



## HOW THAI INDUSTRY GIVES SIGNIFICANCE TO SUPPLY CHAIN PERFORMANCE

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### Abstract

*The paper aims at exploring how Thai industry gives significance to supply chain performance based on supply chain strategic, tactical, and operational levels. Together, there are 40 indicators of interest. The questionnaire is designed and distributed to ask Thai manufacturing companies to assess the significance level of these supply chain performance indicators. The paper explores the result based on 223 companies in Thailand who responded to the survey. The investigations divided into two sections; (1) the identification of the most and the least significant supply chain performance of the Thai industry, and (2) the identification of the most and the least significant supply chain performance of 5 key industries in Thailand. The discussion is then made to reflect the different concerns on each industry type.*

**Keywords:** Supply chain, Supply Chain Performance, Thai industry

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### I. Introduction

Thailand is an industrialized, developing country located in South East Asia. With a GDP of US\$505 billion in 2018, Thailand is the 8th largest economy of Asia, according to the World Bank. Thailand is the 23rd largest export economy in the world and the 32nd most complex economy according to the Economic Complexity Index (ECI). The industry sector contributes up to 39.2% of Thailand's GDP, employing 14% of the workforce. Manufacturing with value-added in Thailand was reported at 26.92 % of GDP in 2018. In 2017, Thailand exported US\$215 billion.

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Top exports of Thailand are machinery, electrical machinery and equipment, vehicles, gems, and precious metals, rubber and plastics.

### ***Supply Chain of Thai Industry***

Thailand is ranked 21st in the World Bank's 2020 Doing Business and ranked 40th in the World Economic Forum's 2019 Global Competitiveness Index [XVII],[XXXIX]. Thailand is strong on the financial system, market size, and business dynamism. Despite global economic tension, Thailand's GDP growth for 2019 is expected to be in the range of 3.5-4.5%, according to the Board of Investment of Thailand. This is a result of expanding private consumption, mega-project economic investments, e.g., Eastern Economic Corridor (EEC) initiation, and several liberal economic policies, e.g., ASEAN Free Trade Agreement (AFTA), Regional Comprehensive Economic Partnership (RCEP).

According to the Bank of Thailand's official statistics, Foreign Direct Investment (Inflow) of the manufacturing sectors in 2019 is at US\$ 8.74 billion. By which two-thirds of this are from Japan, Singapore, and the EU. However, Thailand has become less competitive in terms of labor costs. Many new investments in electronics, textile, and apparel industries have moved to neighboring countries with lower labor costs. However, the Thai industry will continuously be competitive in automobiles, petroleum and chemicals, and food and beverages [XIX].

### ***Logistics of Thai Industry***

Whilst logistics is a key success factor and often included in the supply chain management [XIII],[XIV],[XXVI],[XXVIII], it is of interest to investigate the Thai logistics system, Thai industry logistics performance and how is the supported.

According to the study by Thailand's Office of the National Economic and Social Development Council, the logistics cost of Thailand is still high. Logistics cost per GDP of Thailand in 2018 is at 13.4%, slightly higher than the global average at 11.0% [XXV]. However, the logistics cost has been reduced by 20% over the past decade. The logistics supportment of Thailand also needs improvement. Transport infrastructure including road, rail and waterway are underrated [III],[XVII].

Scoped to the company, the logistics performance and logistics potential of the Thai industry was studied using Industrial Logistics Performance Index (ILPI) and Logistics Scorecard (LSC) by the Ministry of Industry of Thailand. For ILPI, there are 27 logistics performance index. After collecting the data from 1,644 Thai companies, the logistics performance of key Thai industries were identified [XXXVI]. For LSC, there are 23 factors of interest. The data from 100 Thai companies were used for the investigation [XXXVII].

