

How to Cite:

Unkaew, W., & Hotrawaisaya, C. (2022). Sustainable supplier selection in electrical and electronics industry in Thailand. *International Journal of Health Sciences*, 6(S4), 3084–3096. <https://doi.org/10.53730/ijhs.v6nS4.9892>

Sustainable supplier selection in electrical and electronics industry in Thailand

Wilailak Unkaew

College of Logistics and Supply Chain Management, Suan Sunandha Rajabhat University, Thailand

Email: s59484923004@ssru.ac.th

Chattrarat Hotrawaisaya

College of Logistics and Supply Chain Management, Suan Sunandha Rajabhat University, Thailand

Corresponding author email: chattrarat.ho@ssru.ac.th

Abstract---The purpose of this research is to study the causal structure relationship of Sustainable Supplier Selection (SUP) and Competitive Advantage (CA) affecting firm performance (FP) of business operators in the electrical and electronics (E&E) industry. The population and samples were 418 electrical and electronic business operators in Thailand who were members of the Electrical and Electronics Institute (EEI). The research results revealed that SUP, CA and FP in the electrical and electronics industry in Thailand from all questionnaires were at a high level. The model fit indexes modified were empirically and highly appropriate. Results from the final model analysis found that all observed variables were statistically related to latent variables and the error in standardized residuals was less than ± 2.58 , indicating that the latent variables were internally consistent with the empirical data.

Keywords---sustainable supplier selection, competitive advantage, firm performance.

Introduction

In the 21st century, sustainable development in industrial organizations is becoming one of the ideas that are gaining attention around the world due to changes in important economic and environmental regulations. Environmental conservation has become indispensable due to climate change shortage of natural resources population increase and the severity of global warming problems (Prachayapipat et al., 2022). These raise serious concerns about sustainable supply chain management (SSCM) for businesses. Supplier assessment and

selection play an important role in SSCM in making appropriate procurement decisions (Zolfani et al., 2019) as well as proper supplier selection will bring success to the company. How to choose an efficient supplier is essential to the survival of a business in the volatile business competition situation (Mukherjee, 2014). Businesses need to streamline their supply chains to diversify risks. This means situational volatility which leads to reduced operational efficiency (Sinrat & Atthirawong 2014). Choosing the right supplier is one of the most important tasks for an organization as it reduces procurement costs and increases capacity in corporate competition (Nguyen et al., 2016).

The environment of the electrical and electronics industry is rapidly changing and highly competitive. Therefore, it is necessary for the company to strive for competitive advantages and supply chain agility. Assessing and selecting sustainable and appropriate suppliers are an important decision-making decision that plays an important role in sustainable supply chain management (Foroozesh et al., 2018). An important supply chain strategy is choosing the right suppliers that are able to deliver quality parts that can be used in the manufacturing process, leading to more sustainability in the supply chain and reducing procurement costs that will enable manufacturers to create higher quality products at lower prices (Ghassemi et al., 2018). Therefore, the right supply chain can be an important tool to gain competitive advantage and environmentally friendly sustainable supplier selection process. These are a key factor affecting the level of overall supply chain sustainability (Azadnia et al., 2012).

The environment of the electrical and electronics industry is rapidly changing and highly competitive. Therefore, it is necessary for the company to strive for competitive advantages. Supply chain agility and appropriate supplier selection are an important decision-making decision that plays an important role in sustainable supply chain management (Foroozesh et al., 2018). Consequently, to achieve sustainability in every step of the organization's supply chain, purchasing raw materials from sustainable suppliers is an important part. In choosing a sustainable supplier, the sustainability risk from the supplier must also be taken into account (Gold and Awasthi, 2015). Sustainable supplier selection processes also play an important role in the sustainability of production, continuity distribution, and success in business. With today's business environment becoming increasingly complex and uncertain (Srisawat and Aunyawong, 2021), businesses face intense competitive pressure to carry out business activities with service value and reasonable prices (Nualkaw et al., 2021; Phrapratanporn et al., 2022). This makes it necessary to adapt to increase capacity and continually improve operations of the firms. Hence, it is important to measure the company's firm performance constantly (Taouab and Issor, 2019).

