

# STRATEGIES FOR SUPPLY CHAIN MANAGEMENT IN THE INDUSTRIAL SECTOR OF THAILAND

**Nopporn Bua-In, King Mongkut's University of Technology North Bangkok**

## ABSTRACT

*Supply chain management is the key mechanism for business operation to achieve in the industrial sector by developing relationships and cooperation between organizations via modern information technology systems. The organization's operating system has been developed. The digital readiness and business agility can increase productivity by sharing resources. The data is analyzed for effective business decisions. The potential skills of personnel in all aspects are enhanced to become proficient in all areas, especially the language that is necessary for communication. The Big DATA analytics capabilities is developed for the operational personnel to support the decision of the management. It can also reduce the risks in working as well as being ready to deal with the changes in customer behaviors and future industry developments in terms of trade barriers and competitive pressure. This will enable the continuous business operation and will also create the ability to compete fiercely. The digital readiness and business agility are the key strategies set for Thailand's industrial business sector to have the potential to compete at the international level. The objective of this research was to study the strategies for supply chain management in the industrial sector of Thailand. The research population was executives in large industrial businesses and small and medium industrial businesses. The size of the sample group was determined for 500 persons. Both qualitative and quantitative researches were conducted using the Second Order Confirmatory Factor Analysis (SCFA). The qualitative research was conducted with the in-depth interview techniques and group discussion techniques. The hypothesis results were tested by conducting quantitative research. It was found that all 4 components had positive influence on the key strategies of Thailand's industrial sector with the statistical significance at the .001 level. The most influential factor was Integration Strategy, followed by Information Communication Technology Strategy, Knowledge Management Strategy and Agile Supply Chain Strategy, respectively. The Second Order Confirmatory Factor Analysis was correspondent and harmonized with the empirical data  $CMIN/P=.113$ ,  $CMIN/DF=1.121$ ,  $GFI=.960$ ,  $RMSEA=.016$ . The element weight was .93 – .98.*

**Keywords:** Knowledge Management, Agile Supply Chain, Information Communication Technology, Integration

## INTRODUCTION

The economic, social, and technological advancement affects the changing behavior of consumers on the global scale. The business with supply chain management that can respond the needs of consumers will be successful. In the industrial sector, there is the need for the process to build good relationships with customers, production flow management, purchasing efficiency, production cost reduction, productivity increase, and the ability to operate efficiently throughout the supply chain (Ditkaew, Pitchayatheeranart & Jermsittipasert, 2020). The current competitive situation in the global market creates challenges resulting in intense competition. Developing capacity and upgrading business capabilities to be efficient in the supply chain is therefore the approaches for highly profitable business. Supply chain management in the garment industry business in Turkey revealed that knowledge management and human resource development was an important part to enable effective and accurate control of operations throughout the supply chain as well as reducing errors and improving the supply chain efficiency (Kanat, & Atilgan, 2014). It also agrees with the study of Vanpoucke, Vereecke & Muylle (2017); Sabet, Yazdani & De Leeuw, (2017) discussing the strategy of supply chain integration in the industry and operating mechanism that affects the rapid response of the supplier system with innovation and differentiation of products and services. If an organization exchanges information with its

partners through the supply chain, it will result in better operational efficiency. This agreed with the 20-year strategy for the development of Thai Industry 4.0 (2017-2036). The vision has been set for Thai industry to move towards an industry that drives intelligence and connects to the global economy towards the future industry (New S-curve). It will enable Thailand's economy to grow to its full potential (Bureau of Industrial Economics, Ministry of Industry, 2021). Thai economic structure is connected to the world economy. The acceleration is necessary on the development of the ability to bring trade to the international level. The emphasis should be placed on improving and developing operations through the application of innovation and technology to effectively operate industrial businesses throughout the supply chain (Association for Supply Chain Management, 2020). With an economic structure that creates value and creates the body of knowledge based on the concept of "Thailand 4.0", the focus is on business organizations to use technology and innovation to reduce production costs, to be creative, and to focus on safety, social and environmental responsibility to meet the needs of customers and increase sustainable competitiveness. The emphasis is on the market demand as the key mechanism to drive added value. The support is also needed on the diversification of investments to the regions to expand the opportunities of entrepreneurs to the international level (Research Administration and Educational Quality Assurance Division Institute for the Promotion of Knowledge Management for Society, 2021).