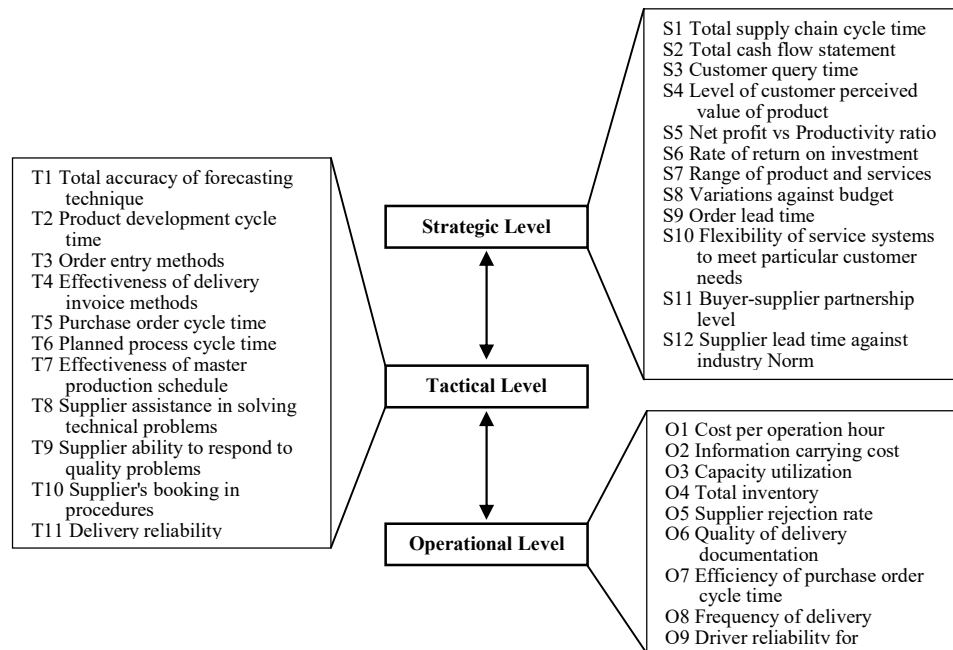
## **II. Supply Chain Performance**

The term "supply chain" typically encompasses members from downstream toward upstream and often includes end-customer. The supply chain quest is to optimally manage cost, time, reliability and quality of the product or service throughout the value-added and logistics activities [XVI],[XVIII]. The complexity of

supply chain management increases due to globalization and technology advancement [X],[XXII],[XXIII],[XXVII],[XXXIII],[XXXIV].

Council of Supply Chain Management Professionals (CSCMP) defines supply chain management scope as the integrating function linking business functions and processes including logistics management activities. Supply chain management directly influences company performance [XV],[XX],[XXI]. However, it is impossible to use any specific means to measure a supply chain performance. Many researchers proposed a model or framework to measure supply chain performance in vast perspective of interest [I],[IV],[V],[IX],[XI],[XXIX]. Therefore, it may be too difficult to conclude if any measurement is sufficient and self-complete.

This paper pays attention to the scope of supply chain performance suggested by Gunasekaran, Patel, and Tirtiroglu[I] who interestingly proposed supply chain performance metrics which divided into 3 levels of management, i.e., strategic, tactical and operational. Each level comprises of indicators. In total, there are 40 indicators to reflect the supply chain performance (see Fig.1).



**Fig. 1:** 40 Supply chain performances indicators: strategic, tactical and operational levels [I]

### III.Methodology

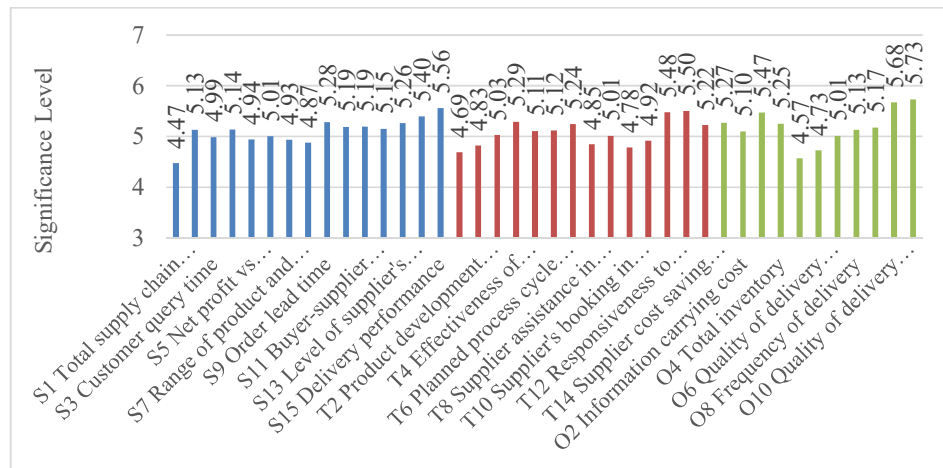
To address the question “How Thai industry gives significance to supply chain performance”, the questionnaire is simply designed and developed to ask if and how the respondent, representing their working company, gives significance to