Research objectives

1. To study the relationship of sustainable supplier selection and competitive advantage that affects the firm performance in the electrical and electronic industry in Thailand
2. To study the relationship of competitive advantage and firm performance in the electrical and electronic industry in Thailand

3. To present guidelines for sustainable supplier selection and development of supplier selection criteria to help increase firm performance in the electrical and electronic industry in Thailand

Literature review

Sustainable supplier management is one of the most important activities in the strategic implementation of sustainable supply chain management. For sustainable supply chain management, suppliers must improve environmental and social performances in addition to economic performance (Öztürka and Özçelikb, 2014; Aunyawong et al., 2021). Sustainable supplier selection is an essential part of sustainable supplier management. This depends on the main criteria and several sub-criteria used for selection. There are 3 main criteria: 1. Economy, 2. Environment, and 3. Society. The selection criteria for suppliers are not based on low-price offers only, but it also depends on the quality of the supplier's product, advanced technology, on time delivery, flexibility, good relationship, compliance management system, and environmental and social standards. These lead to supply chain performance of manufacturing industry (Wisedsin et al., 2020). A framework for assessing sustainable supplier selection depicts 22 criteria and three dimensions (economy, environment, and society). The study found that environmental costs, product quality, price, occupational health, and safety systems and environmental performance were ranked as the most effective sustainable supplier selection criteria for supply chain sustainability and market competitiveness (Sunil et al., 2017). According to the RBA Code of Conduct, it covers issues such as human rights, health and safety, business ethics, environmental system, and management. Supplier assessment and selection are part of the conditions and requirements of the customer to be included in the sustainable supplier selection and evaluation criteria (Kuo et al., 2015). Consistently, RBA in the electronics supply chain in Malaysia found that RBA not only improved the working conditions of the electronics industry, but also strengthen the relationship between the participants and the local community. However, it is important that the code of conduct does not affect the operations of the company and can also create mutually beneficial relationships between customers and suppliers (Hee, 2014).

Competitive Advantage

In the past, researches on the concept of competitive advantage have been numerous. Porter (1985) proposed the concept of a competitive strategy to create a competitive advantage with the organization. The concept is divided into 3 strategies: differentiation, cost leadership, and focus. The "value chain" is a fundamental tool for analyzing sources of competitive advantage. The approach to competitive advantage encompasses seeking new perspectives in the market while maintaining current advantage. An effective strategy is based on adapting to the competition properly by focusing on the customers or use of the perspective of a competitor to assess how to achieve a competitive advantage (Day & Wensley, 1988). In addition, promotional strategies have a positive and significant influence on the competitive advantage and promotion strategies can help create a huge competitive advantage. In addition, competitive advantage has a positive and

significant influence on marketing achievement (Yasa et al., 2020; Aunyawong et al., 2020; Pintuma & Aunyawong, 2020).

