Supply chain management process that affects the efficiency of air freight operations of Thai Airways

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Abstract.

This research aims to 1) analyze the situation of air cargo transportation of Thai Airways, 2) study the supply chain management process of air cargo transportation of Thai Airways, and 3) increase the efficiency of air cargo transportation of Thai Airways. The research design is qualitative. The main informants used in the research are entrepreneurs, supervisors, service positions, and air cargo specialists, totaling 9 people. The sample was selected by purposive sampling. The research instrument was an interview form. Data was collected by primary and secondary methods and analyzed using content analysis.

The research results found that: Air cargo transportation has a service quality management process that meets international standards. In this regard, transportation must check the readiness of personnel, costs, and documents in order to create a better supply chain management process, including planning, data flow, or even service provision. Management according to the method should be promoted to give the company an advantage in operational efficiency, especially in terms of speed, safety, and reliability, etc.

1. Introduction

Supply Chain Management (SCM) reflects the efforts of suppliers to develop and operate supply chains in the most efficient and cost-effective manner. The supply chain encompasses everything from production to product development, including the information systems required for operations. Typically, SCM seeks to centrally control or integrate the production, transportation, and distribution of products. Through effective supply chain management, companies can reduce excess costs and deliver products to consumers more quickly by exercising stricter control over internal inventory, in-house production, distribution, sales, and vendors' inventories. SCM is based on the concept that nearly all products brought to market are the result of the combined efforts of organizations that form a supply chain. Although supply chains have existed for a long time, most companies have only recently begun to focus on them as a means of adding value to their operations (SUMIPOL, 2022).

Within Thai Airways International, internal organizational factors that affect supply chain operations and overall operational efficiency include the absence of data analytics that can be used to support business decision-making. There is no sufficiently updated database, and data are not in a ready-to-use format as a centralized organizational dataset, nor can they be accessed anytime and anywhere. The development of infrastructure, facilities, and technology has not kept pace with the growth in air traffic volume and customer demand. As a large organization, Thai Airways has complex operational processes that are relatively difficult to manage, which

can result in limited accessibility for customers or users of air cargo services. Furthermore, the management and development of human resources are not yet able to effectively support organizational development. Issues include a large and complex organizational structure, individual performance evaluation systems that are not aligned with key performance indicators, a lack of integration and collaboration across departments, and organizational structures, work systems, and personnel management practices that do not facilitate organizational development or revenue generation. Personnel preparation to support digital transformation is inadequate, productivity is not assessed, and employee cost reports indicate that labor costs remain high as fixed costs. In addition, there is a lack of awareness among personnel regarding standards, and employees lack job-related knowledge and competencies (Enterprise Plan, 2023).

Therefore, the researcher recognizes that supply chain management processes are crucial to supply chain operations and have a significant impact on the efficiency of air cargo transportation at Thai Airways International. Consequently, this study aims to identify ways to enhance operational efficiency in order to benefit air cargo operators by providing insights that can be used to analyze situations and improve supply chain management processes. These improvements are intended to increase speed, reduce costs, and effectively respond to market demand.

1.1 Research Objectives

1. To study the current air cargo operations of Thai Airways International.
2. To examine the air cargo supply chain processes of Thai Airways International.
3. To improve the efficiency of Thai Airways International's air cargo operations.

2. Literature review

From the study of concepts and theories related to supply chain management, definitions have been provided by both domestic and international scholars as follows.

Suthathip Lertwiwatchaiphorn (2018) stated that Supply Chain Management (SCM) consists of all processes directly and indirectly involved in responding to customer needs. These processes are not limited to manufacturers and raw material suppliers, but also include transportation providers, warehouses, intermediaries, and customers. The key element linking these parties is the business relationship from upstream to downstream. Strong business relationships foster trust, which can lead to business alliances and result in more effective supply chain operations, generating long-term mutual benefits. Supply chains are characterized by the movement of information related to the consistent flow of products and financial resources across various stages. Each stage of the supply chain has distinct processes but remains interconnected with other stages. The most important component of the supply chain is the customer, as customers serve as the focal point integrating all parts of the supply chain. The primary objective of the supply chain is to respond to customer demand, which subsequently leads to profitability. Supply chain activities begin with customer orders and end when customers receive the products as ordered. It is essential to recognize the flows of information, financial resources, and products. The supply chain operates as a network, commonly referred to as a logistics network, comprising suppliers, manufacturing centers, warehouses, distribution centers, and retail outlets. There is a continuous flow of raw materials, work-in-process items, and finished goods among these entities. Therefore, supply chain management involves applying strategies, practices, or theories to efficiently manage the

transfer of raw materials, products, or services from one entity in the supply chain to another at the lowest total supply chain cost, while ensuring timely delivery of materials, products, or services. In addition, collaboration through information sharing—by any means—is emphasized in order to understand demand, which is a critical factor driving the movement of materials, products, or services, ultimately leading to shared benefits among all parties involved.

