Mediating Impact of Information Sharing In the Relationship of Supply Chain Capabilities and Business Performance among the Firms of Thailand

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ABSTRACT- **Thailand is considered one of the largest exporters and producers of foods and agricultural products, and play an important role in the economic development of Thailand. However, food industry produces a high income for the country. Its supply chain system still has some problems among different parties. There are lot of factors, which effect the performance of food industry's chain. It is difficult to choose one success factor to be improved since improving one factor could lead to a positive or even a negative impact on another factor. The study purpose is to explore the relationship between supply chain capabilities and information sharing towards the business performance. The data was drawn from 220 food companies in Thailand and the measurement scale was validated using structural equation modelling (SEM). The findings show that supplies chain management capabilities have positive and significant association with business performance. Similarly, information sharing also have positive and significant association with business performance and also has mediating impact. Thus, proposed model could also provide causal-effect determinants affecting supply chain performance for enhance the supply chain strategies to meet supply chain goals and also to guide decision makers with the pertaining information for implement such strategies.**

Keywords: *supply chain capabilities; information sharing; business performance; food industry; Thailand*

1. Introduction

In the contemporary environment, the increased competition among the organizations and to consider organizational change, every organization should develop an effective performance. For this purpose, firms need to design and implement all the strategies which could provide help to improve their performance. For this reason, most important goal of the firms is the continuous improvement of performance [1]. Business performance (BP) is one of the important concerns of shareholders and managers of economic entities. Therefore, company's BP is considered achievement of organizational goals or active performance could be effective and constructive [2]. In line with this, performance is a description of the work levels or objectives which could leads to satisfactory and optimal results or outputs in a given time period [2]. As the financial goals are associated with the company's profitability [3]. To describe this, many factors may influence BP of companies and each company tries to improve its business processes through selecting a set of effective ways [4]. Among all these factors, Higginson and Alam [5] describes that supply chain management capabilities are considered an important factor to enhance the BP. Supply chain management (SCM) as a term was firstly introduced by consultants in the early 1980s. This concept was mainly used to discuss the internal business function such as manufacturing, sales, purchase and distribution [6]. Then, scope of SCM was mainly spread over the time from an intra-organization logistics to become focus on the inter-organizational issues, which includes all the key processes and functions. Then, Min and Zhou [7] further explained that supply chain is considered an integrated system that coordinates a series of inter-related business processes in order to:

1. Acquire the raw material and business parts.
2. To transform raw materials and parts into the finished goods.
3. To add the values all of these products.
4. To promote and distribute these products to either the retailer or the customer.
5. To facilitate information exchange among various business entities (e.g., suppliers, manufacturers, distributors, third-parties' logistic providers, and retailers).

In the same vein, the main objective of SCM is to enhance the operational efficiency and profitability of a company and their supply chain partners. An organization begins to realize that it is not enough to improve efficiencies within the organization but the whole supply chain has to be made competitive [7]. It has been cleared that practicing and understanding of SCM has been become an essential prerequisite to stay in the competitive global race and to grow profitably. Many companies have responded to these conditions by focusing on their core competencies, and outsourcing non-core activities that were previously performed in-house. However, increased outsourcing yields less benefit to vertically integrated companies whose abilities to provide competitive products or services depend on the competencies of their supply chain. As a result, there is a need to achieve the right balance between internal and external outsourcing activities. The successful implementation of SCM requires integrating internal functions of a company and effectively linking them with the external operations of its partner companies in the supply chain [8].

