

## การพัฒนาแบบจำลองความสัมพันธ์เชิงสาเหตุของปัจจัยที่มีอิทธิพลต่อความร่วมมือห่วงโซ่อุปทานของวิสาหกิจขนาดกลางและขนาดย่อมไทย

### DEVELOP A CAUSAL RELATIONSHIP MODEL OF FACTORS AFFECTING SUPPLY CHAIN COLLABORATION IN THAI SMES

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#### บทคัดย่อ

การวิจัยครั้งนี้มีวัตถุประสงค์ คือ 1) เพื่อกำหนดปัจจัยสำคัญที่มีผลต่อความร่วมมือห่วงโซ่อุปทานของวิสาหกิจขนาดกลางและขนาดย่อมไทย และ 2) เพื่อทดสอบความสัมพันธ์เชิงสาเหตุในรูปแบบสมการเชิงโครงสร้างของความร่วมมือห่วงโซ่อุปทานของวิสาหกิจขนาดกลางและขนาดย่อมไทย โดยใช้หน่วยการวิเคราะห์ระดับองค์การ และแบ่งระเบียบวิธีวิจัยออกเป็น 3 ขั้นตอน คือ (1) การทบทวนวรรณกรรมเพื่อสังเคราะห์ผลการวิจัยที่ผ่านมาและกำหนดคำถามที่ใช้ในการสัมภาษณ์ (2) การศึกษาเชิงคุณภาพโดยการสัมภาษณ์เชิงลึกกับผู้ประกอบการวิสาหกิจขนาดกลางและขนาดย่อมชั้นนำในประเทศไทย จำนวน 48 คน ที่ได้รับการคัดเลือกโดยการสุ่มตัวอย่างแบบเจาะจงและนำเสนอกรอบแนวคิดงานวิจัยโดยใช้ซอฟต์แวร์เชิงคุณภาพโปรแกรม ATLAS.ti 8.0 (3) การศึกษาเชิงปริมาณของแบบจำลองโดยใช้การสำรวจกับผู้ประกอบการวิสาหกิจขนาดกลางและขนาดย่อมทั่วประเทศไทยโดยการพัฒนาแบบสอบถาม และดำเนินการส่งให้กับผู้ประกอบการวิสาหกิจขนาดกลางและขนาดย่อม ผู้วิจัยได้รับแบบสอบถามกลับ จำนวน 309 ชุด มีอัตราการตอบกลับอยู่ที่ร้อยละ 59.43 โดยผู้วิจัยใช้เทคนิคการวิเคราะห์เส้นทางเพื่อวิเคราะห์ข้อมูลเชิงปริมาณ

จากการสัมภาษณ์เชิงลึกพบว่า มี 2 ปัจจัยที่เกี่ยวข้องกับความร่วมมือห่วงโซ่อุปทาน คือ 1) ปัจจัยภายนอก เช่น การสนับสนุนจากภายนอก การแข่งขันในตลาด และความมุ่งมั่น และ 2) ปัจจัยภายใน เช่น การสนับสนุนจากฝ่ายบริหาร การจัดการสินค้าคงคลัง สมรรถนะ และความไว้วางใจ ส่วนการวิจัยเชิงปริมาณแสดงผลการศึกษาที่มีอิทธิพลต่อความร่วมมือห่วงโซ่อุปทานของวิสาหกิจขนาดกลางและขนาดย่อมไทย ประกอบด้วยอิทธิพลทางตรง มี 2 ตัวแปร คือ 1) การจัดการสินค้าคงคลัง และ 2) ความมุ่งมั่น ส่วนอิทธิพลทางอ้อม มี 4 ตัวแปร คือ 1) การแข่งขันในตลาด 2) การสนับสนุนจากฝ่ายบริหาร 3) การสนับสนุนจากภายนอก และ 4) ความไว้วางใจ โดยแบบจำลองความสัมพันธ์เชิงสาเหตุของปัจจัยที่มีอิทธิพลต่อความร่วมมือห่วงโซ่อุปทาน

ของวิสาหกิจขนาดกลางและขนาดย่อมไทยสอดคล้องกับข้อมูลเชิงประจักษ์ และตัวแปรเหล่านี้สามารถอธิบายความแปรปรวนของความร่วมมือห่วงโซ่อุปทานของวิสาหกิจขนาดกลางและขนาดย่อมไทยได้ที่ร้อยละ 28

