The Effect of Supply Chain Integration on Supply chain performance of Thailand Aftermarket Auto Parts Manufacturers & Distributors

Jinnicha Boontham[1] and Wissawa Aunyawong[2*]

[1-2]Suan Sunandha Rajabhat University, 1-U-Thong Nok, Dusit, Bangkok, Thailand

e-Mail: s66567808026@ssru.ac.th[1], wissawa.au@ssru.ac.th[2*]

*Corresponding author

Abstract

Contemporary Thai entrepreneurs face stiff competition in the globalized economy. The improvement of one's supply chain performance (SCP) can contribute to organizational success. In Thailand, however, SCP of auto parts manufacturers in various industries is not widely measured and needed to be improved. Supply chain integration (SCI) is the factor enhancing SCP. This quantitative research, therefore, aims to study the effect of SCI on SCP to provide entrepreneurs with guidelines in improving SCP of Thai auto-parts manufacturers by SCI. The sample was 342 Thailand auto-parts manufacturers, arisen from stratified random sampling. A questionnaire was used as research instrument. Multiple regression was a statistical technique that used to analyze the data. The results found that supplier, internal, and customer integrations had a positive effect on SCP. These research findings can be used as a guideline for the practical implementation for enhancing supply chain performance by focusing on supply chain integration. Most importantly, the government sector or educational institution can use research findings to give firms in-depth advices, make policies, hold training program, and develop supply chain performance indicators.

Keywords: supply chain integration, supply chain performance, service competency, and logistics flexibility

1. Introduction

The globalization, leading to a decrease in obstacles to international business, has reformed the way in which entrepreneurs do the business (Sambharya, 2021). It causes high competitions in doing business. The entrepreneurs need to develop their firms by increasing the competitiveness to sustain their businesses. The one of key success factors is the ability in analyzing and measuring supply chain performance (SCP) to compare with the indicators of both local and international firms in the same industry.

The study of SCP development of the automotive industry 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, Toyata 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 (Yongpisanphob, 2018).

Previous studies explored a diversity of studying logistics and supply chain factors that are able to enhance the SCP, for example supply chain management practices and supply chain integration (SCI) (Aunyawong, 2020). SCI is considered one of the major factors in improving SCP. As a result, the research aims to study the effect of SCI on SCP to provide entrepreneurs with guidelines in improving SCP of Thai auto-parts manufacturers by SCI.

2. Literature Review

Supply Chain Performance

SCP is defined as the operational measures that improve for each member, as well as for the whole chain as result of participation in a supply chain relationship (Gagalyuk et al., 2013). It also is defined as the benefits derived from supply chain cooperation, including efficiency improvement, cost reduction, and enhancement in cycle time (Yul & Kyu, 2015). SCP is an important driver of organizational and market performance. An efficient and effective supply chain delivers quality products on time and in the right quantities, reduces order cycle time and provides mutual benefits for supply chain partners. As such, firms must proactively engage in practices that will enhance SCP (Singhry, 2018).

Previous studies, likewise, have established that collaborative relationships are associated with improved SCP in terms of cost reduction, increased fill rate, reduced inventory, and improved quality. Further, supply chain members require a positive evaluation of the performance outcomes of a relationship in order to justify continued involvement in collaborative activities (Odongo, 2017).

SCP can be measured in terms of efficiency, responsiveness, quality and chain balance. The efficiency is the best use of available resources which include measures such as logistic costs and profits. Logistic cost refers to the operating and opportunity cost items that can be influenced by logistic decisions and the integration of management practices and activities throughout the supply chain. Profits are the net positive gains from an investment. Responsiveness is the measure of speed/rate of providing the requested products, hence lead time and customer complaints are considered. Lead time is the total amount of time which elapses between sending/ getting and delivering/ receiving goods or services. Customer complaint is defined as the formal complaints from customers regarding the product. Product quality means safety and attractiveness while process quality is measured by environmental friendliness. Chain balance is defined as the understanding of distribution of risks and benefits. Risks and benefits distribution refers to the extent to which business risks and compensations are shared amongst supply chain members. Finally, supply chain understanding refers to chain members' understanding of each other's products and processes (Molnár et al., 2010).

SCP can be divided into both the financial performance measurement and non-financial performance measurement. Two important dimensions of financial performance are examined: net profit performance and sales growth performance. Profitability and sales growth are the two most popular types of performance indicators used in the industry. Two important dimensions of non-financial performance are examined: customer satisfaction performance and lead-time

performance. Customer satisfaction performance is the degree to which customers perceive that they received products and services that are worth more than the price they paid. Lead-time performance refers to the time interval between the receipts of order until the delivery of finished goods. The reduction in lead time leads to reduction in supply chain responsive time, and as such is an important performance measure and source of competitive advantage. It directly relates with customer service in determining firm's competitiveness (Aunyawong et al., 2020).