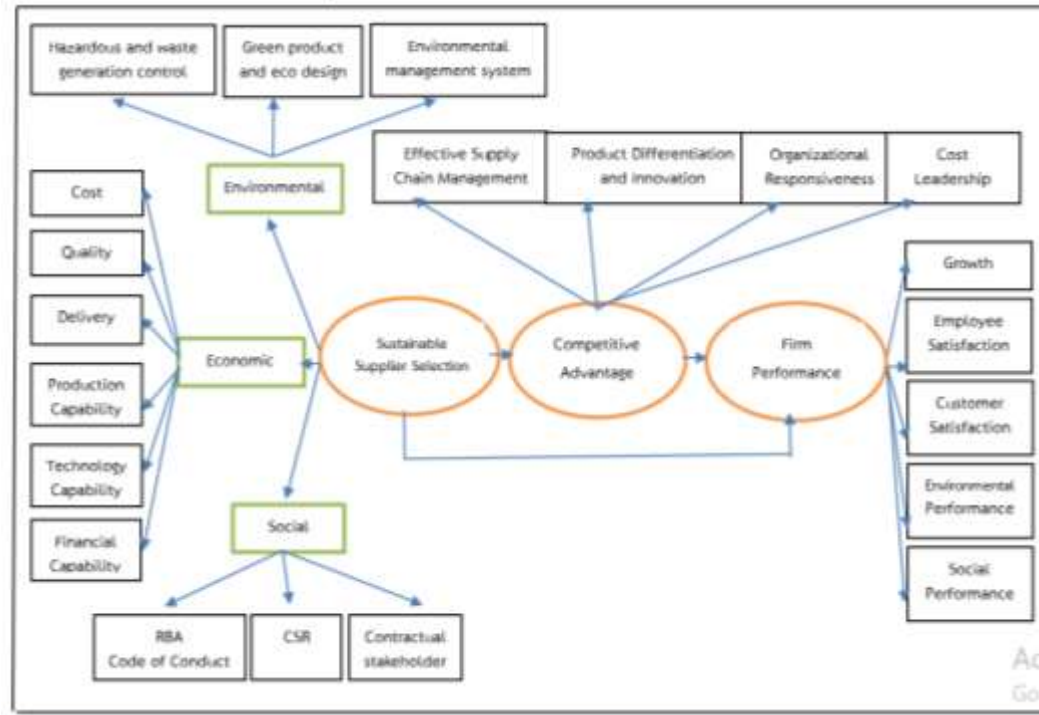
Businesses in a rapidly changing market environment can be considered in 3 forms of competitive advantages: external environment, resources within the company, and core competencies (Reuben, 2015). Knowledge management is a tool to integrate sustainable competitive advantages, such as the knowledge collection, creating development, and distribution. Knowledge management affects the process in maintaining a competitive advantage (Mahdi and Yao, 2011). Especially, the environment of the electronics industry is rapidly changing and highly competitive. The company must strive to gain competitive advantage. Supply Chain Agility is a tool that helps companies achieve a competitive advantage (Bak Aun & Abu, 2017). The key success factors of sustainable competitive advantage are 1) efficient supply chain management, 2) product differentiation and innovation, 3) organizational responsiveness, and 4) cost leadership (Vinayan et al., 2012). These are consistent with study on electrical industry in Malaysia which found that lower cost advantage has the highest effect on competitive advantage, followed by a differentiation advantage (Kuo et al., 2017).

Firm Performance

Performance measurement is extremely important in effective management of an organization. A well-performing company can generate high profits and, over the long term, will create more employment opportunities and improve employee earnings. In addition, the company's financial profitability will increase employee rewards and result in better production quality, enabling customers to receive quality products. Therefore, performance measurement is important for effective firm performance in order to bring the results to adjust the organization's strategy and improve management to predict future internal and external situations to check the status and actions in relation to the goals and use them as information for decision making at the desired time (Taouab and Issor, 2019).

Profitability, business growth, and market value complement each other. Profitability measures a company's historical ability to generate returns (Glick et al., 2005). For performance by market perspective, organizations that are able to achieve the goal of customer satisfaction by performing operations are more efficient and effective than competitors (Kotler, 1984; Phrapratanporn et al., 2019). Performance measurement is a measure of the efficiency of business operation to know the facts of the situation and the efficiency of the business in order to see the operational ability and improve the efficiency in relation to each situation (Lebas, 1995). Therefore, good performance management will result in an efficient firm performance (Herri, 2011). Firm performance is 1) Profit, 2) Growth, 3) Employee Satisfaction, 4) Customer Satisfaction, 5) Environmental Performance, and 6) Social Practice (Santos & Brito, 2012). A financial performance measurement perspective is profitability, growth and market value. From a strategic performance perspective is employee satisfaction, customer satisfaction, and environmental and social performances (Selvam et al., 2016).

Research conceptual framework



Research hypotheses

H1: Sustainable supplier selection directly affects competitive advantage.

H2: Competitive advantage directly affects firm performance.

H3: Sustainable supplier selection indirectly affects firm performance.

Research Methodology

The research was used an explanatory mixed method design, with the population being companies in the electrical and electronics industry in Thailand. For quantitative research, structural equation modeling (SEM) was used as a data analysis tool. A sample size of 418 was determined, as suggested by Hair et al. (2010) and Comrey & Lee (1992)'s criteria, and was based on probability sampling with simple sampling. The questionnaire was used as the instrument to collect quantitative data for this research. Questionnaires were rated on a 5-level scale with the interpretation criteria of Best and Kahn (2006, p. 343). The qualitative research was an in-depth interview with 10 key informants related to select the sample in qualitative research, supplier selection at the managerial level (Morgan & Scannell, 1998). Purposive sampling was used to obtain qualified sample under the framework of the qualitative study. Correlation, not over 0.9, was checked (Tabachnick & Fidell, 2001) before analyzing structural equation modeling.

