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THE INFLUENCE OF LOGISTICS ACTIVITY ON SUSTAINABLE PERFORMANCE OF AIR CARGO BUSINESS IN THAILAND

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Abstract

This research applies logistics management concepts to sustainable business operations in the context of air cargo businesses in Thailand. The study aims to understand how logistics activities impact the sustainable performance of air cargo businesses. The objectives of this study were to examine: 1) logistics activities in air cargo businesses in Thailand, and 2) the influence of logistics activities on the sustainable performance of the air cargo business. This study consists of descriptive research, utilzing a questionnaire for data collection. The sample consisted of 424 employees of air cargo businesses operating in Thailand. The findings reveal that all 9 logistics activities significantly influenced the sustainable performance of air cargo businesses in Thailand, in terms of economic, social, and environmental performance, where Customer Services and Support (CSS) had the highest average value with a mean value of 5.90 (S.D. = 0.723).

Regarding the results of the study of influences, Facilities Site Selection, Warehousing, and Storage (FWS) was found to strongly impact Economic Performance (ECOP) with a β value of .740. Meanwhile, Reverse Logistics (RL) had the greatest impact on Social Performance (SOCP) with a β value of 0.843, and Transportation (TRAN) had the greatest influence on Environmental Performance (ENVP), with a β value of 0.749.

The findings can support the introduction of business guidelines to enhance competitiveness and enable the achievement of sustainable success, offering encouragement for Thailand as a key air cargo hub for Southeast Asia. Moreover, the study can be used to enhance academic knowledge in the field of logistics and contribute to the future sustainable performance of the air cargo business.

Keywords: Logistics Activity, Sustainable Performance, Air Cargo Business, Air Transport

1. INTRODUCTION

Forecasts of various organizations agree that Southeast Asia will be the region with the highest growth in the aviation industry. Boeing Company Limited predicted that in 2010-2029 the aviation industry in Southeast Asia will have the greatest increase in opportunities for competition and growth (Boing, 2021). In line with the concept of the New S-Curve, 10 future

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industries are encouraged by the Thai government. Aviation and logistics are included as one of the 10 industries of the future, predicted to drive the economy and enhance Thailand's competitiveness.

Currently, logistics development has undergone rapid multidimensional changes and will continue to progress even further. This new era of logistics is rooted in the shift towards digitalization. Globalization has determined the direction of global transportation to be closer in terms of connectivity and increasing movement of goods across continents. One business related to logistics development is the transportation industry, classified as a service industry crucial for everyday human life, this industry has become more necessary for various tasks as well as human progress. The transportation industry is undergoing significant changes due to technology and shifts in consumer behavior, not only affecting the way people and goods are moved but also impacting all businesses in the supply chain and stakeholders of the transportation system including sales, marketing, domestic, and overseas distribution, as the industry is considered as an important factor adding value to products or services (Department of Industrial Promotion of Thailand, 2022). There is great potential in Thailand to produce consumer and non-consumer goods with a total export value of one billion baht per year. However, successful export operations rely on effective transportation, particularly air freight which is widely recognized as a critical factor in global economic development, while the success of the air cargo industry is directly related to the economic wealth of countries around the world (International Air Transport Association, 2019).

The air cargo business provides a popular method of transportation worldwide, while many countries have developed commercial airports to enhance their competitiveness, upgrade their capabilities to handle transportation traffic and volume, and become leading airport innovators that incorporate new technologies to meet the needs of air cargo business users (Civil Aviation Authority of Thailand, 2018). In addition, aircraft manufacturers have created large-sized aircraft capable of carrying vast amounts of cargo with the ability to operate modernly and transport goods efficiently; 2023 will be the year of electric airplane technology with major air carriers and new entrants announcing their adoption of zero-emission aircraft for regional air mobility (World Economic Forum, 2023). International airports have also expanded and developed storage or warehouse areas to facilitate transportation. The storage areas for cargo or waiting areas are spacious enough to meet demand and have developed methodology to prevent transportation errors from the originating city to the destination city (Ayasanond, 2015). Air cargo business is one sector in the aviation industry that is interconnected with other industries, both directly, such as through aircraft parts manufacturing, aircraft maintenance, and airports, and indirectly, such as through sales, marketing, investment, the travel industry, inventory management, logistics, and transportation technologies. The sector is rapidly growing following the recovery of the global economy after the spread of COVID-19 in 2020. Air cargo business, throughboth domestic and international routes, can be considered a major source of revenue for many airlines (International Air Transport Association, 2021).

From the aforementioned data, the air cargo business is considered a large-scale industry that is deemed crucial in generating revenue for a country, while also significantly increasing the country's overall gross domestic product. Furthermore, it supports the implementation of Thailand’s logistics action plan 2023-2027, which aims to establish logistics as a key mechanism in driving Thailand's economic growth and competitiveness in both sub-regional and regional trade, focusing on utilizing modern technology to enhance logistics operations, and improve management and service efficiency (Office of the National Economic and Social Development Council, Thailand., 2023). Additionally, the exponential growth of e-commerce, which greatly impacts air cargo business expansion, whether it is linked with main logistic activities or used to enhance the competitiveness of businesses, has been considered as

one of the key factors for business growth, incorporating both goods exports and services (Decharin, 2019). If air cargo business providers aim to achieve sustainable development and growth, it is essential to improve the quality of services delivered to customers, to promote and create customer satisfaction, enhance customer loyalty, and increase competitiveness, enabling them to compete effectively in the long run and generate higher profits in the future (Hu et al., 2018). By implementing suitable and efficient logistics management and operations, air cargo business providers can achieve long-term success and sustainability, especially in challenging economic situations and intense competition.

After studying relevant ideas, reviewing related research, examining the current situation, and benefiting from studying logistics development systems, this study applies various logistics management concepts to the context of sustainable business operations. Implementing sustainable logistics practices enables businesses to achieve cost reductions, minimize losses, and mitigate risks in transportation processes, as well as in inventory management and other related operations. Ensuring accurate and timely delivery is crucial for building customer confidence and satisfaction. Additionally, sustainable logistics activities contribute to reducing pollution emissions, conserving energy, and minimizing the environmental impacts of production. This leads to the enhanced operational efficiency of the entire business system. Therefore, it is essential for businesses to comprehend and align logistics activities towards sustainability in order to achieve sustained operational results. This holds significant importance for businesses aiming to maintain sustainability in the current and future business landscape, particularly within Thailand. The key factors mentioned in this study have a substantial impact on the sustainable operations of numerous businesses in Thailand, including the air cargo business sector. Therefore, the research findings can support the introduction of business guidelines to enhance competitiveness and achieve sustainable success. The findings are also encouraging for Thailand's New-S Curve concept and suggest Thailand as the future air cargo hub for Southeast Asia. Moreover, the study can be used to enhance academic knowledge in the field of logistics and contribute to the future sustainable performance of the air cargo business.

2. LITERATURE REVIEW

2.1 Logistics Activities

Logistics activities refer to the execution of various activities that aim to satisfy customer needs with a suitable cost, according to the Logistics Office, Department of Primary Industries and Mines, Ministry of Industry of Thailand (2015). Nine logistic activities were used as the initial or independent variables to study the influence of logistic activities that may be factors in the sustainable performance of air cargo businesses in Thailand. The content can be summarized as follows:

1) Demand Forecasting and Planning (DFP): Forecasting customer demand effectively can help organizations determine appropriate directions for operations, including production and resource planning in each process, resulting in efficient inventory management (Banerjee et al., 2020).