As mentioned, research on the conceptualization of SCP encompasses a variety of metrics. Diverse definitions and constructs for SCP exist and different metrics have been used for assessing similar dimensions. Metrics are often based on the focal firm, and supply chain metrics are at company level rather than supply chain level. SCP can be viewed as many dimensions. This study, however, observes SCP in terms of the efficiency and effectiveness of supply chain operations. These dimensions represent the internal outcome of supply chain operations (efficiency) and the external outcome perceived by the end-customer (effectiveness). This view is in line with the supply chain process integration concept proposed by Chen et al. (2009), which examines whether integration – driven by supply chain cost and customer - orientation - actually delivers positive results in both of these performance dimensions. Efficiency represents the supply chain's ability to provide a given level of end-customer service at low cost with high levels of accuracy in matching production with actual demand. Effectiveness represents the supply chain's ability to deliver according to end-customer requirements and pre-specified service standards (Aramyan et al., 2007)

Supply Chain Integration

The theory of SCI is very important in supply chain management. Firstly, the definition of integration needs to be clarified due to its differences in the previous literature. Integration is defined as coordination of design manufacturing relationship. They did not provide a definition, but they considered only coordination. It is also referred as the extent to which separate parties work together in a cooperative manner to arrive at mutually acceptable outcomes. Integration, moreover, is explained as a process of interaction and collaboration in which manufacturing, purchasing and logistics work together in a cooperative manner to arrive at mutually acceptable outcomes for their business (Adler, 1995).

The SCI construct is relatively new as an area of research, although there is an extensive body of research on unidimensional supply chain relationships, examining collaborative relationships between a manufacturer and either its customers or suppliers. While some focus on dyadic relationships with supply chain partners, others focus on managing a supply chain as a single system, rather than attempting to individually optimize fragmented subsystems. While some SCI definitions emphasize flows of materials and parts, others focus more on flows of information, resources and cash. Although these descriptions touch many of the critical elements of SCI, they are broad in focus. In addition, most fail to consider the strategic nature of SCI. We build upon the existing literature on the SCI construct, including the manufacturer (internal integration) and extending from it both directions (customer and supplier integration), and building upon its gaps to develop a parsimonious definition of SCI. In conclusion, the researcher defined integration as the integrated control of a number of continual or comparable cost-effective or especially industrial processes formerly carried on independently (Pagell, 2004).

Based on the various definitions of integration mentioned above applied with supply chain concept, SCI refers to the degree to which a manufacturer strategically collaborates with its supply chain partners and collaboratively manages intra- and inter-organization processes. The goal is to achieve the effective and efficient flows of products and services, information, money and decisions, to provide maximum value to the customer at low cost and high speed (Flynn et al., 2010).

Aunyawong et al., (2020) argued that the diverse dimensions of SCI can ultimately be collapsed into three dimensions: customer, supplier and internal integration. Customer and supplier integration are commonly referred to as external integration, which is the degree to which a manufacturer partners with its external partners to structure inter-organizational strategies, practices and processes into collaborative, synchronized processes. Customer integration involves core competencies derived from coordination with critical customers, whereas supplier integration involves core competencies related to coordination with critical suppliers. In contrast, internal integration focuses on activities within a manufacturer. It is the degree to which a manufacturer structures its own organizational strategies, practices and processes into collaborative, synchronized processes, in order to fulfill its customers' requirements and efficiently interact with its suppliers. Internal integration and external integration play different roles in the context of SCI. While internal integration recognizes that the departments and functions within a manufacturer should function as part of an integrated process, external integration recognizes the importance of establishing close, interactive relationships with customers and suppliers. Both perspectives are important in allowing supply chain members to act in a concerted way, to maximize the value of the supply chain.

Hypothesis Development

Feng et al. (2017) provided an initial empirical examination of the effect of SCI on the performance of automobile manufacturers in China. As a dynamic capability, SCI is significantly and positively related to operational performance. Li (2015) also found the impact of SCI on operational performance of manufacturing companies in different countries. While, Zhao et al. (2015) represented that SCI was beneficial to financial performance of manufacturing companies in China. Charterina et al. (2016) indicated that supplier integration or collaborative relationship focused on information-sharing routines exert a significant positive effect on performance of European Machine-tool firms. Also, information sharing routines mediate in the effect from idiosyncratic investments on firm's performance. Consistently, Wong et al. (2015) found that the positive effect of SCI, based on information sharing, on the firm's 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: Supplier integration has a positive effect on supply chain performance.

H2: Internal integration has a positive effect on supply chain performance.

H3: Customer integration has a positive effect on supply chain performance.

3. Methodology

Population and Sample

The population in this study was 171 auto-parts manufacturers and Distributors in Thailand (Thailand Automotive Institute, 2024). The sample was 342 top executives who were asked as the respondents to answer questionnaire since they could represent their firm as the representatives of unit of analysis. The researchers used simple random sampling to select 2 respondents per each auto-parts manufacturer and distributer.