Results

Table 1 Data analysis result of opinion from questionnaires

Dimension	Criteria	Mean	Opinion Level
Sustainable Supplier selection (Environmental)	Hazardous and waste generation control	4.01	High
	Green product and eco design	3.83	High
	Environmental management system	3.89	High
	Total	4.00	High
Sustainable Supplier selection (Economic)	Price	3.94	High
	Quality	4.15	High
	Delivery	4.29	Highest
	Production capability	4.22	Highest
	Technology capability	4.14	High
	Financial capability	3.89	High
	Total	4.10	High
Sustainable Supplier selection (Social)	RMB Code of Conduct	4.23	High
	CSR	4.17	High
	Contractual stakeholders	3.90	High
	Total	3.96	High
Competitive Advantage	Supply Effective Chain Management	4.17	High
	Product Differentiation and Innovation	4.29	Highest
	Organizational Responsiveness	3.96	Moderate
	Cost Leadership	4.11	High
	Total	4.13	High
Firm Performance	Growth	4.16	High
	Employee Satisfaction	3.84	High
	Customer Satisfaction	4.06	High
	Environmental Performance	3.67	High
	Social Performance	3.59	High
	Total	3.86	High

Table 2 Descriptive statistics of research variables

Variable	Mean	Variance	SK	KU	Level
Sustainable Supplier Selection (SUP)					
Environment (ENV)					
- Controlling hazardous waste (ENCW)	4.01	0.50	0.50	-0.47	High
- Environmental product design (ENDS)	3.83	0.49	0.65	0.07	High
- Environmental management (ENEN)	3.89	0.47	0.64	-0.41	High
Overall	4.00	0.45			High
Economic (ECO)					
- Cost (ECOC)	3.94	0.52	0.50	-0.10	High
- Quality (ECOQ)	4.15	0.40	0.70	-0.25	High
- Delivery (ECOD)	4.29	0.35	-0.41	-0.25	Highest
- Production capability (ECOP)	4.22	0.40	0.11	-0.15	Highest
- Technological capability (ECOT)	4.14	0.41	-0.04	0.08	High
- Financial stability (ECOF)	3.89	0.37	-0.60	0.24	High

N	37	45	47	36	25	53	58	32	47	55	60	52	56	64	41	55	45	34		
E	6	1	5	0	0	9	7	3	3	7	7	5	0	0	3	0	3	4		
N																				
D	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
S	33	32	41	31	22	47	49	30	54	53	57	56	45	47	33	44	35	36	66	1
E	2	3	9	7	1	5	8	2	3	1	8	6	1	0	7	3	3	0	6	
N																				
C	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
W	34	49	43	33	23	49	51	31	52	51	49	57	51	64	37	57	34	23	69	61
	5	1	6	0	0	5	9	4	3	1	1	9	4	9	9	7	2	1	3	1

Table 3 found that the correlation of all variables was not more than 0.9, meaning that the relationship between the variables was not found within themselves (Tabachnick & Fidell, 2001).

Table 4 Good-fit model indices

Analysis	CMIN/Df	p-value	RMR	RMSEA	GFI	AGFI	CFI	TLI	NFI
1 st Analysis	7.406	0.000	0.017	0.124	0.762	0.700	0.827	0.801	0.806
Adjustment	1.224	0.069	0.006	0.023	0.975	0.939	0.997	0.993	0.983