2) Customer Service and Support (CSS): Customer service and support is an activity conducted to serve and fulfill customer needs according to the 4R's principle, where customers receive the “Right Product, Right Condition, Right Quantity, in the Right Time”, emphasis is on the marketing department and customer relations (Barreto et al., 2017).

3) Logistics Communication and Order Processing (LCOP): Logistics communication and order processing covers everything from receiving orders from customers, communicating with customers, to collecting details regarding customers. This activity serves as a bridge

between the organization and the customers, easily affecting customer satisfaction levels. Therefore, time should be efficiently utilized in this process, and errors should be avoided as much as possible (Daugherty et al., 2018; Zaloznova & Trush-kina, 2019).

4) Purchasing and Procurement (PP): Purchasing and procurement is an activity that involves sourcing and evaluating sources of raw materials for goods, as well as supply management, which covers various aspects including supplier selection, negotiating & bargaining, discussing minimum quantity (MOQ), and supplier evaluation & assessment, to ensure that the organization receives products or raw materials that meet their requirements (Saputro et al. 2022; Corboș et al., 2023).

5) Materials Handling and Packaging (MHP): In logistics terms, packaging is designed to protect the products from damage and facilitate the products movement and storage. Good packaging must be designed to be suitable for material handling equipment (MHE) and warehouses (Saghir, 2004; Kain & Verma, 2018).

6) Facilities Site Selection, Warehousing, and Storage (FWS): Facilities site selection has an impact on providing convenience in accessibility, reducing transportation distance issues, and enhancing the ability to respond quickly to customer demands, thereby ensuring that products are available to customers without delay. Warehouse management is a strategic decision that affects transportation costs, customer service levels, and the Just in Time strategy application (Chen et al., 2022; Pekkaya & Keleş, 2022).

7) Inventory Management (IM): Inventory management is an activity that has an impact on the efficiency of many departments and also affects the profits and losses of an organization. For example, if a high inventory level is implemented, inventory handling costs increase. Similarly, obsolete stock can lead to increased costs as well. Moreover, inventory management can also impact other functions, for example a low inventory level may result in lower storage and maintenance costs, but may increase transportation costs due to increased frequency of transportation, or the organization may need to accept the risk of a reduced ability to meet customer demands or loss of sales (Bhosekar et al., 2021; Nozari et al., 2023).

8) Transportation (TRAN): Transportation is the movement of goods from point of origin to point of consumption. Organizations must consider the appropriate transportation modes that are suitable for their products, whether it be by air, sea, rail, road, pipeline, or multimodal. In order to comply with the regulations of its specific region, an organization must deliver quality products to customers at the appropriate location and time, as well as efficiently manage costs (Lowe, 2002; Lawrence et al., 2022; Wichitphongsa & Ponanan, 2022).

9) Reverse Logistics (RL): Reverse logistics is a process of managing products that are returned due to reasons such as non-compliance with specifications (claim), customer rejection (reject), damage, or non-standard raw materials. Therefore, organizations must establish policies to efficiently handle these returned products to minimize costs (Calvo-Porraland & Lévy-Mangin, 2020; Sun et al., 2021).

2.2 Sustainable Performance of Businesses

All businesses and industries rely on the most crucial elements, which are investment and employment. Investment and employment are the most important aspects of entering into developed and developing countries. The level of investment and employment can reflect economic and industrial growth, as well as social participation and the severe impact of environmental issues caused by industrial activities. Therefore, the concept of modern business and industry operations focuses on sustainable development in response to environmental responsibilities (Chardine-Baumann & Botta-Genoulaz, 2014; Banihashemi et al., 2019; Aroonsrimorakot et al., 2022; Kumar & An-banandam, 2022; Sudusinghe & Seuring, 2022). If air cargo businesses incorporate sustainability principles into their operations and

management, it will lead to sustainable development, and balance between the economy, the society, and the environment.

From the study and literature review regarding sustainable performance, three types of performance can be summarized; these are the components of sustainable performance in the air cargo business in Thailand, and will be applied as dependent variables in this study:

1) Economic Performance (ECOP): Economic performance refers to conducting business operations with the optimization of sustainable air cargo transportation systems, to ensure competitiveness and alignment with the country's economic growth. This involves the establishment of organizational cultures that prioritize risk management, effective supervision, efficiency, and maintaining long-term customer relationships (Layaoen et al., 2023; Montoya-Torres et al., 2023).

2) Social Performance (SOCP): Social performance refers to conducting business operations with the development and support of employees to increase their productivity, self-reliance, and to establish social systems and management practices that promote participation from all sectors of the organization, with the goal to create a good quality of life for all stakeholders, whether it be customers, employees, communities, or society as a whole, by participating and listening to the opinions of all parties in order to find common ground where business operations may create an impact and benefits and returns for society (Jadhav et al., 2022; Ding et al., 2023).

3) Environmental Performance (ENVP): Environmental performance refers to conducting business operations with consideration for the environment, promoting efficient resource use, and supporting environmentally-friendly business practices. This involves a focus on reducing the potential environmental impacts resulting from organizational activities, from production processes to delivery, consumption, and waste disposal. Additionally, it entails providing information about environmental matters to stakeholders in order to ensure that they are informed of the organization's environmental impact (Agyabeng-Mensah et al., 2020; Mio et al., 2023).

2.3 The Relationship Between Logistics Activities and Sustainable Performance

In order to improve the sustainable performance of businesses, many researchers have contributed to understanding the relationship between logistics activities and sustainable performance and identifying the contributors that lead to sustainable performance. Shee et al., (2021) investigated the effects of smart logistics on smart city sustainable performance. They found that technology-enabled logistic activities had positive impacts on social and economic performance. In the industrial sector, the research of Hejazi, (2023), which studied the supply chain management of Saudi Arabian manufacturing companies and corporate sustainability performance, revealed that green practices significantly impact corporate sustainability performance. Meanwhile, Yontar (2022) studied the logistics sector, assessing the important factors that significantly affect the sustainable performance of logistics activities. The result presented the logistics activities involved in sustainable logistics performance, including waste management, transportation and warehouse management, and resource usage.

For the air cargo business, there are very few studies examining the relationship and the influence of logistics activities on sustainable performance. One of the most related studies is the study of Ditkaew et al., (2021), which studied logistics management in terms of strategic cost management and its impacts on the sustainable performance of export businesses in Thailand. The findings showed that successful logistics management positively influenced sustainable performance. Another study that is relevant to the cargo business is the research of Suleiman, (2023), which examined the impacts of supply chain activities on the sustainable performance of the tourism industry. The results showed that green purchasing and green

packaging had positive effects on environmental performance. In addition, reverse logistics had positive effects on social performance.

Due to the significance of the sustainable business practices concept, many researchers have shown interest and focused on studying the influence these practices have on the sustainable performance of various businesses, both in Thailand and abroad. The findings of previous related research studies are summarized and presented in Table 1.

