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Decision factors of air cargo freight forwarders for transport service providers in different geographic regions: a systematic literature review

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Abstract

Air cargo transportation facilitates companies in global supply chains in organising production on different continents. High value and perishable goods make extensive use of air cargo as preferred mode of transport. Shippers typically outsource their transportation needs to freight forwarding companies with extensive expertise and global presence. The air cargo industry remains relatively underexplored academically and little is known about the decision making of freight forwarding companies in selecting air transport service providers such as airlines, airports and trucking companies. While existing research investigates Asian exports, there is lack of research from the past 25 years on the distinct European market context. This paper aims to review the literature that is available in the field of decision making at air cargo freight forwarding companies and synthesises the outcomes. The paper also identifies that there is no literature available on freight forwarding companies selecting trucking companies that provide pick-up services at the shipper as part of the air transport chain. Finally, continuation of research is proposed in the field of decision making at European based freight forwarding companies exporting air cargo shipments from Europe.

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Keywords: Air cargo; decision making; freight forwarding

1. Introduction

International air cargo transport plays a crucial role in global sourcing and trade. The organisation of global supply chains requires transport that enable ‘just in time’ production principles (Lo et al., 2015; Meixell and Norbis, 2008;

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Park et al., 2009). Less than 1% of the tonnage of global trade is transported as air cargo (Van Bockstaele et al., 2023). Though, from a value perspective, around 35% of total global trade is transported by air, while the remaining 65% use other modes (Beifert and Prause, 2019; Van Bockstaele et al., 2023). Commodities that typically use air cargo as a mode of transport include high tech equipment, pharmaceuticals and flowers (Budd and Ison, 2017). Production locations of these goods are often located on other continents than consumption, which creates a need for transportation. In order to physically move goods from shipper to consignee, goods will be moved through a chain of transport activities as shown in Figure 1. Historically, freight forwarding companies have established themselves in a role as an intermediary in between the shipper, that generates transport demand, and transport service providers, that offer transport capacity (Chu, 2014; Dožić et al., 2023). Freight forwarding companies therefore select the mode of transport and consequently select the transport service provider. Dožić (2019) identifies that these selection problems are complex multi criteria decision making problems.

This paper aims to review the available literature regarding decision-making at air cargo freight forwarders when selecting transport service providers, between 2000 and 2025. Consequently, this paper will review papers that researched geographic differences in how the air cargo transportation chain is organised. These geographical differences may lead to different decision making of air cargo freight forwarders based in different geographic regions.

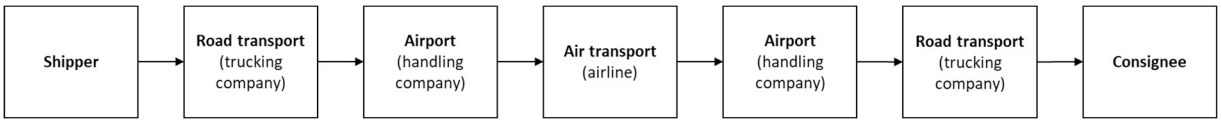

Fig. 1. Air cargo transportation chain from shipper to consignee as organised by freight forwarder (source: Dožić et al. (2023))

The results of this systematic literature review will provide directions to those that want to conduct further research in the field of decision making in the air cargo transportation chain. This paper continues with a methodology section that reveals what and how the literature was sourced. Consequently, the decision factors of previous research are identified and synthesised, followed by conclusions and suggestions for future research.

2. Methodology

This systematic literature review was conducted with a clear methodology to identify, evaluate, and descriptively synthesise relevant academic literature. The main aim of this paper is to review what decision factors influence air cargo freight forwarding companies when selecting transport service providers, such as airlines, airports, and trucking companies. The paper establishes how the air cargo transportation chain is organised differently in geographic regions where freight forwarder decision factors were researched, compared to regions from which no research exists. According to Saunders et al. (2023), there is no fixed publication period to be reviewed for a systematic literature review, but it is determined by the topic, the rate at which the research area is changing, and the available literature. Literature eligible for this systematic literature review is written in English, published between 2000 and 2025, from journals and conference papers. The literature evaluated addresses decision-making at freight forwarding companies for air cargo transport service providers. Also, literature regarding decision making at shippers and airlines is included. Literature regarding freight forwarder decision making in sea transportation, or other modes was not considered.

The literature included in this systematic literature review was sourced from Scopus, Google scholar and books using search terms “air”, “freight”, “forward”, “cargo”, “selection”, “choice”, “transport”, competitiveness” combined with Boolean operators “AND” and “OR”.

No literature on the selection of trucking companies by freight forwarders was identified. Studies regarding freight forwarders selecting airlines and airports conducted in Asia are eligible. Besides relevant information on decision making in different parts of the air cargo transportation chain, such as airlines deciding for airports and shippers’ preferences for freight forwarding companies and transport service providers is included. In the field of decision making in the air cargo transportation chain in total 15 papers are reviewed.