Christopher and Peck (2004) defined supply chain resilience as the ability of a system to return to normal operations or move toward an improved state after experiencing a crisis. This aligns with the views of Santanu (2012) and Christopher and Peck (2004), who proposed that supply chain resilience comprises supply chain re-engineering, supply chain collaboration, agility, and supply chain risk management.

Handfield and Nichols (2002) defined the supply chain as the collaboration and integration of supply chain activities aligned with production processes and flows from raw materials to end consumers, encompassing upstream, midstream, and downstream stages.

Kamble, Desai, and Vartak (2015) discussed the concept of management based on modern business operations, emphasizing that organizations cannot operate independently. Supply chain management encompasses all functions and activities related to producing goods from suppliers to customers. Similarly, Christopher (1994) emphasized the linkage from upstream to downstream industries that creates value in the form of products delivered to consumers. Sudarat Pimolratnakarn, Wiroj Jedsadarat, and Jantana Saensuk suggested that improving service quality in the transportation of living organisms requires effective innovation management capabilities. This is particularly challenging because innovation must originate directly from individuals within the organization. If an organization seeks to transform into an innovation-driven organization, it is necessary to encourage innovation-oriented behaviors among executives at all levels as well as employees, especially frontline staff. Their study found that key factors influencing innovative behavior include granting employees autonomy in their work, allowing them to design tasks, determine directions, and make decisions independently.

In summary, Supply Chain Management refers to the management of all processes from raw material suppliers to end customers, emphasizing collaboration and the efficient flow of information, products, and financial resources in order to meet customer needs and generate profits. The use of cost-reduction strategies and information sharing enhances operational efficiency.

From the study of concepts and theories related to efficiency improvement, definitions have also been provided by both domestic and international scholars as follows.

Preeya Chuenwong (2017) defined operational efficiency as the use of organizational resources to achieve organizational goals. Efficiency focuses on doing the right things and allocating resources in a way that minimizes waste while achieving objectives with the lowest possible resource consumption. Efficiency is goal-oriented, aiming to achieve effectiveness or the highest level of goal attainment, often described as “doing things right.” Operational efficiency can best be evaluated through three key concepts:

Goal Optimization – Efficiency refers to an organization’s ability to acquire and utilize limited and valuable resources in the most beneficial manner to achieve its objectives.

Systems Perspective in Goal Analysis – This perspective emphasizes actions within a system, recognizing that goals are dynamic and may change over time.

Behavioral Emphasis – This focuses on the role of individual behavior within the organization in achieving long-term success, acknowledging that organizational goals can be achieved through employee behaviors characterized by convenience, cost-effectiveness, fairness, equity, and performance levels aligned with organizational objectives.

Warin Kiatnokul (2018) studied efficiency improvement in storage processes to reduce product search time. The study found that raw materials in warehouses were not systematically arranged or categorized, resulting in excessive search time and operational losses due to the absence of an organized storage system. Improvements were made to storage systems and material requisition forms, along with the establishment of inventory counting cycles to enhance accuracy. The results showed reduced search time, clearer categorization of warehouse inventory, improved systematic management, the use of visual control systems to reduce search time, and the implementation of cycle count systems to verify inventory quantities against accounting records.

Gibson et al. (2006) and Deelert et al. (2021) defined organizational efficiency as the level of success an organization achieves in fulfilling its goals or core missions. This involves performing tasks in line with organizational objectives while utilizing resources, including human resources, in the most cost-effective manner with minimal waste. Efficient organizations possess management systems that support production and service delivery aligned with goals, establish strategies and policies, and apply technology intelligently to create appropriate workflows. Such operations run smoothly, with employees exhibiting high morale and job satisfaction. Improving organizational efficiency is a key factor in strategic management processes and directly influences organizational goals.

Suwansup and Sasananan (2014) studied efficiency improvement in procurement through supplier relationship management in the aircraft maintenance industry. Two main forms of supplier relationship management were identified: transactional (arm's-length) relationships and collaborative relationships. Transactional relationships are suitable for low-criticality, widely available consumable items and primarily enhance procurement efficiency by reducing purchase costs. In contrast, collaborative relationships are appropriate for high-criticality, high-value items that are often repairable. This type of relationship improves procurement efficiency by reducing transportation and ordering costs, enhancing order responsiveness and transportation efficiency, and improving product and supplier quality.