Meanwhile, the preparation of organizations in the Thai industrial sector still encounters problems and obstacles in the development of knowledge and competence of personnel to improve work efficiency in supply chain management in the industrial sector of Thailand especially in terms of personnel readiness, digital knowledge, readiness of technology and innovation (Office of the National Economic and Social Development Board Prime Minister's Office, 2017). This was correspondent with the World Talent Ranking of the International Institute for Management Development (IMD) 2019 stating about the industrial business sector of Thailand that there was the delay in preparing to develop the capacity to manage the industrial business sector in 3 issues; 1) the readiness of talented personnel, training, education on knowledge and skills necessary for adapting to changes all the time and can be applied to work together in a systematic way in the supply chain. It was found that the readiness was at a low level. The factors that need to be developed urgently are Language skills. 2) Digital readiness and business and social agility was based on digital capabilities, technology, and future readiness. It was found that the factor ranked the best was technology, followed by digital knowledge and future readiness. 3) The readiness to adapt in information technology and innovation was used to be operated in conjunction with the supply chain system. It was found to be at the moderate level. The industrial business sector has continuous development plans in this area (World Competitiveness Center, 2019).

In terms of GDP growth rate of Thailand, there is the tendency to decrease and fluctuate continuously. According to the GDP growth rate report of Thailand, it was found that GDP in the first quarter of 2021 decreased by 2.6 percent, improving after the decrease of 4.2 percent in the fourth quarter of 2020. In the past, the country investment was accelerated. The government final consumption expenditure continued to expand. The exports of goods were improved. Revenue from foreign services continued to decline. However, the new wave of the coronavirus disease 2019 (COVID-19) pandemic that began in late 2020 has affected private final consumption expenditure (Bureau of Industrial Economics Ministry of Industry, 2021). From the above issues, the industrial sector of Thailand needs to prepare human resources to build competitiveness and achieve international success. The researcher was interested in studying the strategies for supply chain management in the industrial sector of Thailand that lead to the preparation and development of personnel to enter the international market by defining the strategies of the industrial business sector at corporate, business and duty levels. Transforming the infrastructure economy to the knowledge-driven industry improves work efficiency according to international standards to create the sustainable competitive advantage and achievement of the industrial sector in the future.

## LITERATURE REVIEW

### Knowledge Management

It is the ability of knowledge management, knowledge creation process, knowledge exchange, and knowledge sharing to increase the competitiveness of the integrated organization with the focus on improving knowledge, proficiency in strategic planning, and management of information technology in the supply chain to reduce the total cost of the organization as well as increasing the operational efficiency (Chkanikova, 2016; Daghfous & Zoubi, 2017). This is to create efficiency and reduce the total cost of the organization based on social and environmental responsibility under ethical principles and good management both internally and externally towards sustainable development (Rashed, Azeem & Halim, 2010). It is to convey and share knowledge in cooperating and joining the alliance as well as improving the supply chain efficiency. The knowledge management is an important variable in the supply chain affecting the efficiency of an organization and must be able to accurately and appropriately convey across the supply chain (Kanat & Atilgan, 2014). The investment in information technology in the management of information and knowledge in the supply chain are also the decision-making tools in the formulation of knowledge management strategies. The management and cost management makes it possible to quickly implement effectively (Hofmann & Belin, 2011). It can also improve the efficiency of the supply chain in the data management, affect the efficiency of the supply chain and corporate profitability (Qrunfleh & Tarafdar, 2017).