In addition, several other challenges such as weak management relationship, technological insufficiencies, distresses in sharing information, and lack of top management support are a few major challenge and issues in supply chain management [9]. And also, owing to some unavoidable factors, some manufacturing facilities are isolated and secluded with common interruptions in the basic supply of utilities such as internet connection, electricity and water, leading to operating downtime. Specifically, the food industry in Thailand is a major contributor in the economy of Thailand [10] and prior studies reported key issues in SCM in the food industry of Thailand such as lack of scheduling and communication [11]. Therefore, this study expands prior works by investigating the role of information sharing in the supply chain management capabilities and BP in the food industry of Thailand. Unlike previous studies which are mainly focusing on linking technology to supply chain performance [12-15], this study examines technology capability from both aspects technical (information technology advancement) and the social aspects (information sharing). Within the previous business literature, factors such as logistics integration commitment [16], technological advancement [53] logistics integration ([17], and strategic sourcing [18] have and information sharing has been cited as important in achieving BP. Based on the previous discussions, there were divergent empirical results reported on the direct effects of these dimensions on BP in the existing literature highlighting the existent of a mediator. While information sharing has not been explicitly theorized as mediator in the past literature, information sharing has been implicitly serve as an important link between these dimensions and BP.

1.1. Background of the problems of the food industry in Thailand

Food products refer to agricultural products and processed products from the food industry for human consumption [10]. According to Food and Agricuture Organization of United States [19] food industry belongs to the manufacturing sector also known as agro-industries, agricultural processing or agro-processing industries. Indeed, the issue of promoting the food industry is not a new idea for Thailand. The food industry was the first industry promoted in Thailand as stated in the 1st National Economic and Social Development Plan in 1961, due to its high local content [20]. During that period, this industry not only supported rural development but also earned foreign currency for the country. However, the government intensively invested in infrastructure and attracted FDI in favor of capital intensive industries [20].

Moreover, according to Thai government announced a new model for industrial development in order to enhance the potential of Thai businesses and enable them to compete in the constantly-changing 21st century [21]. This model is called "Thailand 4.0" and its key concepts include changing from the manufacture of "Mass Products" to "Innovative Products" through technology, creativity, and new methods, and changing from a "production-based" to "service-based" economy using the digital system as part of the transformation [21]. This manufacturing situation has led to controls through scarce multi-national buyers, carrying about what we demand a Supply Chain Management [21]. Thus based on this, Thai food system becomes more and more consumer driven, vertical coordination as a business strategy. It is believed that vertical coordination has resulted in improved, consistently higher quality, more uniform food products, and more choices of food products for consumers. There are many studies which have examined vertical coordination in the US food industries since the early 1960s. These studies focus on the vertical relationship between the value-added food industries (i.e., food manufacturers) and the upstream production agriculture [22, 23] among others.

2. Literature Review

2.1. Supply chain managements

Supply chain management (SCM) is considered interdisciplinary topic which is created from other topics such as purchasing, marketing and management information system etc. It consists of

set of methods which are used for the efficient integration of manufactures, warehouses, suppliers and retailers so that proper number of goods could be produced and distributed at the best place [24]. In line with this, aim of SCM is to exchange the proper information related which is necessary to fulfillment the requirements of the market, to develop new products, to reduces the number of suppliers for manufacturer, activate and release the appropriate management resources to develop the long term relationship shaped initially based on the member's trust [25].

2.2. Supply Chain capabilities

Supply chain capabilities refers to a network ability is to build, integrate, and reconfigure the internal as well as external competencies to address the rapidly changing environment [26]. In the same vein, Day (1994) further explained that there is an explicit link which is created between exceptional profitability and capabilities. In line with this, Day [27] classifies capabilities into three categories. At first, outside-in processes capabilities refers group of capabilities which enables the company to compete through forecasting and acting on changes in markets through the sound relationship development with channel members, suppliers and customers [20]. At second, Inside-out processes capabilities are consists of internal capabilities which enables the firm to exploit the opportunities in the contemporary environment [20]. In other words, also provides help to facilitate acting of the company on information in a proper manner which helps to brings value for the customers and assures the organization capability in the long run. At third, spanning processes capabilities that is related with the processes which support the anticipated needs of patrons that is being fulfilled by the business [28]. They can do so primarily through appropriately integrating the outside-in and inside-out capabilities.