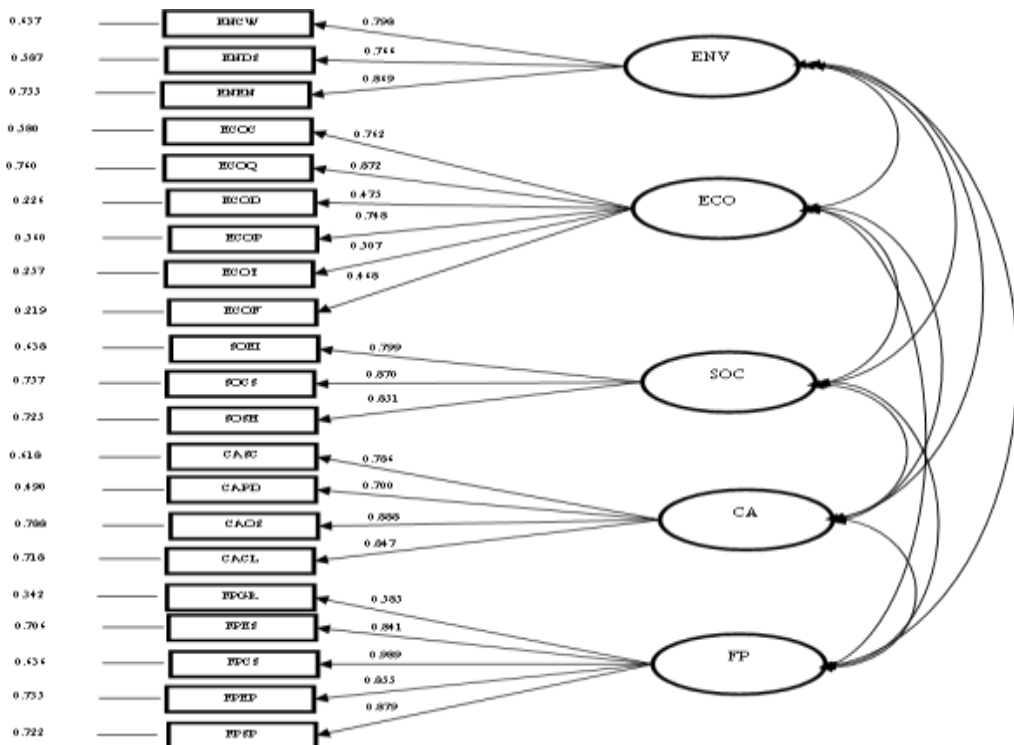


Table 2 Final model after modification

Note: Supplier Selection: Environmental (ENV) Economic (ECO) Social (SOC), Competitive Advantage (CA), Firm Performance (FP)

When analyzing the model, it was found that the model was fit with the empirical data because the Cmin/Df was 7.406, the p-value was 0.000, the Goodness of Fit Index (GFI) was 0.762, the Adjusted Goodness of Fit Index (AGFI) was 0.700, Root Mean-square Residual (RMR) was 0.017, Root Mean Square Error of Approximation (RMSEA) was 0.124, Tucker and Lewis Index (TLI) was 0.801, Comparative Fit Index (CFI) was 0.827 and Normed Fit Index (NFI) was 0.806, which was not met the criteria. From the results of the analysis, it was found that the fit index of the model was not empirically appropriate enough. Therefore, adjustments were made according to the recommendations of modification indices.

When modifying the model based on the recommendation of modification indices, the model was fit with empirical data since it portrayed Cmin/Df of 1.224, p-value of 0.069, Goodness of Fit Index (GFI) of 0.975, Adjusted Goodness of Fit Index (AGFI) of 0.939, Root Mean-square Residual (RMR) of 0.006, Root Mean Square Error of Approximation (RMSEA) of 0.023, Tucker and Lewis Index (TLI) of 0.993, Comparative Fit Index (CFI) of 0.997, and Normed Fit Index (NFI) of 0.983, which passed the criteria (Hooper, Coughlan, & Mullen, 2008; and Sukortprommee, 2013)

Table 5 Estimate, Standard Estimate, S.E., C.R. and p-value of model according to conceptual framework

			Estimate	S.E.	t-value	P
Supplier Selection	--- >	Competitive Advantage	0.957	0.905	13.546	0
Supplier Selection	--- >	Firm Performance	0.324	0.402	3.915	0
Competitive Advantage	--- >	Firm Performance	0.369	0.485	4.523	0

Table 5, results from the final model analysis, revealed that the effect of SUP on CA had standardized estimates of 0.905, unstandardized estimates of 0.957, standardized error of 0.071, and a significant t-value of 13.546 at the 0.000 level. Whereas the effect of SUP on FP had standardized estimates of 0.402, unstandardized estimates of 0.324, standard error of 0.083, and a significant t-value of 3.915 at the 0.000 level. Finally, the effect of CA on FP had standardized estimates of 0.485, unstandardized estimates of 0.369, standard error of 0.082, and a significant t-value of 4.523 at the 0.000 level.