*H1: The element of Knowledge Management Strategy has positive influence on the supply chain management in the industrial business of Thailand.*

### Agile Supply Chain

Developing competitiveness through building an organization and supply chain with business agility emphasizes the linkage among members in the supply chain to achieve the objective of delivering products or services to customers at a low cost and with minimal loss. The goal is to design and develop the supply chain structure to create flexibility (Saini, 2015). The high agility can restructure the processes and forms of relationships with internal and external organizations in response to changes. This can increase competitiveness with high business agility (Oloruntoba & Gray, 2006). Under the pressure of customer's demand, the ability to cope with change, agile and quickly adaptive structure to network relationships, collaborations with external organizations, and use of people and information appropriately and efficiently can create new ideas faster than competitors (Al-Doori, 2019). The organization's ability to quickly adjust strategies and operations in the supply chain can turn crises into opportunities such as predictability (Baramichai, Zimmers & Marangos, 2007). It can also respond to customer's demand for goods or services with increasing volatility in demand as well as creating competitive advantage against the wide range of rapidly changing demands at the lowest cost (Qrunfleh & Tarafdar, 2013).

*H2: The element of Agile supply Chain Strategy has positive influence on the supply chain management in the industrial business of Thailand.*

### Information and Communication Technology

Applying knowledge of information, technology, and new innovations to the operations of the organization throughout the supply chain enhances strategic relationship skills to optimize supply chain operations. It makes analysis and decision-making fast and efficient as business strategy for purchase order management and inventory tracking (Tarafdar & Qrunfleh, 2017). It is also the integrated supply chain management tool to be taken and formulated as collaborative strategy to increase operational efficiency, reduce costs, and improve customer service (Swanier, 2016). Exchanging the supply chain management information efficiently and quickly

can reduce the costs, improve customer service, and increase organizational speed of delivery and reliability (Daneshvar Kakhki & Gargeya, 2019). The organizations should have integrated information exchange throughout their supply chain by managing business information in real time through information technology systems. The coordination throughout the supply chain can improve the value of products and services making the response of customers quickly and creating sustainable competitive advantage (Vanpoucke, Vereecke & Muylle, 2017). Applying information technology to supply chain management and accessing to important business information result in successful supply chain management (Saleh & Roslin, 2015).

*H3: The element of Information and Communication Technology Strategy has positive influence on the supply chain management in the industrial business of Thailand.*

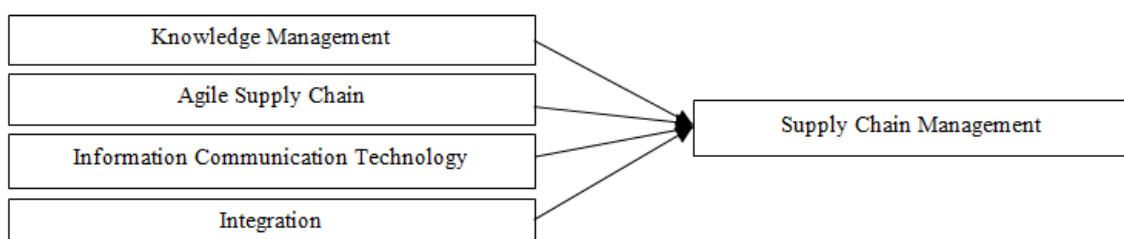
## Integration

The structure and characteristics are similar to Systems Theory which consists of various sub-sections that work altogether. There is the understanding on the work Performance which can be measured altogether (Chikere & Nwoka, 2015). It is the collaboration in the organization and between organizations to develop common strategies by applying solutions to problems through cooperation from internal personnel, cooperation from the sellers, and cooperation from customers (Huo, Qi, Wang & Zhao, 2014). This can develop and improve the organization to achieve common business objectives through an integrated business process. The relationship management and business cooperation throughout the supply chain with the participation of all parties in the operation can support one another networking and cooperation as a business partner in the supply chain process. The supporting network with expertise, skills and experienced persons is provided to increase the efficiency and control costs (Sabet, Yazdani & De Leeuw, 2017). Information is shared internally and externally and strategic business relationships are managed with organizational, operational design, and performance measurement (Flynn, Huo & Zhao, 2010). It is integrated to the Quality Management System (ISO 9001), Environmental Management System (ISO14001) and Health Management System or Occupational Health and Safety Management System altogether to standardize the performance of the supply chain (Ribeiro, Santos, Rebelo & Silva, 2017).