2.3. Business Performance

Business performance refers to how to do organizational activities and results of them as well [29]. There is no generally accepted method for measuring the performance of companies; however, business financial and accounting results are the ultimate goal of many companies [30]. Previous experimental studies show that multidimensional structural performance could be measured by several measurement criteria [30]. Based on the conducted researches, the evaluation of organizational performance is divided into two dimensions: operational performance and business performance [31]. Based on this, a company's business performance is defined as the achievement of organizational goals or as active, constructive, and effective performance [32]. Business performance refers to the company's achievement to shareholder's financial goals in order to increase their wealth. These goals include indicators and criteria such as profit earnings, profit of percentage of sale, Market share, Sales revenue, Production capacity and return on investment which are considered as a part of organization's performance [33, 34]. Business performance is one of the important concerns of shareholders and managers of economic entities and using new methods managers try to manage their organization and provide an outstanding performance [35].

3. Conceptual Framework

Figure 2.1 illustrated the higher level of conceptual framework for this research. The framework identifies that the supply chain capability factors will have an impact on BP and this relationship is mediated by information sharing.

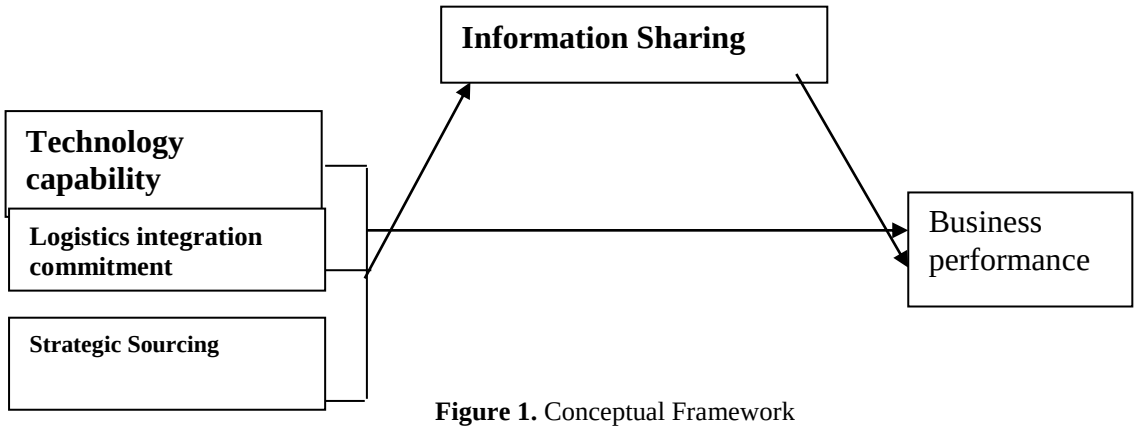

Figure 1. Conceptual Framework

The research framework is grounded in two well-established theories - Resource based view, Dynamic Capability Theory. Resource based view (RBV) asserts that an organization's sustainable competitiveness relies on the company's ability to control the valuable, rare, heterogeneous and

imitable resources and capabilities [36]. Based on this argument, globalization proceeds and information technology developed the value and ability to link supply chain partners across the globe becomes more apparent [37]. The application of information technology (IT) in supply chains are seen as a tool which makes information sharing along with supply chain possible and critical to company's successful performance operations. Moreover, within supply chains, there is a need for effective and efficient product transactions and information sharing among partnering firms [38].

At second, Dynamic Capability Theory, which highlights how supply chain partners could deploy, acquire and reconfigure resources within the organizations and supply chain [39]. This study integrated three constructs including commitment strategic sourcing, logistics integration and information sharing. Logistics integration commitment refers to long-term orientation with the both parties' buyers and suppliers to cooperating the coordination of logistics function [40]. The second element, strategic sourcing refers to the process of designing and managing supply networks in line with BP [41]. The ways firms source from suppliers have changed considerably. Rather than keeping a large base of suppliers and low price materials, firms are now integrating suppliers into their firm 's operations, leading to various collaboration practices. In a global environment, strategic sourcing has gradually become a significant component of company's global strategies to achieve various strategic goals [42].