**คำสำคัญ:** ความร่วมมือห่วงโซ่อุปทาน วิสาหกิจขนาดกลางและขนาดย่อมไทย การพัฒนาแบบจำลองความสัมพันธ์เชิงสาเหตุ

### **Abstract**

The objectives of the study were 1) to determine the critical factors that affect supply chain collaboration for SMEs in Thailand, and 2) to test the causal relations in a structural equation model for the supply chain collaboration framework. The unit of analysis was at the organizational level. The methodology was divided into 3 steps: (1) A literature review was undertaken to synthesize past findings and determine the interview questions for exploration; (2) qualitative study using in-depth interviewing with 48 leading SMEs in Thailand who were selected by purposive sampling and then presenting the proposed research model by using the qualitative software, ATLAS.ti 8.0 program; (3) quantitative study which tested the generalization of the model using a survey with entrepreneurs in SMEs all over Thailand. The questionnaire was constructed and mailed to SME entrepreneurs. The response of SME entrepreneurs was from 309 SMEs, and the response rate was 59.43%. The path analysis technique was intentionally used to analyze these complicated data.

The in-depth interviews revealed that 2 factor groups were related to supply chain collaboration: 1) external factors: external support, market competition, and commitment; and 2) internal factors: management support, inventory management, capability, and trust. For quantitative research, the results were practical models for Thai SMEs. The critical factors that directly influenced the supply chain collaboration in the Thai SMEs were composed of 2 independent variables: 1) inventory management; and 2) commitment. The factors that indirectly influenced the supply chain collaboration in the Thai SMEs were composed of 4 independent variables: 1) market competition; 2) management support; 3) external support and 4) trust. Finally, the causal model of factors affecting supply chain collaboration in Thai SMEs fit the empirical data. These variables could describe the variability of supply chain collaboration in Thai SMEs at 28.0 percent.

**Keywords:** Supply Chain Collaboration, Thai SMEs, Develop a Causal Relationship Model

### **Introduction**

Nowadays, the private sector is confronting incremental cost burdens and SMEs are facing a difficult time serving high-quality product and service at affordable and reasonable costs. The focus of the SMEs sector has shifted from managing procurement to managing relationships. SMEs are intensively

under the limitation of service costs and the pressure of high-standard quality of product. While other sectors have coped with these pressures by engaging value co-creation through purchasing and supply chain management, the SMEs have slowly adopted this concept. Some researchers support the notion that this slow adoption comes from the context of SME's unique operation. At the same time, the general views on value co-creation are focusing more intently on collaborations attempting information and specialized competency sharing among partners working throughout the supply chain network [1].

Organizations which operate within an “open system” structure must regularly interact with and continually adapt to changes in their environment in order to remain competitive. This is especially so for small and medium enterprises (SMEs), which are important mechanisms for strengthening economic progress by generating revenue for the country. They are also a major source of employment, which makes them a mechanism for poverty-solving. In 2012, there were 2,781,945 enterprises in Thailand. 98.50% of these were SMEs. These SMEs employed 80.40% of the total workforce, produced 37.00% of total gross domestic product (GDP) and accounted for 28.82% of total export value. It can be seen that SMEs play an extremely important role in the economic, social and cultural development of the country [2].

In addition to the competitive pressures resulting from Globalization, there are a number of other threats which can increase the operating risk of SMEs. These include political, economic, social, environmental, and transport risks. Over the period 2008 – 2011, the proportion of Thailand's GDP arising from SMEs constantly decreased (from 38.10% in 2008 to 37.80%, 37.10% and 36.60% respectively). The main causes of this were the economic crisis in 2008 and internal political conflict, which had a direct impact on orders from the main buyer countries [2].

Supply chain collaboration are more flexible, adaptable and timely, resulting in efficient operation and leading to competitive advantage [3]. Becoming a supply chain collaboration is considered to be an important factor in enabling an organization to achieve its goals. Michael E. Porter believes that if a SME is able to increase its productivity, it will be in a position of supply chain collaboration. And if many enterprises in the same industry have increased productivity, that industry will be in a position of supply chain collaboration. And if many industries in a country have increased productivity, it will contribute to raise the overall competitiveness of the country.

Although there have been several studies that have examined supply chain collaboration in many Thai manufacturing and service businesses, the supply chain collaboration in Thai SMEs has not been examined yet. High-performing supply chain collaboration is critical to an organization's success in the face of rising cost pressures and more expectations for elevating the quality of product and service. Therefore, it was considered a significant aspect of this study to determine the critical factors affecting the supply chain collaboration in the context of Thai SMEs and their direct and indirect causal relationships.