*H4: The element of Integration Strategy has positive influence on the supply chain management in the industrial business of Thailand.*

The literature review and the aforementioned research hypothesis lead to the study of factors influencing business strategy formulation in the industrial sector of Thailand. It is to improve the efficiency of work according to international standards and create competitiveness. The researcher has set the objectives and research framework as follows.

Research Objective: To study the factors influencing the strategies for supply chain management in the industrial sector of Thailand.



**FIGURE 1**

**RESEARCH CONCEPTUAL FRAMEWORK PRESENTING THE RELATIONSHIP OF STRATEGIES FOR SUPPLY CHAIN MANAGEMENT IN THE INDUSTRIAL SECTOR OF THAILAND**

## RESEARCH METHODOLOGY

The population used in the qualitative research with in-depth interview techniques consisted of 9 experts using the method of specific sampling from the specialists who are executives in the industrial business organizations with at least 15 years of working experience in supply chain management, graduating at least the master's degree and taking part in formulating corporate policies in industrial business organizations and academic experts graduated in business administration, supply chain management or logistics with the doctoral degree. The population in the quantitative research consisted of the executives in large, medium and small business organizations in the industrial sector registered as juristic persons and still performing the operation as of May 2020 from the Department of Business Development totaling 768,371 persons (Department of Business Development, 2020). The criteria used in selecting the industries according to the asset value according to the Ministry of Industry regulations on the employment schedule and fixed asset value B.E.2545 by stipulating multi-stage sampling consisting of cluster sampling by categorizing industrial. The business was categorized into 2 sizes; 1) large industrial business, 2) medium and small industrial business. The Probability Sampling was used on both groups to determine the research samples. The researcher used the criteria of the research type of elemental analysis or structural equation modeling. The very good 500 samples were selected (Comrey & Lee, 1992) using Probability Sampling. The qualitative research was conducted with group discussion techniques to support the study results selecting the specific sample group of 7 people by means of selecting sampling from those who have worked in supply chain management for not less than 10 years, graduated not less than the master's degree, and taking part in formulating corporate policies in industrial business organizations.

The research instruments were questionnaires created from qualitative research with in-depth interview techniques to gain new knowledge which was the current information. The questions were consistent with the four strategies of supply chain management in the industrial sector of Thailand. The questions were in the forms of checklist and estimation scales in five levels of weighting criterion according to the Likert Scale method. From the analysis results, the standard deviation was 0.31–2.24. The question items were of an estimation scale with the values of 0.31–0.90. The reliability analysis of the questionnaire by finding Cronbach's alpha coefficient was 0.99.

In collecting the quantitative data, the researcher collected the questionnaires until the number of questionnaires were reached. The 500 samples were the executives in large, medium and small business organizations. The questionnaires were sent by mail, online, and requested to distribute the questionnaires by hand. The researcher used the fundamental statistics and the Second Order Confirmatory Factor Analysis (SCFA) assisted with the IBM SPSS AMOS software package. The improvement of constituent values according to the empirical data was based on Arbuckle's recommendation (2012). The consideration was made on the value of the results obtained from the program with theoretical academic principles to eliminate some improper observational variables one by one. The new model processing was performed continually until the model with all four statistical values were obtained; (1) Chi-square Probability level with  $p$  (CMIN/P) > 0.05 (2) Relative Chi-square (CMIN/DF) < 2 (3) Goodness of Fit Index (GFI) > 0.90, and (4) Root Mean Square Error of Approximation (RMSEA) < 0.08, respectively. Thus, the structural equation model was considered to be in perfect harmony with the empirical data.

## RESEARCH RESULTS

Most of the business features were found in the manufacturing sector, such as the automotive industry, industrial material products, steel industry, packaging industry, paper industry, petrochemical industry, chemical industry, biochemical industry, food industry, and

agricultural products (accounting for 56.4%). According to the investment features, most of them are investments from Thai and foreign joint venture companies (accounting for 64.4%) with the total average income of more than 500 million baht or more (accounting for 61.8%). The business period was more than 10 years (accounting for 48%). The administration and management of organizations was mostly certified according to International Organization for Standardization (accounting for 80.6%), respectively.