In conclusion, efficiency refers to the effective utilization of resources to achieve organizational goals. Organizations must adopt sound management practices, leverage technology, and support personnel to ensure smooth operations. Procurement and warehouse systems should be improved to reduce costs and increase speed, while resource allocation must be managed efficiently to maximize overall performance.

3. Methodology

Research Design This study employs a qualitative research approach, using both primary and secondary data collection methods. The collected data are analyzed using content analysis.

Key Informants The key informants consisted of: Two entrepreneurs involved in air cargo transportation, Four supervisors and personnel in managerial and operational positions related to air cargo transportation, and Three academic experts specializing in air cargo transportation.

The criteria for selecting participants for the focus group discussions and interviews were as follows: Entrepreneurs involved in air cargo transportation with at least five years of experience. Supervisors, managers, and personnel involved in air cargo transportation with at least five years of experience.

Academic experts specializing in air cargo transportation with at least five years of experience.

Research Instruments

The research instrument used was an interview form. The researcher conducted in-depth interviews with entrepreneurs involved in air cargo transportation, supervisors and personnel in managerial and operational positions related to air cargo transportation, and academic experts in air cargo transportation. The data obtained from these in-depth interviews were used to support the discussion of research findings.

Data Collection The researcher collected data from both primary and secondary sources through in-depth interviews.

Data Analysis In this study on supply chain management processes affecting the operational efficiency of air cargo transportation at Thai Airways International, the researcher analyzed data obtained from the predetermined number of interviews using qualitative data analysis. The data were analyzed through content analysis to interpret and synthesize the findings.

4. Results

The current situation of air cargo transportation directly affects air freight costs, which are determined by the International Air Transport Association (IATA), along with additional service charges imposed by individual service providers. Damage management must comply with established standards, such as the requirements for Certified Shipping Agents. However, limitations in personnel skills—particularly English language proficiency and the shortage of younger-generation labor—have impacted international logistics operations. High operational costs have also contributed to delays in technological adoption within the industry. Consequently, infrastructure development and human resource development are critical factors for ensuring long-term sustainability.

The current supply chain management processes in air cargo transportation require careful planning to ensure that goods are delivered safely and efficiently to their destinations. This involves the use of internationally standardized storage and cargo management systems, along with appropriate cost-control marketing strategies. The aviation industry faces significant challenges from rising supply chain and fuel costs, necessitating adaptation through the adoption of artificial intelligence (AI), automation systems, and blockchain technology. In

addition, supply chain diversification strategies and international insurance coverage are increasingly important to mitigate future risks.

Improving operational efficiency and air cargo transportation performance offers a key advantage in terms of speed, making air transport particularly suitable for businesses requiring urgent delivery. Although costs are relatively high, air cargo transportation is cost-effective for high-value goods and e-commerce shipments. Furthermore, strict security measures and real-time tracking systems enhance reliability and transparency. Air transportation plays a vital role in the global economy, especially in the digital era, and the Thai government continues to support the development of Thailand as an aviation hub in ASEAN in order to compete effectively in the global air cargo market.

5. Conclusion

Results of Data Analysis According to Objective 1 The results of the data analysis addressing Objective 1 indicate that the aviation industry continues to grow steadily; however, it faces challenges related to delays in transportation processes, which affect operational efficiency and operating costs. Air cargo transportation at Thai Airways International must adapt to comply with IATA standards, which involve additional costs imposed by service providers, as well as damage management procedures that must adhere to specific standards such as Certified Shipping Agent requirements. These findings are consistent with the study by Pajjai Intranoy and Nattaphat Areeratchakulkan (2022), which found that logistics and supply chain competencies significantly influence the performance of Thai Airways' air cargo operations, particularly in terms of delivery security, punctuality, and infrastructure, all of which are critical factors in enhancing transportation efficiency.

In addition, the research by Chatsuda Soratsa (2022), which examined service quality and customer loyalty, revealed that communication, customer understanding, and reliability significantly affect customer loyalty. These factors are essential components that enable air cargo transportation companies to retain their customer base and enhance competitiveness.

Overall, the findings suggest that the development of logistics and supply chain competencies, along with improvements in service quality, are key approaches to enhancing the operational efficiency of air cargo companies. This is especially relevant for Thai Airways International, which operates in a highly competitive aviation industry. Investment in infrastructure and human resource development is therefore essential to reduce costs and enhance long-term competitiveness.