4. Hypothesis Development

4.1. Technology Capability, Information Sharing and Business Performance

A good IT infrastructure could be assumed as common in most firms in developed countries, such assumption may not be applied in some developing countries 'firms [43]. As firms extends information sharing across supply chains, partnering organizations' technology (e.g. software, hardware, networking systems) need to be seamlessly compatible to achieve superior BP [44]. Therefore, based on these arguments, this study therefore postulates that:

H:1 There is a significant relationship between the technology capability and business performance.

H:2 There is a significant relationship between the technology capability and information sharing.

4.2. Logistics Integration Commitments, Information Sharing and Business Performance

Logistics integration commitment would also drive firms to improve their BP. Given that firms could face higher degree of uncertainties, leading to long lead time and imprecise demand forecasting a logistics integration that require a good [45]. Such integration produces a seamless connection between firms and suppliers, and would facilitate firms in reducing various problems including bull ship effect [46]. Therefore, coordinated logistics function authority firms to adopt lean production system which are connected with reliable order cycles and inventory costs reduction. Following this trait, this study postulates that:

H:3 There is a significant relationship between the logistics integration commitments and business performance.

H:4 There is a significant relationship between the logistics integration commitments and information sharing.

4.3. Strategic Sourcing, Information Sharing and Business Performance

Various strategic sourcing practices have been shown to enhance BP [47]. Strategic sourcing enables the purchasing function to work closely and collaboratively with selected suppliers in various planning processes. Similarly, through strategic purchasing, manufacturing firms are able to communicate demand changes quickly, enabling suppliers to understand and meet the changing requirements in earlier stage [48] to enhance business performance. Based on these arguments, this study hypothesizes that:

H:5 There is a significant relationship between the strategic sourcing and business performance.

H:6 There is a significant relationship between the strategic sourcing and information sharing.

4.4 Information Sharing and Business Performance

H:7 there is significant relationship between information sharing and business performance

4.4. Supply Chain Capabilities, Information Sharing and Business performance

Since the costs of establishing a technology infrastructure are important, firms in this region are expected to be face challenges, as they particularly have a limited ability to provide resources internally. Within supply chains, there is a need of time effective information exchange between partners, requiring firms to assimilate information

technology through the network [49]. Similar, logistics integration commitment could serve as another factor to influence organization's decisions to share the information with supply chain partners [50]. Such practice is seen as one of the important purchasing exercise for the future [48]. Therefore, the supply chain retailers could handle the expected benefits of technological advances could be retarded without the willingness of firms for exchange strategic information along with transactional data such as product and material order [51]. These arguments highlighted that information sharing may mediate the relationship between supply chain capability and business performance. Hence this study hypothesizes that:

H:8 Information sharing mediates the relationship between the supply chain capability and business performance.

5. Methodology

This study is correlational in nature, employed questionnaire survey, and cross-sectional data to examine the research framework and hypotheses developed. This technique is considered to be a practical approach in providing data which are used to establish a basis for wider generalization [52]. The survey was conducted in mid-2018 and it consists of multiple scale items for each of the factors. The respondents were responded from a variety of companies from the food industry which are listed through the industrial works departments, Ministry of Industry, Thailand. Judgmental sampling technique was developed to choose the respondents. As they were mainly supply chain managers. Hence, response was requested from a top-level executive of production who considered to be a responsible for or well acquainted with supply chain policies and corporate strategies of the firm. From the 500 surveys in the target samples, 220 responses were used for the analysis. Thus, the response rate was about 44%. The questionnaire was comprising of demographic and 5-point Likert-type scale (1 = strongly disagree to 5 = strongly agree) to collect the responses from the respondents to each mode of the hypotheses.