## **Objectives**

The research objective details are as follows.

1. To determine the critical factors that affect supply chain collaboration for SMEs in Thailand.
2. To test the causal relations in a structural equation model for the supply chain collaboration framework.

## **Methods**

### **Research Design**

In this study, the researcher employed the exploratory sequential method for the research design, beginning with the qualitative research technique and then followed by ATLAS.ti program based on the interview in order to gather the necessary information that would be used to answer the research questions. This study was carefully conducted by collecting the qualitative data sequentially, which means that qualitative data collection techniques and analysis procedures were used in a sequential period of time. The results of the qualitative data analysis helped to explain the phenomena of the results and enhanced the concepts and conclusion of the results. The qualitative methodology consisted of the data collection by using a semi-structured interview technique with SME Entrepreneurs of Thai SMEs in order to study the phenomenon and to apply the collected data to describing and confirming the results. Using the in-depth interview technique, the data were collected from a sample of SMEs by face-to-face and telephone interview.

For this study, the quantitative research methodology was also very important. Only quantitative data could provide the pattern and level of relationship among the variables, and the results might due to particular circumstances. For collecting the data from the large sample, a survey questionnaire was developed from the related concepts, theories, and studies in order to gather reliable and valid evidence of the relationships that could be generalized to Thai SMEs. Thus, SME entrepreneurs were considered good participants for the data collection, which could be generalized at the organizational level. All of the obtained data were processed, analyzed, and synthesized to describe and examine the relationships between the dependent variable and independent variables. According to the results, a final research model of the relationship between the main factors affecting supply chain collaboration in Thai SMEs were developed.

### **Population and Sample Selection**

Qualitative Method: The purposive sampling method was used in this study. The key informants in the qualitative research were the best practice SMEs which received the SME national awards from the office of small and medium enterprise promotions, Thailand. The criteria used for selecting the key informants were that they were one of the SME entrepreneurs that were willing to answer the questions, willing to share their opinions, were involved in the SME procurement process and had direct experience

coordinating or working with suppliers. Moreover, for obtaining more important information, the purposive sampling technique was also used in this study where existing study subjects recruit further subjects from among their supervisors, peers, and subordinates. Eventually, the researcher interviewed forty-eight SME entrepreneurs.

Quantitative Method: The population size (N) consisted of a total of 1,348 SMEs with operational excellence mentioned by the Ministry of Commerce. The studied sample was collected by stratified random sampling method and the unit of analysis was at the organization level (the SME). From calculation, sample size of 309 SMEs calculated using the Taro Yamane formula conformed to the recommendation on determining the number of sample units to be used in analyzing data with the structural equation model. In order to avoid the issue of a low response rate, which often occurs in data collection through a mailed survey questionnaire, the survey questionnaires were distributed to Thai SMEs by using purposive sampling. These SMEs were purposive sampling according to the income of SMEs so that the sample could be a good representative of the target population in Thai SMEs.

#### **Data Analysis**

Qualitative Method: The researcher used the triangulation technique to examine the validation and reliability of the raw data [4]. Triangulation was conducted to collect the raw data and to gather the information by using in-depth interviews. Data triangulation was also used by considering the different sources of raw data, including places which are SMEs, and the key informants that were SME Entrepreneurs, and these were compared as to whether the collected data were the same or different. From the in-depth interviews, the raw data collected with SME Entrepreneurs. This was to indicate the consistency and linkage between the evidence and the data responding to the research questions collected from the data analysis concerning whether they were reasonable and acceptable or not.

Before analyzing the data, the researcher managed the data by transcribing each interview and then saved it as computer files, and put all data in a folder and also copied the hard copy to back up the data. For the data analysis, the researcher used the ATLAS.ti program [5], which started with data coding and then moved to the initial coding. In the ATLAS.ti program, it is called open coding, following by family coding and, finally, the researcher developed the themes. Moreover, the researcher extracted written codes and data, and then moved upward to the theoretical categories, and kept writing memos by using mind mapping throughout the research process.