Data extracted from the selected research includes author, date, title, methodology, geographical context, decision factors, key findings, and limitations.

In this systematic literature review the methodologies used in the studies, outcomes and geographical attributes are synthesized, applying a descriptive review of the literature. The systematic approach reveals what has been studied in the field of air cargo freight forwarder decision making and the research gaps. The following chapter will initially synthesise the preferences shippers have when selecting an air cargo freight forwarder and transport service providers, followed by air cargo freight forwarding decision making and geographical differences.

3. Synthesis of decision factors and geographical context

3.1. Shippers' preferences

Although this paper focuses on the selection criteria of air cargo freight forwarders selecting transport service providers, the transportation chain starts with demand created by the shippers (Figure 1). On behalf of the shippers (e.g. high tech or pharmaceutical company), the air cargo freight forwarding companies select transport service providers and as such it is of interest to reveal the outcomes of research regarding the preferences shippers have when selecting freight forwarding companies as well as preferences shippers have for transport service providers.

Voss et al. (2006) found that price is not the only important factor for shippers when selecting a freight forwarder or transport service provider. They established that in the post 9/11 US market, next to price, variables ranging from operational to strategic, such as delivery reliability, carrier reputation, response and equipment availability, influence the preference of shippers for transport service providers as well. Holter et al. (2008) developed a framework for Small and Medium Enterprises (SME) for the purchase of ocean transportation capacity. Logistics purchasing is considered a typical trade-off between cost and quality. Cost consists of expenses for the actual transportation as well as transport management cost within the SME. Quality in this research is determined as transit time, visibility through track and trace, and on-time delivery. Wen et al. (2011) revealed that high tech manufacturers in Taiwan select third party logistics service providers based on cost, delivery performance, responsiveness, information services and perceived capabilities. In a literature review about air cargo operations, Feng et al. (2015) found that shippers are concerned by service level and cost that are being offered by logistics service providers. Mesa-Arango and Ukkusuri (2014) found that price, time, reliability and experience are key decision factors when shippers purchase trucking services. The studies of Voss et al. (2006), Holter et al. (2008),Wen et al. (2011), Mesa-Arango and Ukkusuri (2014) and Feng et al. (2015) provide similar outcomes regarding shipper preferences for both freight forwarding companies and transport service providers, namely price, time, delivery reliability, carrier reputation and shipment visibility.

3.2. Air cargo freight forwarders selecting airlines

The most recent research regarding freight forwarders selecting air cargo transport service providers was conducted by Yoon and Park (2015). They identified the competitive service factors of airlines by rating the views of forwarders in the air cargo export market departing from South Korea. In their research an Analytic Hierarchy Process was applied to data collected from the staff of the top 50 forwarders who were in charge of choosing the airlines. Initially results from previous studies were combined with interviews that were held with industry experts to identify the deciding factors when choosing an airline. The research of Yoon and Park (2015) focussed on export from South Korea on three routes, namely Frankfurt, Los Angeles and Shanghai. From past research and interviews, they concluded that freight forwarding companies take price, promptness, reliability, convenience and sociality into account as deciding factors. Price is then broken down into subfactors such as low price, variety of rates, volume incentives and increases in rate with lead time. In all three markets price turned out to be the dominating factor, followed by promptness and reliability. Differences in the relative importance of these factors were influenced by the supply and demand balance in the researched markets, as well as by the type of goods transported and their specific requirements. Given the geographic location of South Korea bordering to North Korea, trucking air cargo shipments to alternative airports outside South Korea, is not considered an option. Therefore, this study is limited by geography and not directly comparable to an economic region that does provide transport alternatives in neighbouring economic regions.

In the Taiwanese export market Chu (2014) has researched the preferences of freight forwarders for airlines and routes, using data from a revealed preference survey in which 285 small, medium and large freight forwarders, active in short and long-haul transport, were included. As in the study by Yoon and Park (2015), the geographic location of

Taiwan being an island, makes trucking to alternative airports in neighbouring countries not a viable option. Therefor the comparison of decision factors of freight forwarders in other markets is not straight forward. From the study, for which a latent class model was applied, it can be concluded that for large and medium sized freight forwarding companies, the top three factors that determine which airline is chosen, include offering discounted transport rates for high-volume customers, offering efficient and flexible door-to-door services by integrating land transportation and offering of customized options of airfreight services. A limitation in the study of Chu (2014) is that smaller and larger freight forwarding companies are not distinguished, nor long haul and short haul air cargo transport, which is the result of the chosen latent class research methodology. The factors price, promptness and customised solutions are important factors in the studies of both Yoon and Park (2015) and Chu (2014).

Focussing on the express market, Park et al. (2009) conducted research on the competitiveness of air express operators in South Korea. Air cargo services, and air express services in particular, are filling the needs of supply chain companies relying on just in time production principles as well as a growing market of online retailers. Despite consolidation in the air express sector, companies such as DHL, Fedex and UPS are competing on delivery speed, service reliability and service convenience.