Table 1 Summary of Research Findings Related to Sustainable Business Operations

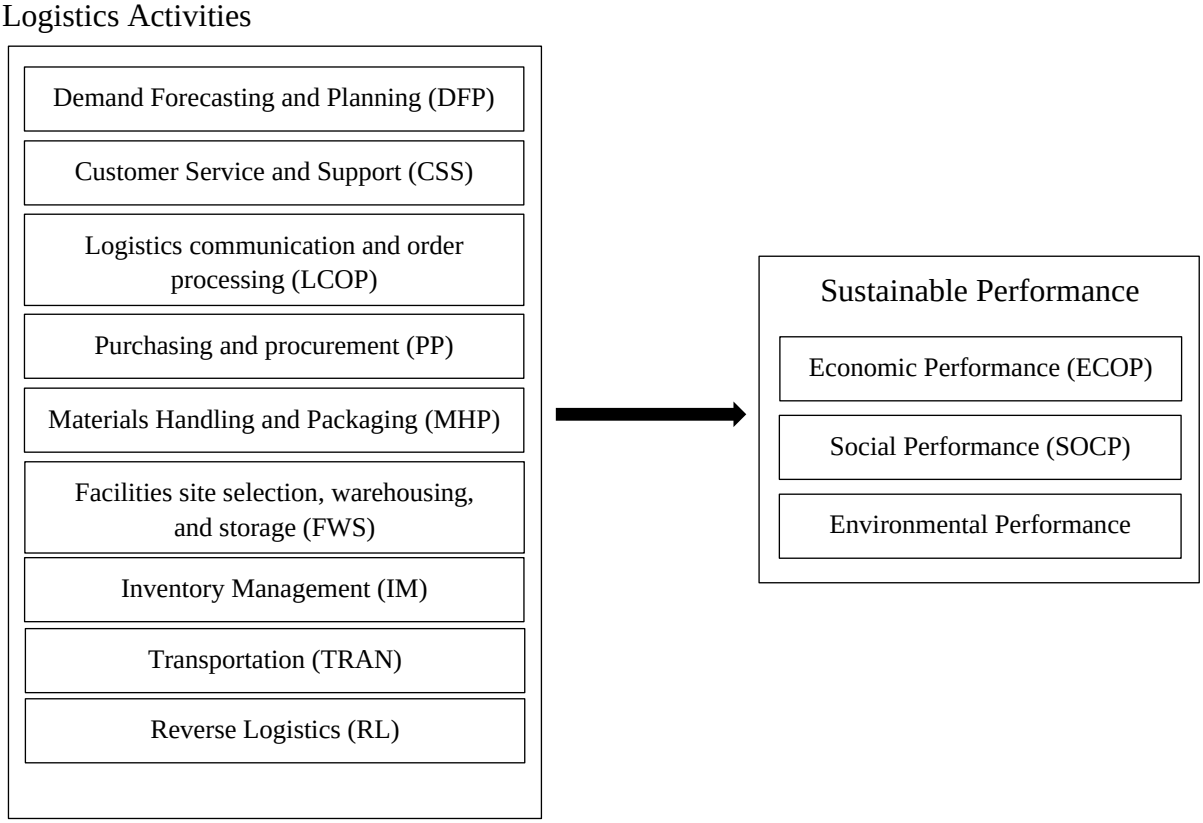
Author	Variables	Target Population	Research Findings
Banihashemi et al. (2019)	Reverse logistics and sustainable performance	Literature review	• Most studies have focused on the performance evaluation of reverse logistics by considering the factors associated with economic and environmental performance. • Reverse logistics can make a significant contribution to improving the sustainable performance of firms.
Shee et al. (2021)	Economic, social and environmental performance	Urban transporters, warehouse managers, retailers, and information technology (IT) managers in Australia.	• Information and communication technology (ICT) use, and IT capability (ITC) have positive and significant effects on smart logistics. • Technology enabled smart logistics have an immediate positive effect on smart city environment, which in turn has positive impacts on social and economic performance.
Ditkaew et al. (2021)	Strategic cost management as a part of logistics management	Export businesses in Thailand.	• The four strategic cost management aspects had significant positive impacts on the success of logistics management. • The success of logistics management in all three dimensions showed a positive impact on sustainable performance.
Yontar (2022)	Environmental, economic, and social factors	Logistics sector	• Logistics activities including environmental impact, waste management, transportation and warehouse management, resource usage, social impacts, internal factors, external factors, and logistics performance factors, are essential for improving the sustainable performance of the logistics sector.
Suleiman (2023)	Economic, social and environmental performance	167 firms in the tourism industry in Tanzania.	• The results reveal that CSR mediates the relationship between managers' sustainability orientation and sustainability performance. (Except economic dimension) • The results also found that owners' orientations towards sustainability positively influenced CSR, and CSR also positively affected social and environmentally sustainable performance.

Table 1 (Continued)

Author	Variables	Target Population	Research Findings
Hejazi et al. (2023)	Economic, social and environmental performance	Operational and production managers of manufacturing companies in Saudi Arabia.	• Green purchasing has positive effects on environmental performance and social performance. • Green packaging has positive effects on environmental performance but no significant influence on social performance. • Reverse logistics has positive effects on social performance but no significant influence on environmental performance.

As can be seen in Table 1, there is limited research on the relationship between logistics activities and sustainable business operations. This study therefore aims to investigate the influence of logistics activities on the sustainable performance of air cargo businesses in Thailand by applying the reviewed theories and related works. It is hypothesized that logistics activities influence sustainable performance in air cargo businesses in Thailand. The conceptual framework for the study is presented in Figure 1.

Figure 1 Conceptual Framework of this Study



3. RESEARCH METHODOLOGY

This research took a quantitative research approach, utilizing a questionnaire as the tool for data collection from a sample group. The research was approved according to the operating standards of the Human Research Ethics Committees of Rangsit University, Thailand, adhering to the principles of the Declaration of Helsinki, The Belmont Report, CIOMS Guideline, and the International Conference on Harmonization in Good Clinical Practice (ICH-GCP) in accordance with certification number DPE. No. RSU-ERB2023-001 dated January 9, 2023.

3.1 Population and Sample

The population used in this research consisted of employees of an air cargo company that owns planes and operates in Thailand. The exact population size is unknown; therefore, Cochran's formula (Cochran, 1963) was used to calculate the sample size (n). A sample size of 385 people, with a confidence level of 95% and a margin of error of 5%, was determined accordingly. To prevent the number of participants from dropping too low, the sample size was increased by 10% (equivalent to 38.5 people), resulting in a total sample size of 424 people. Respondents were then selected using a simple random sampling method.

3.2 Measurement and Questionnaire Design

The research instrument for the study was a questionnaire divided into 3 parts: Part 1 consisted of general information about the survey respondents and information about the air cargo transportation business, including gender, age, education level, duration of work, current job position, the duration of the company's operations, and the number of employees in the company. Part 2 consisted of questions regarding respondents' opinions on factors related to the logistics activities of air cargo businesses in Thailand based on the variables and questions formulated according to the logistics activity theory of the Logistics Office, Department of Primary Industries and Mines, Ministry of Industry of Thailand (2015). There were a total of 37 questions, on the following topics: Demand forecasting and planning; customer services and support; logistics communications and order processing; purchasing and procurement; materials handling and packaging; facilities site selection, warehousing, and storage; inventory management; transportation; and reverse logistics. Part 3 consisted of questions regarding respondents' opinions of the influence of logistic activity factors on the sustainable performance of air cargo business in Thailand. Questions were created according to the study of relevant theories and research. There were a total of 14 questions, consisting of the following topics: economic performance, social performance, and environmental performance.