Table 6 Direct and indirect effects

Variables	Total effect		Direct effect		Indirect effect	
	CA	FP	CA	FP	CA	FP
SUP	0.905	0.402	-	0.439	0.905	0.841
CA	-	0.485	-	-	-	0.485

Note: Sustainable Supplier Selection (SUP), Competitive Advantage (CA)

From the table 6 above, SUP had total effects on CA with a standardized regression coefficient of 0.905 and FP with a standardized regression coefficient of 0.402, whereas CA had a total effect on FP with a standardized regression coefficient of 0.485.

When considering direct effect, it was found that SUP had direct effects on CA with a standardized regression coefficient of 0.905 and FP with a standardized regression coefficient of 0.402, whereas CA had a direct effect on FP with a standardized regression coefficient of 0.485. When considering the indirect effect, it was found that SUP had an indirect effect on FP with a standardized regression coefficient of 0.439.

Discussion

1. Discussion of the effect of SUP on FP in the Electrical and Electronics Industry has found that SUP variables comprise sustainability in three dimensions: Economic (ECO), Environment (ENV) and Social (SOC). SUP has a statistically significant effect on FP, consistent with Wang et al., (2019), studying of the supplier selection criteria for the textile industry in Vietnam. Such study conducted the model of the problem of TBL-based supplier selection decision-making (Economic, environmental and social aspects). Multi-Criteria Decision Model (MCDM) was used to optimize the supplier assessment and selection process using sustainability considerations. The main studied criteria were 1) economic, with sub-criteria of cost, price, reliability in delivery, quality and technological capability, 2) social aspect, with sub-criteria of health and safety, local community and contract stakeholders, and 3) environment aspect, with sub-criteria of pollution from production, resource use, eco design, environmental management system. It has found that in increasing public awareness of environmental issues and government regulations, consumer responsibility and supplier financing play an important role in the sustainable supplier selection process and sustainable development of ongoing distribution and business success. It is also in line with Sunil et al., (2017), who have proposed a framework for assessing sustainable supplier selection using a hierarchical analysis process. This is a multi-criteria optimization and compromise approach. Initially, 22 sustainable supplier selection criteria and three dimensions were identified (economic environmental and social aspects) through literature and expert opinion. A real example from an automobile company in India discusses the application of the proposal framework. The results showed that "environmental cost", "product quality", "price of product", "occupational health and safety" and "environmental performance" were ranked among the top 5 and top 3 sustainable supplier selection criteria. It was the criteria for selecting the most efficient key suppliers for supply chain sustainability for competitive market.
2. Discussion of the effect of CA on FP of the electrical and electronics industry has found that CA variables include: effective supply chain management (CASC), product and innovation differences (CAPD), organizational responsiveness (CAOS) and cost leadership (CACL). CA has a statistically significant total and direct effect on FP. This is consistent with the results of a study by Wang et al., (2019), which stated that sustainable supplier selection processes also play an important role in the sustainable development of continuous production and distribution and successful business operations. In choosing a sustainable supplier, consideration must be given to economic, social and environmental standards in the supplier

assessment process. It is also in line with Nguyen et al., (2016) who said that choosing the right supplier is one of the most challenging tasks for an organization because it reduces procurement costs and increases the competitiveness of the organization.

Acknowledgement

The corresponding author is Chattrarat Hotrawaisaya from College of Logistics and Supply Chain, Suan Sunandha Rajabhat University, Thailand. The corresponding author's e-mail is chattrarat.ho@ssru.ac.th.