Research Instrument

The research instrument in this study was the questionnaire divided into 2 parts: Part 1 - the questions measuring the characteristics of the respondents consisting of job position, firm location, and work experience. The respondents can select only one answer for each question. Part 2 - The 14 questions measuring four variables in the study. According to the supply chain integration, nine items were used to measure three variables, involving supplier integration, internal integration, and customer integration (Flynn et al., 2010; Tseng & Liao, 2015). Supplier integration's items include "My firm exchanges information with supply chain partners", "My firm has a good strategic teamwork with our supply chain partners", and "Our relationship with supply chain partners is based mutual trust". Internal Integration's items include "Data integration among internal departments in our firm is through networks", "My firm has periodic interdepartmental meeting", and "Within our firm, employees from different departments are encouraged to cooperate together". Customer Integration's items include "My firm follows up with customers for feedback", "My firm shares market information with customers", "My firm has periodic contact with customers".

According to supply chain performance, five items (Tsanos et al., 2014; Odongo et al., 2017) include "Doing business with SC partners helps my company to lower transport costs significantly", "Doing business with SC partners helps my company to lower warehousing and inventory costs significantly", "Doing business with SC partners helps my company to lower transaction costs significantly", "Doing business with SC partners helps my company to reduce lead time", and "Doing business with SC partners enable our company to obtain perfect order fulfillment."

All items were measured on a five-point Likert scale which has criteria for scoring as follows: strongly agree to strongly disagree. The mean was used as the criteria to interpret scores of attitudinal levels as follows (Best & Kahn, 2006).

Data Analysis

Descriptive statistics used to describe the characteristics of the sample, while Inferential statistics used in this research is Multiple Regression Analysis, which is a data analysis to find the relationship between one dependent variable (Y) (Dependent Variable) or one criterion variable and independent variable (X) (Independent Variable) or forecast variable or two or more predictor variables. Multiple regression analysis is a statistical technique that uses linear relationships between variables to predict relationships between variables. The linear multiple regression equation has the following equation.

$$y = a + b1(x1) + b2(x2) + b3(x3)$$

Note: y is supply chain performance, x1 is supplier integration, x2 is internal integration, and x3 is customer integration.

4. Results

The results of the independent variables analysis showed that supplier, internal and customer integrations had a positive effect supply chain performance of auto-parts manufacturers in Thailand. All independent variables explained supply chain performance of auto-parts manufacturers in Thailand by 83.00 percent ($R^2 = .830$), with a statistical significance of 0.01.

When considering the standardized regression coefficients of the effect of independent variables on supply chain performance of auto-parts manufacturers in Thailand, it was found that customer integration was the most (β=.64), followed by internal integration (β=.49), and supplier integration (β=.53), respectively.

From the test results of the coefficients of the independent variables - supplier integration (X_1), internal integration (X_2), and customer integration (X_3) - that affect supply chain performance of auto-parts manufacturers in Thailand, it could be written as a linear equation obtained from a multiple regression analysis at the significance level of .001 to predict supply chain performance as follows:

$$Y = 1.79 + 0.49X_1 + 0.53X_2 + 0.64X_3$$

From the above linear equation, it can be seen that the coefficients showed that all three supply chain integration factors were positive. It indicated that they related with supply chain performance of auto-parts manufacturers in Thailand in the same direction due to a positive correlation. The results of multiple regression analysis displayed P-Value = 0.000, which was less than 0.01. Therefore, all three main hypotheses were accepted with statistical significance at .01 level.

5. Conclusion and Discussion

First, the findings on the positive effect of supply chain integration on supply chain performance of auto-parts manufacturing firms in Thailand are in line with the past studies of Feng et al. (2017) which provided an initial empirical examination of the effect of SCI on the performance of automobile manufacturers in China, Li (2015, p. 40) which found the impact of SCI on operational performance of manufacturing companies in different countries, Zhao et al. (2015) which represented that SCI was beneficial to financial performance of manufacturing companies in China, Charterina et al. (2016) which indicated that supplier integration or collaborative relationship focused on information-sharing routines exert a significant positive effect on performance of European Machine-tool firms, and Wong et al. (2015) which found that the positive effect of SCI, based on information sharing, on the firm's performance. As information-sharing is a core of SCI, so SCI possibly has a positive impact on SCP.

For recommendations on practical implications, in enhancing supply chain integration, the manufacturing firms should exchanges or share information with both suppliers and customers and among internal departments in manufacturing firms should be through networks. To increase the flexibility in logistics, the firms should select supplier that has ability to cooperatively work on the purchasing process. Moreover, the government sectors should 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 supply chain performance indicators and measurement system.

The related government authorities, besides, should use these research results to make the policies to enhance the performance of the entire automotive industry.

Further study should emphasize the effects of digital transformation in supply chain to offer the policy enhancing supply chain performance effectively since the firms in digital era today has encountered the barriers due to lack of digital skills and talent. Moreover, the comparative future study on supply chain integration and supply chain performance should be conducted in different ASEAN countries or cultures distinguished in automotive industry and although this study provides the empirical results on, the future studies in different interesting industries related to automotive industry are necessary. Finally, the qualitative research using in-depth interview and focus group is necessary to explain deeper than analyzing quantitative data and to encourage executives of auto-parts manufacturers to expand on their responses so as to open up new issue or obtain the in-depth information and to provide the guidelines on enhancing supply chain performance.

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