In Parts 2 and 3, closed-ended questions were used following a 7-point Likert scale format ranging from 1 (lowest) to 7 (highest) to evaluate the weight of each question. This is considered to be the most accurate, offering a range of options where a true midpoint can be selected (Likert, 1932). The developed questions and measurement scale of logistics activities and sustainable performance, are shown in Table 9 (Appendix).

3.3 Validity and Reliability Testing

The questionnaire passed testing for accuracy. Content validity was checked and evaluated based on the congruence between the research objectives and the questions (Index of Item Objective Congruence; IOC) by three experts in air cargo transportation, logistics and supply chain, and research, respectively. The criteria for assessing congruence yielded index values of 0.67 to 1.00. The questionnaire was then tested on a sample group of 30 people to

assess reliability (reliability test) using the Cronbach's alpha coefficient (Vanichbuncha, 2013). The coefficient for all variables was .967, which was close to 1, indicating the high reliability of the tool.

Furthermore, all questions in the questionnaire were performed through the factor analysis by the extraction method before conducting regression analysis. The resulting value of all questions was above 0.50 which is acceptable for research in the social science area according to Hair et al. (2010). For the purpose of assessing the structural validity (Convergent Validity) of the items included in this measurement model, confirmatory factor analysis (CFA) was utilized (Hox, 2021). The loadings of items on the factors were evaluated through factor loadings. At the first stage of this process, the reliability and validity of the constructs were ensured by examining internal consistency using composite reliability (CR) and average variance extracted (AVE) (Cheung et al., 2023). Table 2 presents a detailed summary of the results for the reliability and validity measurements of the construct indicators.

As shown in Table 2, total reliability was confirmed for each latent variable through both Composite Reliability (CR) and Average Variance Extracted (AVE). Furthermore, an examination of the total reliability of the latent variables (CR) revealed a maximum value of .934 and a minimum value of .672, with all values being above the recommended cut off of .60. The average variance extracted values for the individual constructs (AVE) had a maximum value of .764 and a minimum of .508, suggesting that each latent variable consistently accounts for its observed variables, as values above .50 indicate a consistent explanation of the variance in the observed variables.

Table 2 Confirmatory Factor Analysis

Indicators	Factor Loading	CR	AVE	Indicators	Factor Loading	CR	AVE
(DFP)		**0.726**	**0.609**	**(IM)**		**0.737**	**0.581**
DFP1	.80			IM1	.71		
DFP2	.75			IM2	.75		
DFP3	.71			IM3	.62		
DFP4	.69			IM4	.67		
(CSS)		**0.814**	**0.527**	**(TRAN)**		**0.795**	**0.590**
CSS1	.65			TRAN1	.81		
CSS2	.84			TRAN2	.76		
CSS3	.64			TRAN3	.91		
CSS4	.72			TRAN4	.78		
(LCOP)		**0.794**	**0.670**	**(RL)**		**0.869**	**0.689**
LCOP1	.79			RL1	.84		
LCOP2	.80			RL2	.85		
LCOP3	.74			RL3	.80		
LCOP4	.68			**(ECOP)**		**0.850**	**0.637**
LCOP5	.69			ECOP1	.71		
(PP)		**0.672**	**0.570**	ECOP2	.72		
PP1	.67			ECOP3	.72		
PP2	.87			ECOP4	.84		
PP3	.78			ECOP5	.83		
(MHP)		**0.814**	**0.508**	**(SOCP)**		**0.927**	**0.763**
MHP1	.65			SOCP1	.77		
MHP2	.80			SOCP2	.98		

Table 2 (Continued)

Indicators	Factor Loading	CR	AVE	Indicators	Factor Loading	CR	AVE
MHP3	.84			SOCP3	.84		
MHP4	.73			SOCP4	.89		
MHP5	.72			**(ENVP)**		**0.934**	**0.738**
(FWS)		**0.846**	**0.526**	ENVP1	.77		
FWS1	.71			ENVP2	.87		
FWS2	.66			ENVP3	.89		
FWS3	.65			ENVP4	.90		
FWS4	.76			ENVP5	.86		
FWS5	.83						

Note. DFP = Demand Forecasting and Planning, CSS = Customer Services and Support, LCOP = Logistics Communication and Order Processing, PP = Purchasing and Procurement, MHP = Materials Handling and Packaging, FWS = Facilities Site Selection, Warehousing, and Storage, IM = Inventory Management, TRAN = Transportation, RL = Reverse Logistics, ECOP = Economic Performance, SOCP = Social Performance, ENVP = Environmental Performance.

3.4 Data Analysis

Data collection was conducted through an online questionnaire using Google Forms, with responses being tracked through follow-up emails sent via the human resources department of the sample company. The data collection period spanned three months, from January 15th to April 15th, 2023.

The researcher conducted data verification and ensured completeness of the data collected. Subsequently, the data were categorized and analyzed using statistical software (SPSS) (Silpcharu, 2017). The collected data in Part 1 of the questionnaire were analyzed using descriptive statistics including frequency and percentage to describe the general information of the respondents. Mean and standard deviation were used to describe the logistics activities of the air cargo transportation industry and the sustainable performance of the air cargo business in Thailand. In the final step, a regression analysis was applied to examine the influences of logistics activities on the sustainable performance of the air cargo business in Thailand.

Table 3 Pearson's Correlation for All Variables

	DFP	CSS	LCOP	PP	MHP	FWS	IM	TRAN	RL	VIF
DFP										2.475
CSS	.572**									2.344
LCOP	.603**	.562**								2.334
PP	.622**	.544**	.751**							2.703
MHP	.539**	.647**	.692**	.603**						2.899
FWS	.616**	.536**	.566**	.542**	.558**					2.324
IM	.624**	.599**	.682**	.570**	.711**	.531**				2.430
TRAN	.660**	.713**	.658**	.543**	.698**	.646**	.751**			2.245
RL	.689**	.607**	.699**	.599**	.701**	.712**	.715**	.748**		2.696

Note. **p< 0.01

DFP = Demand Forecasting and Planning, CSS = Customer Services and Support, LCOP = Logistics Communication and Order Processing, PP = Purchasing and Procurement, MHP = Materials Handling and Packaging, FWS = Facilities Site Selection, Warehousing, and Storage, IM = Inventory Management, TRAN = Transportation, RL = Reverse Logistics.

The results of the correlation analysis are presented in Table 3. An analysis of the correlation coefficients was performed to ascertain the relationships among the independent variables utilized in the research. The coefficients ranged from .536 to .751, all of which were less than the 0.80 recommended cut-off value suggested by Cooper and Schindler (2003). This indicates that the independent variables exhibited no significant interrelationship and were suitable for predictive purposes. Additionally, the Variance Inflation Factors (VIF) for the independent variables ranged from 2.245 to 2.899, and were all less than the recommended cut-off value of 10, indicating that there was no significant multicollinearity issues among the independent variables (Kim, 2019).