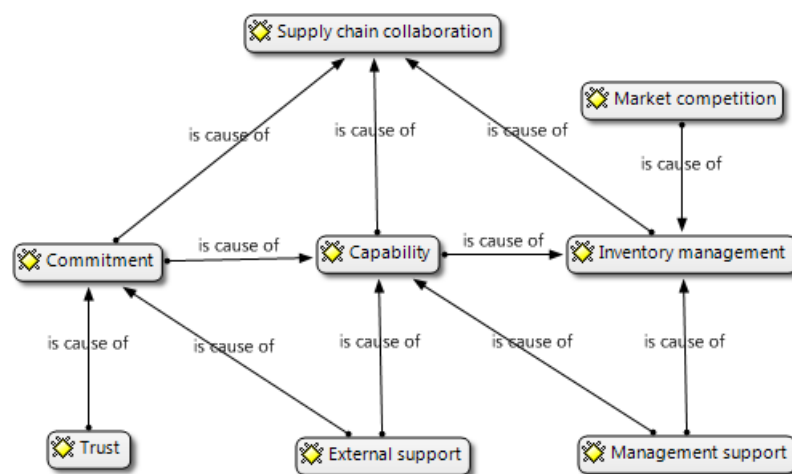
Quantitative Method: The researcher tested the path analysis to study the relationship among the variables. The validation and reliability of the independent variables in relation to the dependent variables were examined. The analysis of the relationship between the variables was in the structural equation model. This was to investigate the direct and indirect impact of the variables, whether they were consistent with the empirical data or not. The empirical data on Thai SMEs were separately analyzed. The structural model denoted the relationship of the variables in the form of a regression equation among the independent and dependent variables. The regression coefficient of the structural equation should be higher than 0.50

## Results

The transcripts used in this study were imported into ATLAS.ti. After repeated reading and examining of the transcripts, 452 relevant quotations were identified. Within these quotations, 382 provisional codes were identified and classified into 298 code families. Through further abstraction, 202 code families were categorized into 8 core categories. The model comprises 8 core categories: supply chain collaboration, external support, market competition, commitment, management support, inventory management, capability, and trust. The bracketed number indicates the number of times the code appears in the provisional codes.

When comparing the supply chain collaboration model with the empirical findings in this research, most of the category identified in this study relate to existing theories of supply chain collaboration in Thai SMEs. However, several new types of concepts were identified to expand and modify existing models.

However, when drawing up and connecting these themes together, the researcher found that there are common properties of the supply chain collaboration model. There are the representations and reflection of supply chain collaboration in Thai SMEs; creation of credibility and reliability; and the need for accumulated acceptance or extra effort to achieve trust. In addition, there were strong relationships between category and category that emerged, as illustrated in figure 1.



**Figure 1** Develop a Causal Relationship Model of Factors Affecting Supply Chain Collaboration in Thai SMEs.

**Source:** Generated by the researcher.

The sample data were used to analyze the qualitative techniques by ATLAS.ti program. The relationship among the factors was investigated and tested. Once all of the factors were proved, it was found that there were seven relationships that showed an effect: 1) commitment, capability, and

inventory management had a significant impact on supply chain collaboration; 2) market competition had a significant impact on inventory management; 3) commitment had a significant impact on capability; 4) market competition had a significant impact on inventory management; 5) management support had a significant impact on inventory management and capability; 6) external support had a significant impact on capability and commitment; 7) trust had a significant impact on commitment. In summary, there were three factors such as commitment, capability, and inventory management that had a direct effect on supply chain collaboration. All of the causal factors could describe supply chain collaboration in Thai SMEs. Finally, ATLAS.ti program is a particularly important way to increase the strength of the research findings.

After that, the researcher tested the path analysis to study the relationship among the variables. The validation and reliability of the independent variables in relation to the dependent variables were examined. The analysis of the relationship between the variables was in the structural equation model. This was to investigate the direct and indirect impact of the variables, whether they were consistent with the empirical data. This section explains the coefficient of determination ( $R^2$ ) of the independent variables in relation to the dependent variable in each structural equation. The details of each path analysis are shown as follows:

(1) Supply chain collaboration: it was found that there were only 2 independent variable - 1) inventory management; and 2) commitment - that had a positive impact on supply chain collaboration. These variables could describe the variability of supply chain collaboration in Thai SMEs at 28.0 percent ( $R^2 = .280$ ). The standardized coefficients of these variables were .127 at 4.2% level of significance and .436 at less than 0.01% level of significance, respectively. In this structural equation, there was no independent variable that was at over than 5.0% level of significance.