5.1. Measures

The independent variables were measured using 15 items grouped into three constructs - technology capability, logistics integration commitment. Similarly, secondly, mediating variable, information sharing was measured by 7 items and the following table highlights the measures used to assess the variables identified.

Constructs	Measures	References
Technology capability	1. My organization uses the most advanced IT systems. 2. My organization has skilled and knowledgeable IT staff. 3. My organization is experienced in deploying IT applications. 4.Our supply chain partners' information systems are technically compatible with those of our firm. 5. There are direct computer-to-computer links with my key supply chain partners. 6. Inter-organizational coordination is achieved using electronic links.	[53]
Logistics integration commitments	1.Logistics integration has a key role in our supply chain from the providing raw material to the end delivery. 2. We have seamless integration of logistics activities with our key supply chain partners. 3. The inbound and outbound distribution of goods with our supply chain partners is well integrated. 4. Inter-organizational logistics activities are closely coordinated.	[54]
Strategic sourcing	1.We heavily source components and semi-processed products across national boundaries. 2. We gain access to our suppliers 'capabilities to design and develop major components and finished products. 3. Technical engineering activities are the main characteristic for supplier involvement in this organization. 4. We are well informed about our supplier 's product and market. 5. We depend on supplier's knowledge and expertise in developing new product.	[48]
Information sharing	1. Our organization exchange and share the information related to changes in the end-users need, preference, and behavior. 2. Our organization exchange and share the information related to changes in the technology of the focal products. 3. Our organization exchange and share the information within the network as soon as unexpected problem arise.	[51, 55]

	4. Our organization exchange and share the information in the organizations' strategies and policies with network partner. 5. Our organization exchange and share the information of financial performance and organization know-how within network partner. 6. Our organization established network information in due to distribute sales information within network partner. 7.Our organization used information sharing with suppliers and buyers via Extranet.	
Business performance	1. Market share 2. Sales revenue 3.Production capacity 4. Return on investment 5. Profit as a percentage of sales	[20]

6. Results And Discussions

To test the model, we used the structural equation modelling (SEM) technique using partial least squares (PLS) with Smart PLS 3.0 [56] software. Smart PLS is a second-generation analysis software that could be used to test the complex model with latent variables. For this purpose, we were followed recommended two-stage analytical procedures which is introduced by [57] where the measurement model was tested first to validate the instruments. Table 6.1 has shown the scores obtained from the analysis of the measurement model. Based on Table 6.1, it could be seen that all loadings were higher than 0.70 which is the threshold suggested by [58]. The average variance extracted (AVE) of all constructs exceeded 0.5 [59] while the composite reliability scores (CR) were all higher than 0.7 [56]. So, we can have concluded that convergent validity has been achieved. Table 6.2 and 6.3 shows the results for the discriminant validity test. As recommended by [60] and [61] the AVE of each construct should be higher than the correlation between it and any other constructs of the model. As shown in the tables that all constructs meet this criteria indicating the constructs have discriminant validity. (Hair Jr et al., 2016 suggests that the loadings of measured variables (i.e., items) should be higher than the cross loadings by at least 0.1 to indicate sufficient discriminant validity. As shown in Table 6.3 loadings of all constructs satisfy this criterion. As such we can conclude that discriminant validity is achieved.

Table 6.1. Confirmatory factor analysis

Constructs	**Items**	**Loadings**	**Alpha**	**CR**	**AVE**
Technology capability	TC1	0.837	**0.851**	**0.9**	**0.693**
	TC2	0.785			
	TC3	0.879			
	TC4	0.825			
	TC5	0.793			
	TC6	0.867			
Logistics integration commitments	LIC1	0.758	**0.758**	**0.839**	**0.512**
	LIC2	0.702			
	LIC3	0.793			
	LIC4	0.704			
Strategic sourcing	SS1	0.703	**0.774**	**0.847**	**0.526**
	SS2	0.701			
	SS3	0.705			
	SS4	0.814			
	SS5	0.796			
Information sharing	IS1	0.795	**0.834**	**0.798**	**0.654**
	IS2	0.809			