To examine the discriminant validity, and explain any differences between the latent variables, the Fornell-Larcker criterion was used to determine whether a contentious issue demonstrated greater variability with its items as compared to others. Table 4 shows the correlations for individual factors. If the correlation is less than the square root of the Average Variance Extracted (AVE), then it suggests that there is discriminant validity. The obtained Average Variance Extracted (AVE) values for each latent variable surpass the correlation values between the latent variables. Consequently, the discriminant validity of the measure for each latent variable is deemed satisfactory, as per the criteria established by Fornell and Larcker (1981).

Table 4 Discriminant Validity

	Fornell-Lacker criterion											
	DFP	CSS	LCOP	PP	MHP	FWS	IM	TRAN	RL	ECOP	SOCP	ENVP
DFP	*(.713)*											
CSS	.572**	*(.726)*										
LCOP	.603**	.562**	*(.755)*									
PP	.622**	.544**	.751**	*(.755)*								
MHP	.539**	.647**	.692**	.603**	*(.713)*							
FWS	.616**	.536**	.566**	.542**	.558**	*(.725)*						
IM	.624**	.599**	.682**	.570**	.711**	.531**	*(.762)*					
TRAN	.660**	.713**	.658**	.543**	.698**	.646**	.751**	*(.768)*				
RL	.689**	.607**	.699**	.599**	.701**	.712**	.715**	.748**	*(.830)*			
ECOP	.703**	.524**	.696**	.598**	.678**	.640**	.658**	.682**	.634**	*(.733)*		
SOCP	.667**	.564**	.667**	.614**	.660**	.574**	.723**	.729**	.743**	.630**	*(.873)*	
ENVP	.634**	.631**	.537**	.587**	.590**	.595**	.620**	.749**	.722**	.610**	.777***	*(.859)*

Note. **p< 0.01

DFP = Demand Forecasting and Planning, CSS = Customer Service and Support, LCOP = Logistics Communication and Order Processing, PP = Purchasing and Procurement, MHP = Materials Handling and Packaging, FWS = Facilities Site Selection, Warehousing, and Storage, IM = Inventory Management, TRAN = Transportation, RL = Reverse Logistics, ECOP = Economics Performance, SOCP = Social Performance, ENVP = Environmental Performance.

4. FINDINGS AND DISCUSSION

As shown in to Table 5, most respondents were male (56.80%), with the greatest proportion of respondents being in the age category of 30 – 39 years old (65.10%), while most were found to have graduated with a bachelor's degree (79.20%), and the most common current position of respondents was senior/professional officer (62.30%). The majority of the respondents' companies had been operating for more than 15 years (64.90%), while 60.40 percent of the respondents' companies had more than 200 employees.

Table 5 Demographic Profile of the Respondents (n = 424)

	Frequency	%		Frequency	%
Gender			**Current job position**		
Male	241	56.80	Operational officer	56	13.20
Female	183	43.20	Professional/ Senior officer	264	62.30
Age			Assistant manager	10	2.40
Less than 20	1	0.20	Department manager	75	17.70
20 – 29	98	23.10	Senior management	19	4.50
30 – 39	276	65.10	**Duration of the company's operation**		
40 – 49	37	8.70	Less than 5 years	33	7.80
50 – 59	6	1.40	6 – 10 years	51	12.00
60 and older	6	1.40	11 – 15 years	65	15.30
Education level			More than 15 years	275	64.90
Under bachelor's degree	1	0.20	**Number of employees in the company**		
Bachelor's degree	336	79.20	Less than 50 persons	74	17.50
Postgraduate	87	20.50	50 – 100 persons	43	10.10
Duration of work			101 – 200 persons	51	12.00
5 years or less	79	18.60	More than 200 persons	256	60.40
6 – 10 years	210	49.50			
11 – 15 years	83	19.60			
More than 15 years	52	12.30			

4.1 The level of the Respondents' Opinions Toward the Logistics Activities of Air Cargo Businesses in Thailand

Based on a 7-point Likert scale, among the 9 logistics activities of air cargo businesses in Thailand, the most consistent logistics activities were found to be customer services and support, followed by transportation, and then logistics communication and order processing, with a mean values of 5.90, 5.84, and 5.82 respectively. In contrast, purchasing and procurement, demand forecasting and planning, and inventory management, were found to be the least consistent logistics activities with mean levels of 5.57, 5.58, and 5.58 respectively, as presented in Table 6.

Table 6 The Respondents' Opinion towards the Logistics Activities of Air Cargo Businesses in Thailand

Logistics Activities	N	Mean	S.D.	Mid-point
Demand Forecasting and Planning (DFP)	424	5.58	.636	5.50
Customer Services and Support (CSS)	424	5.90	.723	5.30
Logistics Communication and Order Processing (LCOP)	424	5.82	.753	4.90
Purchasing and Procurement (PP)	424	5.57	.700	5.00
Materials Handling and Packaging (MHP)	424	5.82	.785	5.20
Facilities Site Selection, Warehousing, and Storage (FWS)	424	5.80	.632	5.50
Inventory Management (IM)	424	5.78	.776	5.25
Transportation (TRAN)	424	5.84	.785	5.30
Reverse Logistics (RL)	424	5.65	.908	4.67
Total	424	5.57	.615	5.28

4.2 The Level of the Respondents' Opinions Toward the Sustainable Performance of Air Cargo Businesses in Thailand

The 7-point Likert scale questionnaire, asked respondents to evaluate their companies' sustainable performance according to three aspects including economic, social, and environmental performance. The results showed that social performance was perceived by the respondents to be at a high level with a mean value of 5.59 and S.D. of 1.08, followed by environmental performance (mean = 5.55, S.D. = 1.05). Meanwhile, economic performance received the lowest score with a mean value of 5.54 and S.D. = 0.80, but was also at a high level, as presented in Table 7.

Table 7 The respondents' opinions toward the sustainable performance of air cargo businesses in Thailand

Sustainable Performance	N	Mean	S.D.	Mid-point
Economic Performance (ECOP)	424	5.54	.807	5.20
Social Performance (SOCP)	424	5.59	1.080	4.38
Environmental Performance (ENVP)	424	5.55	1.052	4.50
Total	424	5.56	.882	4.83

4.3 The Influences of Logistics Activities on the Sustainable Performance of Air Cargo Businesses in Thailand

As shown in Table 8 below, the influence of logistics activities on the sustainable performance of air cargo businesses in Thailand was positive and statistically significant for all variables. Regarding sustainable economic performance (ECOP), the logistics activity of air cargo businesses in Thailand which had the greatest impact was facilities site selection, warehousing, and storage (FWS), with a β value of 0.740 (p-value < 0.01). It can be said that when facilities site selection, warehousing, and storage are improved, the value of the economic performance of the air cargo business will greatly increase at 74.0 percent of the value of increase in facilities site selection, warehousing, and storage.