supply chain performance. The respondents then reflect on how they give significance to 40 supply chain performances using a 1-7 score. Whilst 1 denotes no concern, representing that the performance has no significance to the company, 7 represents if the indicator is the most significant and highly concerned by the company. The questionnaires had been distributed to 2,288 medium- and large-sized manufacturing companies in Thailand during 2018-2019. The database is taken from the Department of Industrial Work, Ministry of Industry of Thailand. 255 companies had responded to the questionnaire, by which 223 are consistent and thus credible. Then, the significance level of supply chain performance from Thai industry perspectives can be identified. The following results divided into 2 perspectives. The first result section investigates the Thai industry on which supply chain performance indicators are the most and the least significant. Secondly, the industry type is focused on. The significance level supply chain performance indicators of each industry can be identified.

#### IV.Result Presentation

##### A) The most and the Least Significant Supply Chain Performance by Thai Industry

Fig.2 illustrates the average significance level, reflected by 223 Thai companies, of 40 indicators of interest.



**Fig. 2:**Average significance level of supply chain performance of Thai industry

##### Strategic Level

The significance level given by the Thai company on a strategic level is averaged at 5.10 out of 7. The most concern indicators that received the highest attention are S15 Delivery performance at 5.56, S14 Delivery lead time at 5.40, and S9 Order lead time at 5.28. On the other hand, the indicators that are concerned the least are S1 Total supply chain cycle time at 4.47, S8 Variations against budget at 4.87, and S7 Range of product and services at 4.93.

### ***Tactical Level***

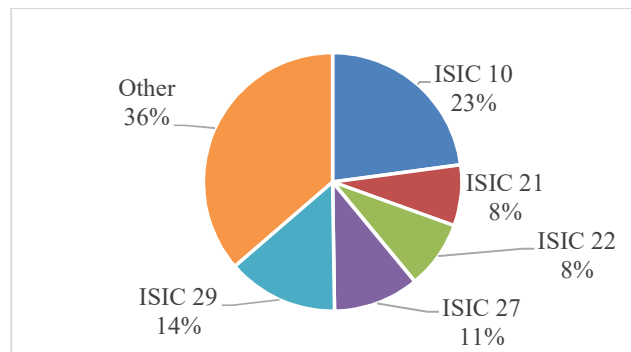
The significance level on a tactical level is averaged at 5.08 out of 7. The most concern indicators are T13 Effectiveness of distribution planning schedule at 5.50, T12 Responsiveness to urgent deliveries at 5.48, and T4 Effectiveness of delivery invoice methods at 5.29. Oppositely, the indicators that are concerned the least are T1 Total accuracy of forecasting technique at 4.69, T10 Supplier's booking in procedures at 4.78, and T2 Product development cycle time at 4.83.

### ***Operational Level***

The operational supply chain performance has the most attention by the Thai industry with the average significance level of 5.19 out of 7. The most concern indicators that received the highest attention are O11 Achievement of defect free at 5.73, O10 Quality of delivery goods at 5.68, and O3 Capacity utilization at 5.47. The indicators that are concerned the least are O5 Supplier rejection rate at 4.57, O6 Quality of delivery documentation at 4.73, and O7 Efficiency of purchase order cycle time at 5.01

### **B) The most and the Least Significant Supply Chain Performance of 5 Key Industries in Thailand**

The paper also investigates the issue on 5 major industries, i.e., ISIC 10 manufacture of food products, ISIC 21 manufacture of pharmaceuticals, medicinal chemical and botanical products, ISIC 22 manufacture of rubber and plastics products, ISIC 27 manufacture of electrical equipment and ISIC 29 manufacture of motor vehicles, trailers, and semi-trailers [XXXV]. These industries are nominated as key industries due to both economic significance and a sufficient number of respondents from the survey (see Fig.3).



**Fig.3:** Distribution of respondent industry in the survey

### ***Brief profile of key industries of Thailand***

#### ***Thai Automotive Industry***

The industry contributed up to 12% of Thailand's GDP with more than 2.17 million vehicles produced annually, by which 1.14 million vehicles were exported to the global market [XXXVIII]. The supply chain of the Thai automotive industry has

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been well established [XXX]. The industry involves more than 1,700 companies and 750,000 employees. The industry is led by Japanese car OEM, e.g., Toyota, Honda, Mazda, Nissan as well as the European brands, e.g., Mercedes-Benz and BMW. These successes ranked the country as the largest automotive producer in Southeast Asia and 12th in the world and recognized as “Detroit of the East” [II].