For the characteristics of supply chain management in the industrial business sector, it was found that most of them were used in the operational planning process, namely, sales planning, raw material purchase planning, production planning, number of people planning, delivery planning, etc. (accounting for 62.4%). The organizations need personnel with knowledge and expertise essentially to support and promote successful supply chain management for the business sector (accounting for 66.2%). The information technology system has been applied for communication (accounting for 57.8%). The ability to communicate and manage the entire supply chain from executives included the action plans to reduce costs, increase profits, and increase sustainable competitiveness (accounting for 81%). The obstacles that affected the organization's supply chain management were the lack of personnel with knowledge in supply chain, lack of support for information technology and innovation to apply in operations (accounting for 60.8%), respectively.

The analysis results on the strategies for Supply Chain Management in the industrial sector of Thailand were as shown in Table 1 as follows:

| <b>Strategies for Supply Chain Management in the industrial sector of Thailand</b> | <b>Large business</b> |      |                            | <b>Medium and small business</b> |      |                              |
|--|-----------------------|------|----------------------------|----------------------------------|------|------------------------------|
|  | $\bar{x}$             | S.D. | <b>Level of importance</b> | $\bar{x}$                        | S.D. | <b>Level of significance</b> |
| Overview   | 4.22                  | .45  | High                       | 4.00                             | .52  | High                         |
| 1. Knowledge Management Strategy   | 4.19                  | .46  | High                       | 3.93                             | .56  | High                         |
| 2. Agile supply Chain Strategy   | 4.27                  | .46  | High                       | 4.05                             | .49  | High                         |
| 3. Information Communication Technology Strategy                                   | 4.26                  | .50  | High                       | 4.10                             | .58  | High                         |
| 4. Integration Strategy  | 4.18                  | .54  | High                       | 3.97                             | .56  | High                         |

Table 1 showed the mean and standard deviation of the strategies for Supply Chain Management in the industrial sector of Thailand. From the analysis of large businesses, it was found that the overall picture was of high importance. The mean was 4.22. Considering each strategy, it was found that the Agile supply Chain Strategy was of high importance with the mean of 4.27, followed by Information Communication Technology Strategy. It was of high importance. The mean was 4.25. Knowledge Management Strategy was of high importance. The mean was 4.19. The Integration Strategy was of high importance with the mean of 4.18, respectively. For the small and medium-sized business, it was found that the overall significance was at the high level with the mean of 4.00. When considering each strategy, it was found that the Information Communication Technology Strategy was of high importance with the mean of 4.10, followed by Agile supply Chain Strategy. It was of high importance. The mean was 4.05. The Integration Strategy was very important with the mean of 3.97. The Knowledge Management Strategy was of high importance with the mean of 3.93, respectively.

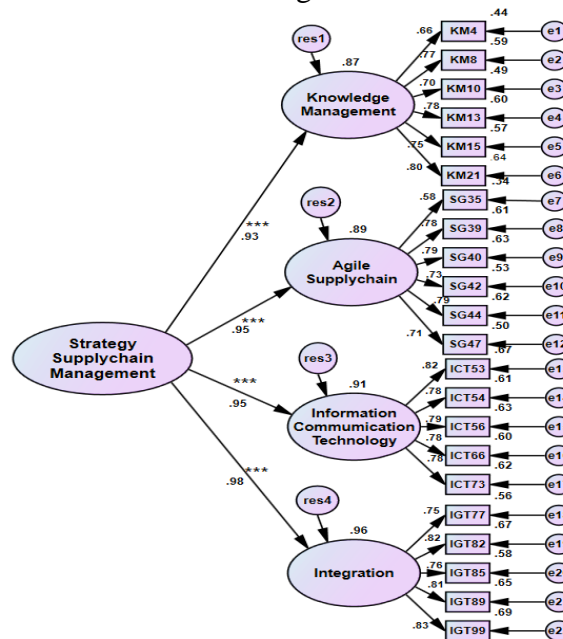
According to the results of Second Order Confirmatory Factor Analysis (SCFA), it was found that the criteria for harmonization with the empirical data were not yet passed. The researcher therefore proceeded to improve the model by considering the Modification Indices Arbuckle (Arbuckle, 2012). The value of results obtained from the packaged program was considered with theoretical academic principles to eliminate some improper observational variables one by one. Then, the new model evaluation was performed continually until the

model was obtained with all 4 statistical values. The model was therefore considered to be in harmony with the empirical data as shown in Table 2.