	IS3	0.839			
	IS4	0.768			
	IS5	0.786			
	IS6	0.719			
	IS7	0.657			
Business performance	BP1	0.591	**0.898**	**0.917**	**0.704**
	BP2	0.786			
	BP3	0.704			
	BP4	0.757			
	BP5	0.806			

Table 6.2. Heterotrait-Monotrait Ratio

	Technology Capability	**Logistic Integration Commitments**	**Strategic Sourcing**	**Information Sharing**	**Business Performance**
Technology Capability					
Logistic Integration Commitments	0.731				
Strategic Sourcing	0.79	0.724			
Information Sharing	0.764	0.823	0.835		
Business Performance	0.709	0.607	0.724	0.611	
Technology Capability	0.719	0.707	0.749	0.802	0.722

Table 6.3. Cross Loadings

	Technology Capability	**Logistic Integration Commitments**	**Strategic Sourcing**	**Information Sharing**	**Business Performance**	**Technology Capability**
TC1	**0.789**	0.371	0.432	0.316	0.412	0.36
TC2	**0.708**	0.272	0.355	0.345	0.341	0.457
TC3	**0.633**	0.434	0.554	0.56	0.399	0.316
TC4	**0.809**	0.573	0.487	0.505	0.532	0.437
TC5	**0.807**	0.552	0.428	0.52	0.438	0.376
TC6	**0.709**	0.533	0.309	0.427	0.25	0.345
LIC1	0.345	**0.675**	0.488	0.526	0.326	0.373
LIC2	0.451	**0.797**	0.464	0.625	0.387	0.538
LIC3	0.436	**0.736**	0.451	0.44	0.434	0.337
LIC4	0.496	**0.708**	0.452	0.584	0.496	0.545
SS1	0.553	0.559	**0.805**	0.589	0.59	0.416
SS2	0.508	0.492	**0.875**	0.641	0.554	0.603
SS3	0.515	0.486	**0.817**	0.591	0.49	0.441
SS4	0.482	0.686	**0.816**	0.427	0.416	0.552
SS5	0.497	0.551	**0.772**	0.526	0.478	0.513
IS1	0.516	0.563	0.661	**0.862**	0.52	0.466
IS2	0.347	0.400	0.338	**0.623**	0.234	0.456
IS3	0.475	0.307	0.461	**0.805**	0.412	0.274

IS4	0.352	0.362	0.331	**0.875**	0.341	0.339
IS5	0.443	0.37	0.378	**0.817**	0.399	0.422
IS6	0.469	0.357	0.536	**0.708**	0.532	0.331
IS7	0.469	0.413	0.567	**0.633**	0.412	0.461
BP1	0.375	0.376	0.443	0.554	0.378	**0.751**
BP2	0.381	0.33	0.437	0.253	0.335	**0.617**
BP3	0.388	0.398	0.381	0.529	0.387	**0.791**
BP4	0.428	0.46	0.508	0.442	0.399	**0.708**
BP5	0.326	0.371	0.377	0.411	0.329	**0.697**

The Q^2 or predictive relevance analysis has been done through using the blindfolding procedure (Hair *et al*., 2016). If the value of Q2 is larger than 0, we could have concluded that the model has adequate predictive relevance (Fornell & Cha, 1994). The Q2 was 0.174 that was greater than 0, thus predictive relevance was established.

6.1. Direct relationship

The next steps in assessing the structural model are to examine the hypothesized relationships among constructs in the model. The explanatory power of the model was determined by examining how well the observed data fit the hypothesized relationship among the constructs. Following Chin (1998), bootstrap re-sampling approach was employed to test the statistical significant of each coefficient. As recommended by Hair et al. (2014), five thousand iterations using randomly selected subsamples were performed to test the hypothesized relationships. Table 6.13 depicts the beta coefficients and t-values for the first 11 direct hypotheses. As depicted, this study found support for eight out of 11 hypotheses tested.