$$SCCSMEs = .127(INM) + .436(COM)$$

(2) Inventory management: it was found that all 3 independent variables - 1) market competition; 2) management support; and 3) capability - had a positive impact on inventory management. These variables could describe the variability of inventory management in Thai SMEs at 46.7 percent ( $R^2 = .467$ ). The standardized coefficients of these variables were .151 at 4.2% level of significance, .349 at less than 0.01% level of significance, and .368 at less than 0.01% level of significance, respectively. In this structural equation, there was no independent variable that was at over than 5.0% level of significance.

$$INMSMEs = .151(MAC) + .349(COM) + .368(MAS)$$

(3) Capability: it was found that all 3 independent variables - 1) management support; 2) external support; and 3) commitment - had a positive impact on capability. These variables could describe the variability of capability in Thai SMEs at 37.8 percent ( $R^2 = .378$ ). The standardized coefficients of these variables were .614 at 0.01% level of significance, .195 at 1.2% level of significance, and .251 at less than

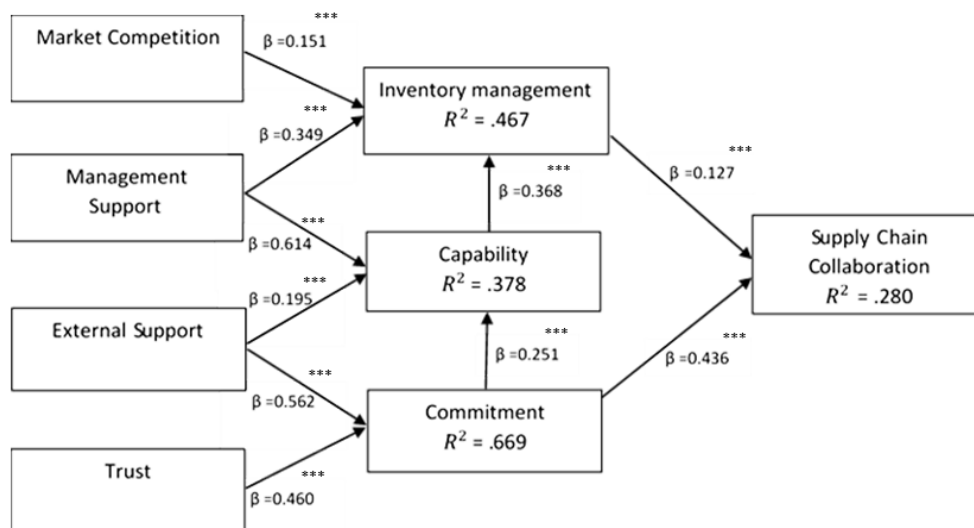
0.01% level of significance, respectively. In this structural equation, there was no independent variable that was at over than 5.0% level of significance.

$$\text{CAPSMEs} = .614(\text{MAS}) + .195(\text{COM}) + .251(\text{CAP})$$

(4) Commitment: it was found that all 2 independent variables - 1) external support; and 2) trust that had a positive impact on commitment. This variable could describe the variability of commitment in Thai SMEs at 66.9 percent ( $R^2 = .669$ ). The standardized coefficient of this variable was .562 at less than 0.01% and .460 at less than 0.01% level of significance, respectively. In this structural equation, there was no independent variable that was at over than 5.0% level of significance.

$$\text{COMSMEs} = .562(\text{EXS}) + .460(\text{TRU})$$

The final model for supply chain collaboration in Thai SMEs is illustrated in figure 2.



**Figure 2** The final model for supply chain collaboration in Thai SMEs.

**Note:** The significant level of the coefficient in the model with \*\*\* $p \leq 0.01$ , \*\* $p \leq 0.05$ ,  $p \leq 0.10$  respectively.

Finally, this final model for supply chain collaboration in Thai SMEs was tested and indicated a quite good fit between the data and the model. The detail of goodness-of-fit statistics is shown in table 1.



**Table 1** Goodness-of-fit Statistics: Final model for supply chain collaboration in Thai SMEs (n = 309).

Measurement	Abbreviation	Value
Chi-square	CMIN	11.901
p-value	P	.063
Degree of freedom	DF	6
Chi-square/df	CMIN/DF	1.984
Root Mean Square Residual	RMR	.026
Root Mean Square Error of Approx.	RMSEA	.053
Goodness-of-fit Index	GFI	.992
Adjusted Goodness-of-fit	AGFI	.954
Normed Fit Index	NFI	.990
Comparative Fit Index	CFI	.994
Tucker-Lewis Index	TLI	.973
Relative Fit Index	RFI	.951

## Conclusions and Discussion

This research employed the exploratory sequential method in the design, beginning with the qualitative research technique to capture depth and details of the phenomenon of supply chain collaboration in Thai SMEs, it could only capture the truth during a short period of time. Therefore, the uncertainty of the impacts of each critical factor on those proposed outcomes are limited in the results of this research. The summary and discussion of the findings from the data collected concerning the two research objectives of this study are as follows.