| Statistical index | Criteria | Pre-improvement | Post-improvement |
|-------------------|----------|-----------------|------------------|
| Chi-Square        | >0.05    | 0.000           | 0.113            |
| CMIN/DF           | < 2.00   | 2.286           | 1.121            |
| GFI               | >0.90    | 0.608           | 0.960            |
| RMSEA             | <0.08    | 0.051           | 0.016            |

Table 2 showed that the analysis of this empirical data was consistent with the theoretical measurement model which was the strategies for Supply Chain Management in the industrial sector of Thailand. The positive influence was obtained with statistical significance at the 0.001 level coming from the latent variables which were all 4 components of the strategies passing the assessment criteria. It was represented by the following statistics: CMIN/P=0.113, CMIN/DF=1.121, GFI=0.960, RMSEA=0.016.

The results of Second Order Confirmatory Factor Analysis (SCFA) revealed that there were four factors influencing the strategies for Supply Chain Management in the industrial sector of Thailand. The most influential factor was the Integration Strategy, followed by the Information Communication Technology Strategy, the Knowledge Management Strategy and the Agile Supply Chain Strategy, respectively. There were 22 questionnaires that were consistent with the empirical data as shown in Figure 2.



Chi-square = 229.814, df = 205, p = .113  
CMIN/DF = 1.121, GFI = .960, RMSEA = .016

\*\*\* Statistically significant level at .001

**FIGURE 2**  
**RESULTS OF SECOND ORDER CONFIRMATORY FACTOR ANALYSIS ON THE FACTORS INFLUENCING THE STRATEGIES FOR SUPPLY CHAIN MANAGEMENT IN THE INDUSTRIAL SECTOR OF THAILAND IN THE STANDARDIZED ESTIMATE MODE AFTER THE MODEL IMPROVEMENT**

**DISCUSSION AND CONCLUSION**

The results of this research showed that all elements influenced the strategies for Supply Chain Management in the industrial sector of Thailand. It indicated that the research findings could be used as the key criterion for formulating supply chain management strategies in the industrial sector of Thailand. The strategies were able to apply to prepare personnel, digital readiness, business and social Agility, and readiness to adapt to information technology and innovation. The emphasis was placed on building competitiveness, improving and increasing the efficiency of Thai industrial supply chains to the world trade arena (Chkanikova, 2016; Oloruntoba, & Gray, 2006). According to the hypothesis test, Knowledge Management strategy was found to have positive impact on supply chain management in the industrial sector in Thailand. It was important to the operation of the business allowing the organization to be more agile in its operations and able to adapt quickly to meet the needs of the customers. It was consistent with the organization's ability to manage knowledge management to increase the competitiveness of an integrated organization (Chkanikova, 2016; Sabet, Yazdani & De Leeuw, 2017), specializing in strategic planning (Daghfous & Zoubi, 2017) which was effective and cost-effective for the organizational integration (Rashed, Azeem & Halim, 2010). It was the key variable that drove the organizations in the supply chain affecting organizational efficiency throughout the supply chain (Kanat, & Atilgan, 2014). It was the tool to help formulating the knowledge management strategies, management and cost efficiency (Hofmann & Belin, 2011). It could also be applied to improve supply chain efficiency in data management and organizational profitability (Qrunfleh & Tarafdar, 2017). The Agile supply chain strategy had positive influence on supply chain management in the industrial sector of Thailand. It empirically showed that Agile supply Chain Strategy affected supply chain management in the industrial sector of Thailand by developing the capabilities of the organization with business agility. It must be an organization that was highly flexible, able to modify the structure processes and formed relationships with internal and external organizations in response to change which could develop into international competition (Saini, 2015). This was correspondent with the goal setting in the design and development of the supply chain structure to create agility highly in order to modify the structure processes and form relationships with internal and external organizations in response to changes and increasing competitiveness (Oloruntoba & Gray, 2006). The networking of relationships and cooperation with external organizations as well as utilizing people and data appropriately and efficiently could innovate ideas faster than competitors (Al-Doori, 2019). This quickly adjusted strategies and operations in the supply chain. It could turn crises into opportunities (Baramichai, Zimmers & Marangos, 2007) in order to respond to customer needs and create competitive advantage at the lowest cost (Qrunfleh & Tarafdar, 2013). The Information and Communication Technology strategic component had positive influence on the supply chain management in the industrial sector in Thailand. It showed empirically that the Information and Communication Technology strategy affected supply chain management in the industrial sector of Thailand. In the relationship of supply chain partners, the business information was an important asset for supply chain management relaying of information sharing and data control. It agreed with the application of information technology, knowledge and innovation in the organization's operations throughout the supply chain. It also helped developing the inter-strategic relationship skills (Tarafdar & Qrunfleh, 2017). It was defined as collaborative strategy to increase operational efficiency (Swanier, 2016), increase delivery speed and enterprise reliability (Daneshvar Kakhki & Gargeya, 2019; Vanpoucke, Vereecke & Muylle, 2017). Applying information technology to supply chain management and access to important business information resulted in successful supply chain management (Saleh & Roslin, 2015). The strategic component integration positively influenced the supply chain management in the industrial sector in Thailand. It showed empirically that the integration strategy affected supply chain management in the industrial sector of Thailand. The competitiveness and profitability of an organization depended on the formulation of strategies to meet market demands. Integrated relationship management in development continuously improve products and services according to international standards.