Table 6.5. Estimated Path Coefficient- Direct Effect

Path	**Beta**	**t-value**	**Hypothesis**	**Results**
TC->BP	0.01	1.98	H1	Accepted
LIC->BP	0.51	6.44	H3	Accepted
SS->BP	0.51	3.88	H5	Accepted
TC->IS	0.42	6.33	H2	Accepted
LIC->IS	0.45	4.03	H4	Accepted
SS->IS	0.58	3.97	H6	Accepted
IS->BP	0.45	5.87	H7	Accepted

Accordingly, technology capability has shown significantly related to information sharing (β=0.42; t=6.33; *p*<.001) and also have the direct effect on BP (β=0.01; t=1.98, ns). Thus hypothesis H2 and H1 aree accepted. In addition, the result also highlighted that logistics integration commitment was significantly related to Business performance (β=0.51; t=6.44; *p*<.001) and information sharing (β=0.45; t=4.03; *p*<.001). The findings provide support for hypothesis H3 and H4. Furthermore, strategic sourcing was significantly related to information sharing (β=0.58; t=3.97; *p*<.001), yet was significantly associated with BP (β=0.51; t=3.88; ns). Therefore, hypothesis H5 and H6 was supported. Finally, as expected, information sharing was positively and significantly related to BP (β=0.58; t=7.50; *p*<.000). Hence, H7 was supported.

6.2. Testing Mediating Relationship

The research model hypothesized that information sharing mediates the effects of three antecedents on the business performance. For this purpose, to test the mediation hypotheses, this study has used [62] criteria to determine whether the mediation condition is exist. All of these tests shows in the 6.6 shows that information sharing has the positive and significant association in the relationship of supply chain capabilities and BP.

Table 6.6. Mediation tests using PLS

Path	**Beta**	**t-value**	**Hypothesis**	**Results**
TC->IS->BP	0.11	2.78	H8a	Accepted
LIC->IS->BP	0.41	3.92	H8b	Accepted
SS->IS->BP	0.33	4.96	H8c	Accepted

7. Conclusion

In the current study test the general importance of the supply chain management capabilities on information sharing and business performance in the Thai food industry. The current study findings support all of the hypothesis that SCM capabilities are considered an important determinant of a company's business performance. Therefore, through transferring and acquiring information and knowledge across the organizational boundaries, manager could be reducing variance in their system and subsequently improve the predictability of the production and distribution systems. Thus, under current circumstances in the industry of Thailand, as per the findings companies should concrete on better productivity and the cost efficiency to differentiate themselves by their competitors and to achieve business overall goals. Our results also have very important management implications. Since most of the small and medium sized companies, as presented by a major part of Thai food industry do not have much resources, it is important that they set clear priorities in investing in resources and developing the capabilities that match their business strategy.

However, our study is rigorous and systematic, therefore, it has some limitations that could represent opportunities for future research. At first, singular respondents that's why responses suffer from an individual's unique perspective and limited access to information because of the coordinated responses from the top management team [63]. Furthermore, this study not measured all supply chain capabilities, rather it seeks to demonstrate the unique effect of SCM practices on performance. Accordingly, future research could be assembling with other practices which are less important than those tested in the current study, such as business strategy and supplier involvement. Also, this study has limits its analysis to combination or the adverse effects of different supply chain capabilities. Therefore, further research could be test the interactive effects between different elements for investigate the antagonistic effects among them in predicting various type of performance. Lastly, it is an exploratory study, we have mainly focused on the food industry in Thailand. Given the growing importance of other manufacturing sectors in Thailand such as the, pharmaceutical industry, electrical and electronics industry, and automotive industry, etc., there will be increased demand for knowledge of these sectors, to see the any similarity in the findings, as per compared with the food industry. As such, these sectors could be serve as a research setting in future research.

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