Table 8 Summary of the Regression Analysis Results

	Dependent Variables					
	Economics Performance (ECOP)		Social Performance (SOCP)		Environmental Performance (ENVP)	
Independent Variables	β	R^2	β	R^2	β	R^2
Demand forecasting and planning (DFP)	.703**	.493	.667**	.444	.634**	.401
Customer services and support (CSS)	.524**	.273	.564**	.317	.631**	.397
Logistics communication and order processing (LCOP)	.696**	.483	.667**	.444	.537**	.287
Purchasing and procurement (PP)	.598**	.356	.614**	.375	.587**	.342
Materials handling and packaging (MHP)	.678**	.459	.760**	.576	.590**	.347
Facilities site selection, warehousing, and storage (FWS)	.740**	.546	.574**	.328	.595**	.352
Inventory management (IM)	.658**	.431	.723**	.521	.620**	.383
Transportation (TRAN)	.682**	.464	.729**	.530	.749**	.560
Reverse logistics (RL)	.734**	.538	.843**	.710	.722**	.519

Note. **p< 0.01

Meanwhile, the logistics activity which had the greatest effect on social performance (SOCP) was reverse logistics (RL) ($\beta = 0.843$, p-value < 0.01). It could be interpreted that when reverse logistics increases, social performance rises at 84.3 percent of the increase in reverse logistics.

Regarding the environmental (ENVP) aspect of sustainable performance, transportation (TRAN) was found to be the most influential factor with a β value of 0.749 (p-value < 0.01). This means that if transportation increases, environmental performance will also increase at 74.9 percent of the increase in transportation.

The findings show that all logistics activities in air cargo businesses as studied in Thailand influenced all three aspects of sustainable performance including economic, social, and environmental performance. These results are consistent with the previous related research. Firstly, the study of Suleiman, (2023), which studied the tourism industry, found that purchasing and packaging impacted environmental performance, while reverse logistics significantly affected social performance. Regarding the study area, the tourism industry is close to the air cargo business. It can be implied that to gain sustainable performance, the air cargo business can apply these practices in logistics activities and vice versa. Secondly, the results of the current study also correspond with the research of Yontar, (2022) who looked at logistics businesses, finding that transportation and warehouse management can enhance the sustainable performance of the logistics sector. Likewise, the study of Aroonsrimorakot et al. (2022) demonstrated that transportation in logistics activities is a significant contributor to environmental performance. Consequently, providers of logistics and transportation services should implement intelligent and innovative strategies to address the issue of carbon emissions, enhance efficiency in loading and unloading, and incorporate other green technologies in the transportation process. Due to the same area of study, the findings are therefore consistent.

Thirdly, the results of this study emphasize the importance of reverse logistics as one of the logistics activities which can make a significant contribution to improving the sustainable performance of firms. This point is in line with the literature review study of Banihashemi et al., (2019) which studied more than 40 related research articles and found that most studies focused on the affect of reverse logistics on economic and environmental performance.

Moreover, there is general agreement when compared to the work of Shee et al., (2021) which examined the three aspects of sustainable performance (social, economic, and environmental) in the context of smart cities. Specifically, there is agreement regarding the application of technology in logistics, such as logistics communication and order processing; facilities site selection, warehousing, and storage; inventory management; and transportation. This emphasizes the importance of considering the use of IT in logistics activity to support the sustainable performance of the air cargo business.

5. CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

This research demonstrates the influence of logistics activities on the sustainable performance of air cargo businesses operating in Thailand. The logistics activities consisted of 9 activities including Demand Forecasting and Planning (DFP), Customer Services and Support (CSS), Logistics Communication and Order Processing (LCOP), Purchasing and Procurement (PP), Materials, Handling and Packaging (MHP), Facilities Site Selection, Warehousing, and Storage (FWS), Inventory Management (IM), Transportation (TRAN), and Reverse Logistics (RL). Sustainable performance of the business was studied through the three aspects of Economic Performance (ECOP), Social Performance (SOCP), and Environmental Performance (ENVP).

The findings reveal that among all 9 logistics activities, Customer Service and Support (CSS) has the highest average value with a mean value of 5.90 (S.D. = 0.723) while all 9 activities were found to have statistically significant impacts on the sustainable performance of air cargo businesses at varying levels. Specifically, facilities site selection, warehousing, and storage (FWS) was found to strongly influence Economic Performance (ECOP). Business sectors should pay attention to the company location, ensuring it is convenient to access, has no issues regarding work performance standards, effective cost management is set, various resources are used effectively, and work process standards and defined. These measures will lead to economically sustainable performance.

Regarding Social Performance (SOCP), Reverse Logistics (RL) was found to have the most critical influence. The business sector should have a clear, effective product return procedure which is convenient and quick.

Meanwhile, Transportation (TRAN) was found to have the greatest influence on Environmental Performance (ENVP). The business sector should therefore be concerned about safety, accuracy, speed, and ensure strict adherence to rules and regulations. Human Resource competencies and modern technology are other factors that the business sector must not ignore.

5.2 Recommendations

Businesses can apply the research findings as guidelines to improve their operational competitiveness, leading to sustainable development. The recommendations are:

5.2.1 Recommendations for the Business Sector

The analysis of logistics activities that are highly aligned with the air cargo business indicates that customer services and support should prioritize marketing activities, advertising, and public relations, to inform customers about the service delivery process. This will promote effective communication skills and good interpersonal skills among employees, enabling them to use appropriate language and the art of speech in various situations. Additionally, conducting customer-oriented activities as a primary focus will help create a positive image for the organization. In contrast, other factors related to logistics activities, such as demand forecasting and planning, and inventory management, have the lowest alignment with the air cargo business. Therefore, businesses should prioritize predicting or forecasting customer demands in advance and increasing the allocation of work and the number of employees involved in predicting or forecasting customer needs. Additionally, companies must focus on utilizing technology for inventory control and efficient management of warehouse inventory to enhance the efficiency of product flow, from the receiving process to storage, and ultimately to the delivery process.

5.2.2 Recommendations for Future Research

Future studies should focus on trends in the supply chain management, examining the competitiveness of transportation businesses in all modes of transportation in the digital era. Data collection for future studies can utilize other research techniques such as observations and interviews, to provide a broader perspective for these studies.

5.3 Research Limitations

The study was carried out in Thailand, which is categorized as an emerging nation within Southeast Asia. Consequently, the empirical evidence of the proposed conceptual framework of the research solely focuses on the air cargo business in Thailand. Therefore, applying the research results in other countries might require further research to adjust the

findings to their surroundings. Furthermore, the data used in this study were collected from a perceptual base, as a starting point to identify relationships. Further studies should expand this study by exploring the impacts on the actual sustainable performances of companies.

Moreover, in terms of the statistical methods applied in this research (regression analysis), future studies may embrace a predictive model assessment or advanced PLS-SEM analysis, as these are considered superior to regression analysis (Ramli et al., 2018) and can significantly enhance the overall quality and depth of the study.

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REFERENCES

Agyabeng-Mensah, Y., Afum, E., & Ahenkorah, E. (2020). Exploring financial performance and green logistics management practices: examining the mediating influences of market, environmental and social performances. *Journal of Cleaner Production*, 258, 120613.

Aroonsrimorakot, S., Laiphrakpam, M., & Mungkun, S. (2022). Green Logistics (GL) for Environmental Sustainability: A Review in Search of Strategies for Thailand's GL Management. *ABAC Journal*, 42(2), 293-319. https://doi.org/10.14456/abacj.2022.14

Ayasanond., C. (2015). The Service Management that Affects Supply Chain Performance of Freight and Mail Management of Thai Airways International Public Company Limited. *Journal of Logistics and Supply Chain College*,1(2), 28-40.