Results of Data Analysis According to Objective 2 The results corresponding to Objective 2 show that supply chain management processes in air cargo transportation emphasize careful planning to ensure that goods reach their destinations safely and efficiently, alongside effective cost management and the application of marketing strategies. Businesses face challenges from rising supply chain and fuel costs, necessitating the adoption of technologies such as artificial intelligence (AI), automation systems, and blockchain to mitigate risks. Furthermore, supply chain diversification and the use of international insurance are required to manage risks effectively.

These findings are consistent with the study by Suthathip Lertwiwatchaiphorn (2018), which stated that supply chain management encompasses all processes directly and indirectly involved in responding to customer needs, extending beyond manufacturers and raw material

suppliers to include transportation providers, warehouses, intermediaries, and customers. Business relationships serve as the key linkage among these parties, and strong relationships can lead to business alliances that enable supply chains to operate more efficiently and generate long-term mutual benefits.

There is clear alignment in terms of supply chain planning and management, the management of flows of goods, information, and financial resources, as well as the use of technology and innovation to enhance risk management efficiency and adaptability to external factors.

Results of Data Analysis According to Objective 3 The results related to Objective 3 reveal that air cargo transportation offers several advantages, particularly high speed, which significantly reduces delivery time and is well suited to businesses requiring urgent shipments. Although air transportation costs are higher than those of land or sea transport, it remains cost-effective for time-sensitive and high-value goods. In addition, air cargo transportation offers a high level of security and accurate shipment tracking, making it suitable for high-value products such as diamonds and electronic equipment.

Currently, air cargo transportation plays a vital role in the global economy, especially in the rapidly growing e-commerce sector. In Thailand, the government supports the development of the aviation industry with the goal of positioning the country as an aviation hub in ASEAN. This includes enhancing transportation efficiency and adopting digital technologies for real-time shipment tracking, which can strengthen the global operational performance of Thai Airways International's air cargo services.

These findings are consistent with the study by Pajjai Intranoy and Nattaphat Areeratchakulkan (2022), which examined logistics and supply chain competencies affecting the performance of air cargo transportation at Thai Airways International Public Company Limited. The study found that overall logistics competency was at a high level (mean = 4.23), with the highest mean in international shipment security (4.33), followed by punctuality (4.25), customs procedures (4.24), shipment tracking (4.23), international delivery (4.19), and infrastructure (4.16). Overall supply chain competency was also at a high level (mean = 4.22), with flexibility showing the highest mean (4.33), followed by reliability (4.24), responsiveness (4.22), asset management (4.19), and supply chain cost (4.11). Furthermore, logistics and supply chain competencies were found to have a statistically significant effect on air cargo operational performance at the 0.01 level.

In summary, these findings consistently highlight the advantages of air transportation in terms of speed and security, as well as the importance of real-time tracking technologies. They reflect the role of digital technology development in enhancing efficiency within the aviation industry and support efforts to strengthen the competitiveness of air cargo transportation in Thailand at the global level.

Acknowledgment

Recommendations for the Application of Research Findings

1. Limitations in Cargo Volume and Weight Air cargo transportation is constrained by limited cargo space and weight capacity, resulting in higher costs per kilogram compared to other modes of transportation. Therefore, businesses that rely on air transportation should adopt efficiency-enhancing strategies, such as using lightweight yet durable materials (e.g.,

lightweight plastics) to optimize cargo space utilization and reduce overall weight, thereby improving storage efficiency and cost effectiveness.

2. Personnel with Limited Work Experience Personnel with less than five years of work experience often lack sufficient language proficiency, which is a key factor affecting operational efficiency, particularly in international communication with suppliers, customers, and business partners. This may lead to delays, operational errors, and reduced competitiveness. Accordingly, organizations should invest in language training and skills development to enhance communication capabilities and overall performance.

3. Development and Improvement of IT and Technology Systems

The development and enhancement of IT systems or technologies used in air cargo transportation processes often involve high costs, including investments in equipment, employee training, and system maintenance. Therefore, organizations should carefully evaluate and invest in technologies that can deliver long-term value and support sustainable operational efficiency.

4. Damage Prevention and Temperature Control

For temperature-sensitive cargo, such as food and pharmaceutical products, maintaining proper temperature control during transportation is critical to preventing damage. Companies should utilize temperature-controlled transportation services and provide training and knowledge-sharing programs for relevant personnel. In addition, temperature monitoring should be continuously conducted during transportation through sensor systems connected to cloud-based platforms, enabling real-time data tracking and effective risk management.

Recommendations for Future Research

1. Future studies should examine supply chain management practices of other airlines, both domestic and international, in order to compare them with those of Thai Airways International.

2. Further research should focus on the operational strategies of air cargo transportation at Thai Airways International to gain deeper insights into efficiency enhancement and competitiveness.

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