#### ***Thai Food Industry***

The industry and its supply chain contributed up to 23% of Thailand GDP. The value of the industry, including local consumption and exports, is estimated at US\$102 billion [VII]. Thailand is ranked 12th in global food exports, accounting for up to US\$33 billion in 2019. The industry has been the strongest contribution to the Thai economy in terms of production inducement, employment generation, value-added inducement and net foreign exchange [XXXI]. The logistics performance of the Thai food industry was also investigated and the strengths and weaknesses of the industry were identified [XXXII].

#### ***Thai Electronic Industry***

Thailand’s electrical and electronics industry is ranked the world’s 14th largest exporter in the world in 2016. The industry export revenue was worth US\$ 55 billion in 2016. Thailand is the world’s largest manufacturers of Hard Disk Drives (HDDs), supplying 30% of the global market. Thailand is also the 2nd largest air conditioner producer in the world [VI]. Currently, there are more than 600,000 people employed in this sector.

#### ***Thai Rubber and Plastic Industry***

The Thai rubber industry is one of the important contributors to the Thai economy. From the downstream, Thailand produces more than 4.5 million tons of natural rubber yearly. This accounts for 36% of the world’s total natural rubber production [VIII]. More than 3 million tons of natural rubbers are exported to China, Malaysia, the EU, and Japan. Another 0.6 million tons are then used to produce vehicle tires, elastics, and gloves domestically. As a rubber product, tire alone has generated more than US\$ 3 billion of export yearly.

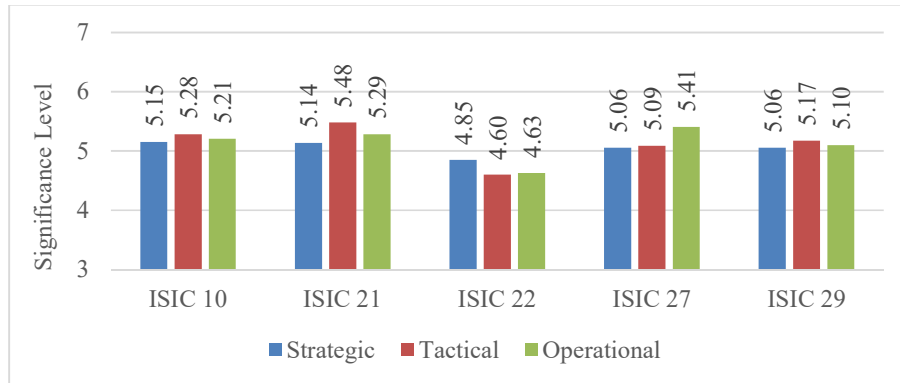
The Thai plastic industry is worth US\$ 36 billion. The production capacity is at 11.46 million tons per year and increasing. There are more than 4,600 companies involving in the sectors. The demand of the industry has been constantly increased addressing the needs in packaging, electronic and electric, automotive, construction and medical application [XII].

#### ***Thai Pharmaceuticals, Medicinal Chemical and Botanical Industry***

The value of the Thai medicines market is approximately US\$ 5 billion. However, the industry will tend to expand due to an increasing demand caused by an aging population, universal healthcare and the growth of medical tourism. According to Thai Food and Drug Administration statistics, there are 178 manufacturers of conventional medicines and 159 were accredited with the Good Manufacturing

Practice (GMP) standards. In terms of exports, due to a large demand for domestic consumption, only 5% of the production output can be exported [XXIV].

Fig.4 then illustrates the average significance level of each key industry based on supply chain performance levels of interest.



**Fig.4:** Average significance level of key industries

At first, it shall be noted that among 5 ISIC, ISIC 22 is found to be the least concern on supply chain performance. The total average significant level of ISIC 22 is at 4.69 out of 7. Whilst ISICs 23, 10, 27, and 29 give importance to supply chain performance at an average level of 5.30, 5.21, 5.18, and 5.11, respectively. Figure 4 illustrates interestingly information that each industry concerns on different perspectives of the supply chain. For example, ISIC 21 is more focused on tactical level whilst ISIC 27 is more concerned about operations.

## V. Discussion

Whilst different industry concerns on different perspectives of supply chain performances, the following section summarises the issues of interest, focusing on specific indicators. Table 1 represents the most concern indicators of supply chain performance of the Thai industry, by ISIC. The indicators shown in Tables 1 are only those possessing much higher than the average. Oppositely, Table 2 represents supply chain indicators that are the least concerned by the Thai industry, by ISIC.