Banerjee, N., Morton, A., & Akartunalı, K. (2020). Passenger demand forecasting in scheduled transportation. *European Journal of Operational Research*, 286(3), 797-810.

Banihashemi, T. A., Fei, J., & Chen, P. S. L. (2019). Exploring the relationship between reverse logistics and sustainability performance: A literature review. *Modern Supply Chain Research and Applications*, 1(1), 2-27.

Barreto, L., Amaral, A., & Pereira, T. (2017). Industry 4.0 implications in logistics: an overview. *Procedia Manufacturing*, 13, 1245-1252.

Bhosekar, A., Ekşioğlu, S., Işık, T., & Allen, R. (2021). A discrete event simulation model for coordinating inventory management and material handling in hospitals. *Annals of Operations Research*, 1-28.

Boeing. (2021). *Our Presence in Southeast Asia*. https://www.boeing.com/global/boeing-southeast-asia/.

Calvo-Porral C, Lévy-Mangin J-P. (2020). The circular economy business model: examining consumers' acceptance of recycled goods. *Adm Sci* 10:28. https://doi.org/10.3390/admsci10020028

Chardine-Baumann, E., & Botta-Genoulaz, V. (2014). A framework for sustainable performance assessment of supply chain management practices. *Computers & Industrial Engineering*, 76, 138-147.

Chen, J., Xu, S., Liu, K., Yao, S., Luo, X., & Wu, H. (2022). Intelligent Transportation Logistics Optimal Warehouse Location Method Based on Internet of Things and Blockchain Technology. *Sensors*, 22(4), 1544.

Cheung, G. W., Cooper-Thomas, H. D., Lau, R. S., & Wang, L. C. (2023). Reporting reliability, convergent and discriminant validity with structural equation modeling: A review and best- practice recommendations. *Asia Pacific Journal of Management*. https://doi.org/10.1007/s10490-023-09871-y

Civil Aviation Authority of Thailand. (2018). *Direction of airport development in Thailand*. https://www.caat.or.th/th/archives/32229

Cochran, Lee J. (1990). *Sampling Technique* (2nd ed). New York, NY: Harper Collins.

Cooper, D., & Schindler, P. (2003). *Business Research Methods*. 8th ed. Massachusetts: McGraw-Hill Irwin.

Corboș, R. A., Bunea, O. I., & Jiroveanu, D. C. (2023). The Effects of Strategic Procurement 4.0 Performance on Organizational Competitiveness in the Circular Economy. *Logistics*, 7(1), 13.

Daugherty, P. J., Bolumole, Y., & Grawe, S. J. (2018). The new age of customer impatience: An agenda for reawakening logistics customer service research. *International Journal of Physical Distribution & Logistics Management*, 49(1), 4-32.

Decharin., P. (2019). *Strategy*. https://bit.ly/42dyjYj

Department of Industrial Promotion of Thailand. (2022). *Logistics Definition and Meaning*. https://dol.dip.go.th/th/category/2019-02-08-08-57-30/2019-07-21-16-50-25

Ding, S., Ward, H., & Tukker, A. (2023). How Internet of Things can influence the sustainability performance of logistics industries–A Chinese case study. *Cleaner Logistics and Supply Chain*, 6, 100094.

Ditkaew., K., Jermsittiparsert., K., Sinjai., M., & Kaliappen., N. (2021). Strategic cost management on success of logistics management for sustainable performance of export businesses. *International Journal of Entrepreneurship*, 25(4).

Fornell, C., & Larcker, D. F. (1981). Structural Equation Models with Unobservable Variables and Measurement Error: Algebra and Statistics. *Journal of Marketing Research*, 18, 382-388.

Hair, J. F., Black, W. C., Babin, B. J. & Anderson, R. E. (2010). *Multivariate Data Analysis* (7th ed.). Upper Saddle River, NJ: Prentice Hall.

Hejazi, M. T., Al Batati, B., & Bahurmuz, A. (2023). The Influence of Green Supply Chain Management Practices on Corporate Sustainability Performance. *Sustainability*, 15(6), 5459.

Hox, J. J. (2021). Confirmatory Factor Analysis. In *The Encyclopedia of Research Methods in Criminology and Criminal Justice*: Volume II: Parts 5-8 (pp. 830–832). John Wiley & Sons. https://doi.org/10.1002/9781119111931.ch158

Hu, Y. C., Lee, P. C., Chuang, Y. S., & Chiu, Y. J. (2018). Improving the sustainable competitiveness of service quality within air cargo terminals. *Sustainability*, 10(7), 2319.

International Air Transport Association (IATA). (2019). *IATA Forecasts Growth and Demand for Air Cargo in 2019*. https://www.airfreight-logistics.com/th/forecasting-airfreight-growth-and-demand-with-iata/

International Air Transport Association. (2021). *IATA Annual Report* 2021. https://www.iata.org/en/publications/annual-review/

Jadhav, A., Rahman, S., & Ahsan, K. (2022). Sustainability practices disclosure of top logistics firms in Australia. *The International Journal of Logistics Management*, 33(5), 244-277.

Kain, R., & Verma, A. (2018). Logistics management in supply chain–an overview. *Materials Today: Proceedings*, 5(2), 3811-3816.

Kim, J. H. (2019). Multicollinearity and misleading statistical results. *Korean Journal of Anesthesiology*, 72(6), 558-569.

Komchornrit, K. (2021). Location selection of logistics center: A case study of greater mekong subregion economic corridors in Northeastern Thailand. *ABAC Journal*, 41(2), 137-155.

Kumar, A., & Anbanandam, R. (2022). Assessment of environmental and social sustainability performance of the freight transportation industry: An index-based approach. *Transport*

Policy, 124, 43-60.

Lawrence, J. M., Hossain, N. U. I., Rinaudo, C. H., Buchanan, R. K., & Jaradat, R. (2022). An approach to improve hurricane disaster logistics using system dynamics and information systems. In *Recent Trends and Advances in Model Based Systems Engineering* (pp. 699-712). Cham: Springer International Publishing.

Layaoen, H. D. Z., Abareshi, A., Abdulrahman, M. D. A., & Abbasi, B. (2023). Sustainability of transport and logistics companies: an empirical evidence from a developing country. *International Journal of Operations & Production Management*, 43(7), 1040-1067.

Likert, R. (1932). A technique for the measurement of attitudes. *Archives of Psychology*, 22(140), 1–55.

Logistics Office, Department of Primary Industries and Mines, Ministry of Industry of Thailand. (2015). *Fundamentals of Logistics and Supply Chain Management* (2nd ed). Bangkok: A-Print And Pack.

Lowe, D. (2002). *The dictionary of transport and logistics*. Kogan Page Publishers.

Mio, A., Barbera, E., Pavan, A. M., Danielis, R., Bertucco, A., & Fermeglia, M. (2023). Analysis of the energetic, economic, and environmental performance of hydrogen utilization for port logistic activities. *Applied Energy*, 347, 121431.

Montoya-Torres, J. R., Muñoz-Villamizar, A., & Mejia-Argueta, C. (2023). Mapping research in logistics and supply chain management during COVID-19 pandemic. *International Journal of Logistics Research and Applications*, 26(4), 421-441.