References

- Aunyawong, W., Waiyawuththanapoom, P., Setthachotsombut, N., & Wisedsin, T. (2020). Roles of 7R logistics management and consumer satisfaction on marketing performance of local bottled water SMEs in Thailand. *Test Engineering and Management Journal*, 83, 12220-12229.
- Aunyawong, W., Wararatchai, P., Shaharudin, M.R., Hirunpat, A., & Rodpangwan, S. (2021). The mediating role of transportation practices during the COVID-19 crisis in Thailand. *The Open Transportation Journal*, 15(1), 170-181.
- Best, J.W. & Kahn, J.V. (2006). *Research in Education*. 10th Edition, Pearson Education Inc., Cape Town.
- Gupta, V., & Chopra, M. (2018). Gauging the impact of knowledge management practices on organizational performance—a balanced scorecard perspective. *VINE Journal of Information and Knowledge Management Systems*. 48(1), 21-46.
- Hair, J.F., Black, W.C., Babin, B.J., & Anderson, R.E. (2010). *Multivariate Data Analysis*. (7th Ed.). Upper Saddle River, New Jersey: Prentice Hall.
- Hooper, D., Coughlan, J., & Mullen, M. (2008). *Structural equation modelling: Guidelines for determining model fit*. Articles, 2.
- Morgan D. L. & Scannell, A. U. (1998). *Planning focus groups*. California, US: Sage.
- Nguyen, T.S., Mohamed, S. & Rahman, A. (2016). A new hybrid supplier selection model, *Int. J. Operational Research*, X (Y).
- Nualkaw, S., Wararatchai, P., Sommanawat, K., & Aunyawong, W. (2021). Service value of transportation service providers for e-commerce products in the new economy era: creativity, society and environment. *Psychology and Education Journal*, 58(4), 2016-2023.
- Phrapratanporn, B., Thanitnan, C., Thanitnan, C., & Rungsawanpho, D., Aunyawong, W., & Kochakasettrin, N. (2022). Online Purchase Decision on Consumer Goods in the Context of the Service Value of Third-Party Logistics Service Provider. *Journal of Optoelectronics Laser*, 41(4), 79-84.
- Phrapratanporn, B., Wararatchai, P., Aunyawong, W., & Nik Ramli Nik Abdul Rashid (2019). Enhancing supply chain performance of SMEs in Thailand using the integrated personnel development model. *International Journal of Supply Chain Management*, 8(5), 176-186.
- Pintuma, S., & Aunyawong, W. (2021). The effect of green supply chain management practices on environmental, operational and organizational

- performances of seafood manufacturers in Thailand. *International Journal of eBusiness and eGovernment Studies*, 13(2), 33-48.
- Prachayapipat, M., Wararatchai, P., Aunyawong, W., & Panjakajornsak, V. (2022). The effect of stakeholder on sustainable supply chain performance of road transportation service providers in Thailand: the mediating role of green supply chain management practices. *Journal of Optoelectronics Laser*, 41(4), 184-190.
- Srisawat, S., & Aunyawong, W. (2021). Development of business performance under environmental uncertainty: lesson from Thailand's Eastern Economic Corridor. *International Journal of Entrepreneurship*, 25(5), 1-10.
- Sukortprommee, S. (2013). The effect of corporate brand personality on customer-contact employee's pro-social behavior and the mediating effect of brand identification in Japanese automotive service sector. Dissertation, Faculty of Business Administration, Rajamangala University of Technology Thanyaburi: Pathumthani.
- Sunil Luthra, Kannan Govindan, Devika Kannan, Sachin Kumar Mangla & Chandra Prakash Garg (2017). An integrated framework for sustainable supplier selection and evaluation in supply chains, *Journal of Cleaner Production*, 140, (Part 3), 1686-1698.
- Tabachnick, B. & Fidell, L. (2001). *Using multivariate statistics*. Needham Heights: Allyn & Bacon.
- Wang, Chia-Nan & Yang, Ching-Yu & Cheng & Hung-Chun. (2019). A Fuzzy Multicriteria Decision-Making (MCDM) Model for Sustainable Supplier Evaluation and Selection Based on Triple Bottom Line Approaches in the Garment Industry. *Processes*, 7, 400.
- Wisedsin, T., Jermstittiparsert, K., Thitrat, P., & Aunyawong, W. (2020). Role of advanced manufacturing technology, human capital and employee empowerment to enhance manufacturing industry supply chain performance. *International Journal of Supply Chain Management*, 9(2), 411-418.