**Table 1: The most concern supply chain performances of interest of Thai industry by ISIC**

	Strategic Level	Tactical Level	Operational Level
<b>ISIC 10</b>	+ S11 Buyer-supplier partnership level	+ T10 Supplier's booking in procedures	+ O1 Cost per operation hour + O8 Frequency of delivery
<b>ISIC 21</b>	+ S9 Order lead time + S10 Flexibility of service systems to meet particular	T5 Purchase order cycle time T6 Planned process cycle time + T8 Supplier assistance in	+ O1 Cost per operation hour + O3 Capacity utilization

	Strategic Level	Tactical Level	Operational Level
	customer needs	solving technical problems T9 Supplier ability to respond to quality problems + T10 Supplier's booking in procedures + T11 Delivery reliability T12 Responsiveness to urgent deliveries + T13 Effectiveness of distribution planning schedule + T14 Supplier cost saving initiatives	+ O5 Supplier rejection rate + O7 Efficiency of purchase order cycle time
ISIC 22	N/A	N/A	N/A
ISIC 27	+ S11 Buyer-supplier partnership level + S15 Delivery performance	N/A	+ O6 Quality of delivery documentation + O7 Efficiency of purchase order cycle time + O9 Driver reliability for performance O10 Quality of delivery goods
ISIC 29	N/A	N/A	+ O5 Supplier rejection rate

**Table 2: The least concern supply chain performances of interest of Thai industry by ISIC**

	Strategic Level	Tactical Level	Operational Level
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	Strategic Level	Tactical Level	Operational Level
<b>ISIC 10</b>	N/A	N/A	- O5 Supplier rejection rate
<b>ISIC 21</b>	S11 Buyer-supplier partnership level	N/A	- O9 Driver reliability for performance
<b>ISIC 22</b>	S1 Total supply chain cycle time - S10 Flexibility of service systems to meet particular customer needs S11 Buyer-supplier partnership level S12 Supplier lead time against industry Norm	- T1 Total Accuracy of forecasting technique - T3 Order entry methods T5 Purchase order cycle time T6 Planned process cycle time - T7 Effectiveness of master production schedule - T8 Supplier assistance in solving technical problems T9 Supplier ability to respond to quality problems - T10 Supplier's booking in procedures - T11 Delivery reliability T12 Responsiveness to urgent deliveries	- O1 Cost per operation hour - O2 Information carrying cost - O4 Total inventory - O5 Supplier rejection rate - O6 Quality of delivery documentation O7 Efficiency of purchase order cycle time
<b>ISIC 27</b>	- S9 Order lead time S13 Level of supplier's defect free deliveries - S14 Delivery lead time	- T3 Order entry methods T5 Purchase order cycle time - T8 Supplier assistance in solving technical problems - T10 Supplier's booking in procedures - T11 Delivery reliability	N/A
<b>ISIC 29</b>	- S2 Total cash flow statement - S10 Flexibility of service systems to meet particular customer needs	N/A	O7 Efficiency of purchase order cycle time - O8 Frequency of delivery

It is suggestive that the food industry (ISIC 10) mostly concerns supply chain relationship, cost, and delivery frequency. Whilst, ISIC 21 gives significance in several supply chain indicators. This may be due to the nature of the industry that concerns health and wellness. Therefore, cycle time, quality and reliability of the supply chain seems are of interest. On the other hand, the rubber and plastic industry (ISIC 22) gives fewer concerns on supply chain performance, especially the supply chain partnership. The electronics and electrical industry (ISIC 27) concerns delivery

performance, documentation, and quality. However, delivery lead time and reliability are less significant. The automotive industry (ISIC 29) concerns supplier rejection rate but total cash flow statement, the flexibility of service systems to meet particular customer needs, the efficiency of purchase order cycle time and delivery frequency.

## **VI. Conclusion**

The paper investigates the significance level of supply chain performance concerned by the Thai industry. Based on 3 levels of the supply chain performance, i.e., strategic, tactical and operational, a total of 40 indicators are of interest. The result is based on 223 Thai manufacturing companies who had responded to the questionnaire. Firstly, the top 3 most and the top 3 least significant indicators of supply chain performance of the Thai industry are identified, classified based on the supply chain level. Then the investigation was conducted furthermore on 5 key industries. Then, the most and the least significant supply chain performance of these 5 industries was identified.

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