This corresponded to the System Theory which described how to work altogether under an understanding, organizational and inter-organizational cooperation to develop the joint strategies (Chikere & Nwoka, 2015; Huo, Qi, Wang & Zhao, 2014). This is to achieve common business objectives through integrated business processes. The internal and external information is shared and strategic business relationship is managed (Flynn, Huo & Zhao, 2010). The Quality Management System (ISO 9001) is provided with the Environmental Management System (ISO14001) and the Occupational Health and Safety Management System to standardize the way the supply chain works (Ribeiro, Santos, Rebelo & Silva, 2017).

The strategies for Supply Chain Management in the industrial sector of Thailand are the important goals in formulating the strategies to manage the new industrial business sector focusing on the development of operational processes throughout the supply chain. There is the link to the relationship of all departments in the organizations to coordinate and collaborate through information technology systems. The productivity is increased by sharing resources. The data is analyzed for effective business decisions. The emphasis is put on the development of language skills, especially English and Chinese, and the development of personnel's knowledge and abilities particularly multi-skilled abilities. Therefore, organizations must focus on personnel development of skills in order to become proficient in all areas. The internal training or training outside the organizations should be provided by the institutions to meet international standards. In this regard, it is necessary to focus on the development of information technology. It is an important business tool to increase efficiency for operations throughout the supply chain as well as being able to analyze Big Data and support executive decision-making. This is to simplify with the ability to meet customer demands that change in new behaviors quickly. The organizations need to consider trade barriers and competitive pressures which are important for the development of the industry in the future. This includes the risk management plans for business crises with the ability to respond to events quickly. The organizations must also be able to deal with the risks that will damage the business in order to be able to operate the business continuously and still create the ability to continue competitive.

## ACKNOWLEDGEMENT

Dr.Nopporn Bua-In is an Assistant Professor at King Mongkut's of Technology North Bangkok, Thailand. His email address is nopporn.b@fba.kmutnb.ac.th.

