 1996. *Supply chain optimization : building the strongest total business network*, San Francisco, Berrett-Koehler Publishers.
- PREACHER, K. J. & HAYES, A. F. 2008. Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods*, 40, 879-891.
- SAUNDERS, M., LEWIS, P. & THORNHILL, A. 2007. *Research methods for business students*, Harlow, England, Pearson Education Limited.
- SOBEL, M. E. 1982. Asymptotic confidence intervals for indirect effects in structural equation models. *Sociological Methodology*, 13, 290-312.
- TAN, E. N., SMITH, G. & SAAD, M. 2006. Managing the global supply chain: a SME perspective. *Production Planning & Control*, 17, 238-246.
- THAILAND BUSINESS NEWS. 2010. Small and medium enterprises are making up 99.7% of Thai companies. *Thailand Business News*, 14 Apr. 2010.

- THAKKAR, J., KANDA, A. & DESHMUKH, S. G. 2008. A conceptual role interaction model for supply chain management in SMEs. *Journal of Small Business and Enterprise Development*, 15, 74-95.
- UDOMLEARTPRASERT, P., JUNGTHIRAPANICH, C. & SOMMECHAI, C. Supply chain management - SME approach. Engineering Management Conference, 2003. IEMC'03. Managing Technologically Driven Organizations: The Human Side of Innovation and Change, 2003. IEEE, 345-349.
- VICKERY, S. K., JAYARAM, J., DROGE, C. & CALANTONE, R. 2003. The effects of an integrative supply chain strategy on customer service and financial performance: an analysis of direct versus indirect relationships. *Journal of operations management*, 21, 523-539.
- WONG, C., SKIPWORTH, H., GODSELL, J. & ACHIMUGU, N. 2012. Towards a theory of supply chain alignment enablers: a systematic literature review. *Supply Chain Management: An International Journal*, 17, 419-437.
- YARDPAGA, T., MEGICKS, P. & SONG, D. 2013. A structural equation model of supply chain management practices: finding from Thai SMEs. *Logistic Research Network Annual Conference 2013*. Aston University, Birmingham, United Kingdom.
- YU, W., JACOBS, M. A., SALISBURY, W. D. & ENNS, H. 2013. The effects of supply chain integration on customer satisfaction and financial performance: An organizational learning perspective. *International Journal of Production Economics*, 146, 346-358.