To respond to research objective one, this point also aligns with the qualitative result captured that many key informants working in SMEs stated that management support is very crucial for their daily works. However, Bhakoo and Chan [6] argued that market competition, management support, external support and trust might not be directly provided to the organization to build supply chain collaboration, but it might indirectly be provided to the organization to build supply chain collaboration through other critical factors. Management support can also generally influence the supply chain collaboration model through inventory management and capability for Thai SMEs. This finding and results can also be interpreted in the sense that SME entrepreneurs are more concerned about emphasizing management support than emphasizing other critical factors, but still less than building trust and enhancing commitment. However, Levitin and Redman [7] argued that most private sectors often have imprecise goals that are difficult to determine and measure. As a result, Thai SMEs might tend to have several goals and focuses that are not easy to quantify. Thus, no effect of capability on supply chain collaboration through inventory management can be seen in the proposed model of Thai SMEs.

This point also aligns with the qualitative result captured that many key informants working in SMEs stated that capability is very crucial for their organizations since they had lots of pressure from law and regulation changes, economics fluctuations, market and customers' changes, increase of new direct and indirect competitors, emerging market growth, etc. Moreover, they continuously focused on developing themselves and their operations to cope with any changes and business disruptions in order to survive in the current situation and ensure their business growth. On the other hand, some key informants working in SMEs stated that capability may be not much critical to their companies since they perceived that the market and customer's changes has quite less influenced to their organizations. Moreover, they also perceived that their organizations can always get the support from government organizations in any market situation. In the key informants' opinion, the proposed model for supply chain collaboration in Thai SMEs would rather be more suitable to apply for in the near future. As an impact of rapid market and economics changes, Thai SMEs are necessary to survive by themselves while the external support tends to be decreased over time.

McKone-Sweet et al. [8] stated that commitment, capability, inventory management could be positive in establishing the collaboration between buyers and suppliers in the supply chain, and Phong-arjarn and Jeenanunta [9] also mentioned that commitment, capability, inventory management were significantly related to supply chain collaboration in several Thai major industries. However, Bhakoo and Chan [6] argued that capability might not be directly provided to the organization to build supply chain collaboration, but it might indirectly be provided to the organization to build supply chain collaboration through other critical factors. Thus, no significant effect of capability on supply chain collaboration can be seen in the practical model of Thai SMEs.

To respond to research objective two, based on the results of the direct and indirect causal relationships between the critical factors on supply chain collaboration in Thai SMEs, it is obviously that indirect effects are more than direct effects. This can be implied that market competition, commitment, capability, and inventory management are also very important to establish supply chain collaboration in Thai SMEs. This point quite aligns with the qualitative result captured that many key informants working in SMEs stated that commitment, capability, and inventory management are very crucial for SMEs. In the key informants' opinion, regarding the effects of the critical factors affecting supply chain collaboration, all factors were seen to have direct or indirect effects on supply chain collaboration in Thai SMEs except some factors, which had an indirect effect on supply chain collaboration in Thai SMEs. Finally, as mentioned by Piboonrunroj [10], the collaboration throughout the supply chain will significantly affect firm performance. In the key informants' opinion, these eight critical factors should be set up, monitored, and emphasized by top management team members and SME entrepreneurs in order to increase the level of supply chain collaboration in Thai SMEs. Once the level of supply chain collaboration is intentionally increased, the firm performance of both Thai SMEs will eventually increase as well.

The research findings and results suggested that each critical factor had an impact on supply chain collaboration in Thai SMEs. The findings and results help to confirm and indicate the importance of each critical factor as a valuable factor that can respond to the needs of SME entrepreneur and stakeholders. It is an approach that scholars or researchers have had an interest in for a long time. Besides, the outcome of this research can be used as a guideline in business system policy formulation and service business development. It will benefit SME entrepreneur and top management team members to realize what critical factors can be more greatly utilized for supply chain collaboration establishment. Government offices related to business system policy and regulations can use the information and findings elaborated from this research to formulate precise organization spending policies and support to improve Thai SMEs as a whole.

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