## REFERENCES

- Al-Doori, J.A. (2019). The impact of supply chain collaboration on performance in automotive industry: Empirical evidence. *Journal of Industrial Engineering and Management*, 12(2), 241-253.
- Arbuckle, J.L. (2012). *IBM SPSS Amos 21 User's Guide*. U.S.A.: IBM Corporation.
- Association for Supply Chain Management. (2020). *The essential supply chain reference*. In *APICS Dictionary (16<sup>th</sup> ed.)*.
- Baramichai, M., Zimmers, E.W., & Marangos, C.A. (2007). Agile supply chain transformation matrix: an integrated tool for creating an agile enterprise. *Supply Chain Management: An International Journal*.
- Bureau of industrial economics ministry of industry. (2021). *Gross Domestic Product : Q2/2021*.
- Chkanikova, O. (2016). *Sustainable supply chain management in food retailing: Insights into corporate practice of managing supplier relationships* (Doctoral dissertation, University of Lund).
- Comrey, A., & Lee, H. (1992). *A first course in factor analysis (2<sup>nd</sup> edn.)* Lawrence Earlbaum associates. Publishers: Hillsdale, New Jersey.
- Daghfous, A., & Zoubi, T. (2017). An auditing framework for knowledge-enabled supply chain management: Implications for sustainability. *Sustainability*, 9(5), 791.
- Daneshvar Kakhki, M., & Gargeya, V.B. (2019). Information systems for supply chain management: a systematic literature analysis. *International Journal of Production Research*, 57(15-16), 5318-5339.
- Department of business development. (2020). *Business registration for the month of May 2020*.
- Ditkaew, K., Pitchayatheerant, L., & Jermstipisert, K. (2020). The causal structural relationships between accounting information system quality, supply chain management capability, and sustainable competitive advantages of maize.

- Flynn, B.B., Huo, B., & Zhao, X. (2010). The impact of supply chain integration on performance: A contingency and configuration approach. *Journal of operations management*, 28(1), 58-71.
- Hofmann, E., & Belin, O. (2011). *Supply chain finance solutions* (644-645). Springer-Verlag Berlin Heidelberg.
- Huo, B., Qi, Y., Wang, Z., & Zhao, X. (2014). The impact of supply chain integration on firm performance: The moderating role of competitive strategy. *Supply Chain Management: An International Journal*.
- Kanat, S., & Atilgan, T. (2014). Effects of knowledge management on supply chain management in the clothing sector: Turkish case. *Fibres & Textiles in Eastern Europe*, 1(103), 9-13.
- Office of the national economic and social development board prime minister's office. (2017). *Innovation leads to the future of the country*.
- Oloruntoba, R., & Gray, R. (2006). Humanitarian aid: An agile supply chain?. *Supply Chain Management: an international journal*.
- Qrunfleh, S., & Tarafdar, M. (2013). Lean and agile supply chain strategies and supply chain responsiveness: the role of strategic supplier partnership and postponement. *Supply Chain Management: An International Journal*.
- Rashed, C.A.A., Azeem, A., & Halim, Z. (2010). Effect of information and knowledge sharing on supply chain performance: a survey based approach. *Journal of Operations and Supply Chain Management*, 3(2), 61-77.
- Research Administration and educational quality assurance division institute for the promotion of knowledge management for society. (2021). *Blueprint Thailand 4.0 Model Driving Thailand towards Wealth, Security and Sustainability*.
- Ribeiro, F., Santos, G., Rebelo, M.F., & Silva, R. (2017). Integrated management systems: Trends for Portugal in the 2025 horizon. *Procedia Manufacturing*, 13, 1191-1198.
- Sabet, E., Yazdani, N., & De Leeuw, S. (2017). Supply chain integration strategies in fast evolving industries. *The international journal of logistics management*.
- Saini, M. (2015). *A framework for transferring and sharing tacit knowledge in construction supply chains within lean and agile processes* (Doctoral dissertation, University of Salford).
- Saleh, Z.M., & Roslin, R.M. (2015). Supply chain integration strategy: a conceptual model of supply chain relational capital enabler in the Malaysian food processing industry. *Procedia-Social and Behavioral Sciences*, 172, 585-590.
- Swanier, W.A. (2016). *Strategies for implementing a successful enterprise resource planning system* (Doctoral dissertation, Walden University).
- Tarafdar, M., & Qrunfleh, S. (2017). Agile supply chain strategy and supply chain performance: complementary roles of supply chain practices and information systems capability for agility. *International Journal of Production Research*, 55(4), 925-938.
- Vanpoucke, E., Vereecke, A., & Muyllle, S. (2017). Leveraging the impact of supply chain integration through information technology. *International Journal of Operations & Production Management*.
- World Competitiveness Center. (2019). *IMD World Talent Ranking 2019*.