Niyawanont, N., & Wanarat, S. (2021). Structural Equation Modelling of Digital Entrepreneurship, Logistics Innovation, and Digital Transformation Influence on Logistics Performance of Logistics Entrepreneurs in Thailand. *ABAC Journal*, 41(4), 147-174.

Nozari, H., Ghahremani-Nahr, J., & Szmelter-Jarosz, A. (2023). A multi-stage stochastic inventory management model for transport companies including several different transport modes. *International Journal of Management Science and Engineering Management*, 18(2), 134-144.

Office of the National Economic and Social Development Council, Thailand. (2023). *Thailand Logistics System Development Action Plan 2023 – 2027*. https://www.nesdc.go.th/main.php?filename=logistics

Pekkaya, M., & Keleş, N. (2022). Determining criteria interaction and criteria priorities in the freight village location selection process: the experts' perspective in Turkey. *Asia Pacific Journal of Marketing and Logistics*, 34(7), 1348-1367.

Pengman, H., Melan, M., & Hanan, S. B. A. (2022). Logistics service providers' capabilities and roles of government towards cross border logistics performance between Thailand and Malaysia. *ABAC Journal*, 42(1), 202-221.

Ramli, N. A., Latan, H., & Nartea, G. V. (2018). Why should PLS-SEM be used rather than regression? Evidence from the capital structure perspective. *Partial least squares structural equation modeling: Recent advances in banking and finance*, 171-209.

Saghir, M. (2004). The concept of packaging logistics. In *Proceedings of the Fifteenth Annual POMS Conference*, Cancun, April (pp. 1-31).

Saputro, T. E., Figueira, G., & Almada-Lobo, B. (2022). A comprehensive framework and literature review of supplier selection under different purchasing strategies. *Computers & Industrial Engineering*, 108010.

Shee, H. K., Miah, S. J., & De Vass, T. (2021). Impact of smart logistics on smart city sustainable performance: an empirical investigation. *The International Journal of Logistics Management*.

Silpcharu., T. (2017). *Research and statistical analysis with SPSS and AMOS* (17th ed). Bangkok: Business R&D.

Sudusinghe, J. I., & Seuring, S. (2022). Supply chain collaboration and sustainability performance in circular economy: A systematic literature review. *International Journal of Production Economics*, 245, 108402.

Suleiman, M. A. (2023). The impact of tourism supply chain on sustainable performance in sub-Saharan Africa: evidence from Tanzania. *Management of Environmental Quality: An International Journal*, 34(2), 492-510.

Sun X, Yu H, Solvang WD, Wang Y, Wang K. (2021). The application of Industry 4.0 technologies in sustainable logistics: a systematic literature review (2012–2020) to explore future research opportunities. *Environ Sci Pollut Res* 29:9560–9591. https://doi.org/10.1007/s11356-021-17693-y

Vanichbuncha., K. (2013). *Factor Analysis with SPSS and AMOS for Research*. Bangkok: Se-education.

Wichitphongsa, W., & Ponanan, K. (2022). A Development of Mode Choice Models for Modal Shift Potential Towards Intermodal Transportation: A Case Study of Vientiane-Boten Railway. *ABAC Journal*, 42(1), 222-236.

World Economic Forum. (2023). *Transport industry leaders share 2023 predictions for decarbonization*. https://www.weforum.org/agenda/2023/01/transport-industry-leaders-2023-predictions-decarbonization/

Yontar, E. (2022). Assessment of the logistics activities with a structural model on the basis of improvement of sustainability performance. *Environmental Science and Pollution Research*, 29(45), 68904-68922.

Zaloznova, Y., & Trushkina, N. (2019). Management of logistic activities as a mechanism for providing sustainable development of enterprises in the digital economy. *Virtual Economics*, 2(1), 64-81.

APPENDIX

Table 9 Source of Measurement Items Used in the Questionnaire

Variables	Measurement Items	Source
DFP	Predicting advance customer demands. Coordinating with departments for customer requirements. Planning and allocating resources for each process. Assigning employees for anticipating customer needs.	Banerjee et al. (2020)
CSS	Nurturing a service-oriented mindset for customer satisfaction. Swiftly responding to and assisting customers. Proficient in communication and adept in expression. Addressing customer needs in accordance with the 4R's principle.	Barreto et al. (2017)
LCOP	Efficiently handling orders and air cargo operations. Clear communication with organizational clients. Offering convenient ordering options. Promptly responding to customer orders. Employing technology for precise and efficient communication.	Daugherty et al. (2018) Zaloznova & Trush-kina (2019)
PP	Negotiating prices with resource providers. Timely and cost-effective resource delivery. Streamlined order and supply management systems.	Saputro et al. (2022) Corboș et al. (2023)
MHP	Controllable and verifiable goods transportation procedures. Safeguarding goods from potential transit damage. Suitable packaging design for transportation equipment. Satisfactory usage and condition of Unit Load Devices. Compliance with international airfreight transportation labeling regulations.	Saghir (2004) Kain & Verma (2018)
FWS	Optimize location and reduce transportation. Enhance workflow and resource allocation. Set operational standards for handling goods. Allocate resources strategically. Manage costs in air cargo warehousing.	Chen et ai. (2022) Komchornrit (2021) Pekkaya & Keleş (2022)
IM	Improve customer responsiveness and availability. Efficiently manage inventory turnover. Implement technology for inventory control and damage reduction. Prioritize agile warehouse management for swift goods flow.	Bhosekar et al. (2021) Nozari et al. (2023)
TRAN	Swift, precise, and on-demand product delivery. Integration of advanced tech in transportation. Effective cost control in transport. Employee training for operational skill development.	Lowe (2002) Lawrence et al. (2022)
RL	Convenient and prompt return process. Standardized procedures for confident returns. Promptly accept returns when customers report product issues.	Calvo-Porraland & Lévy-Mangin (2020) Sun et al. (2021)
ECOP	Reliant on a stable transportation system. Firm commitment to good governance throughout the organization. Prioritizing employee income satisfaction.	Layaoen et al. (2023)

Table 9 (Continued)

Variables	Measurement Items	Source
	Sustainable expansion and development of the organization. Demonstrating competency in competition and economic adaptation.	Montoya-Torres et al. (2023)
SOCP	Developing a skilled workforce for enhanced performance. Involving all stakeholders for improved quality of life. Emphasis on inclusivity, active listening, and societal benefits. Viewing sustainability as integral to organizational culture.	Jadhav et al. (2022) Ding et al. (2023)
ENVP	Sustainable policies guide operations. Prioritize eco-consciousness and efficient resource use. Reduce environmental impacts across processes. Optimize resource use and disclose environmental practices. Promote environmental awareness among employees.	Agyabeng-Mensah et al. (2020) Mio et al. (2023)

Note. DFP = Demand Forecasting and Planning, CSS = Customer Service and Support, LCOP = Logistics Communication and Order Processing, PP = Purchasing and Procurement, MHP = Materials Handling and Packaging, FWS = Facilities Site Selection, Warehousing, and Storage, IM = Inventory Management, TRAN = Transportation, RL = Reverse Logistics, ECOP = Economics Performance, SOCP = Social Performance, ENVP = Environmental Performance.