Park et al. (2009) have explored the relative importance of factors that influence the adoption of air express delivery services and evaluated the competitiveness of air cargo express carriers in the Korean market. Based on a survey set out to experts six competitiveness factors were identified: promptness, accuracy, safety, convenience, economic efficiency, and dependability. These factors were consequently ranked through an Analytical Hierarchy Process (AHP) and show that accuracy and promptness are considered the two most influential factors to competitiveness, followed by safety, convenience, economic efficiency, and dependability. Experts value service aspects over price. In a following panel of users, it was established that economic efficiency is a more important deciding factor than service factors such as accuracy and promptness. Similar to the study of Yoon and Park (2015), the research of Park et al. (2009) was also conducted in South Korea. The specific geographical position of South Korea, being a peninsula bordering North Korea, does not allow for road transportation to other countries. Trucking opportunities to neighbouring countries, may lead to extended choice from the perspective of the freight forwarder.

The study of Boonekamp and Burghouwt (2017) shows significant numbers of European air cargo shipments depart from airports outside the originating country of the shipment. This proves that freight forwarders include airports across borders when selecting airlines. Although the studies of Yoon and Park (2015), Chu (2014) and Park et al. (2009) are useful from the perspective of selecting transport service provider by freight forwarder, it cannot be concluded that the importance of decision factors presented in the studies also apply to air cargo freight forwarders based in countries that are geographically located in a competitive region with ample trucking services between countries available, such as Europe.

Geimba De Lima et al. (2007) focussed in their research on the preferences that Brazilian air cargo freight forwarders have when selecting an airline for domestic air cargo shipments. They applied an AHP and found that freight forwarders value cost of transportation the most, followed by speed, reliability and flexibility. Their research focussed on domestic cargo transportation and therefore does not consider airports outside Brazil to start the air transportation. Also, because of this domestic focus, road transportation from shipper to consignee can be considered by the freight forwarding company, instead of air transport, implying a different trade-off.

3.3. Air cargo freight forwarders selecting airports

Research of Dožić et al. (2023) focussed on the airport choice per shipment, as is decided by air cargo freight forwarders. The study of Dožić et al. (2023) found that air cargo freight forwarders consider all airports that provide air transport capacity relevant for a respective shipment, within an acceptable radius from the shipments' origin. Freight forwarders follow a stepped approach:

1. Based on geographical location, freight forwarders consider airports that can be reached by truck within acceptable time.
2. Freight forwarders then consider the airport and handler capabilities for processing and handling air cargo. Modern well-designed facilities are attractive to freight forwarders.
3. Freight forwarders then compare total cost and transport time for each airport and appropriate routes from shipper to consignee and analyse trade-off between cost and the quality of service.

After choosing the airport and the route, air cargo freight forwarding companies start negotiating with the airline that offers the chosen routing (Dožić et al., 2023). Typically, air cargo freight forwarders are most interested in delivering freight to the destination on time, efficiently, safely, and cost-effectively. Thus, they choose those airlines that offer lower prices as well as reliable and efficient services, rather than choosing a specific transport route.

Dožić et al. (2023) consequently conducted a case study for Serbia in Southeast Europe. For shipments originating from Serbia transport options were evaluated, trading off total transport costs and the quality of connections. For total transport cost, the cost of both air transport and road transport from shipper to departing airport were included, in addition to the cost of ground handling. The quality of the connection is determined by available airline schedules and the Connectivity Network Unit, as derived from the Netscan model developed by Veldhuis (1997). From the study Dožić et al. (2023, p5) conclude that "In most circumstances, the attractiveness of an airport depends on the characteristics of the supply in terms of transport cost and airline flight schedule." In other words, the freight forwarders' choice for an airport is largely determined by the availability and cost of the airline operating at that specific airport.

Findings of Dožić et al. (2023) raises the question how airlines decide for airports they operate into for a given schedule period. Gardiner et al. (2005) conducted empirical research that finds the decision factors for airlines when adding an airport to its network for a scheduled period. This research was done through a global survey and included scheduled freighter operators but excluded integrators. The most important factor for airlines is the ability to operate into airports at night. This was followed by minimised overall cost for the airline and a positive cargo reputation of the airport. Local origin destination demand and the influence of freight forwarders were only ranked fourth and fifth. Other factors include road access, customs clearance times, financial incentives from the airport and trucking times to main markets.

Research conducted by Kupfer et al. (2016) found different outcomes. The difference in research scope is the inclusion of combination carriers, as opposed to full freighter operators only in the study by Gardiner et al. (2005). The most important factor for airlines when deploying freighter aircraft to an airport is the presence of air cargo freight forwarders. This is followed by an airport's experience with air cargo, the level of airport charges, demand and the possibility of night-time operations. It must be mentioned that demand and freight forwarders are closely related, since most demand is offered to airlines through freight forwarders. Kupfer et al. (2016) also state that in future the role of freight forwarders may become even more dominant, given consolidation in that sector and consequently providing freight forwarders more market power.

Adding to research about freight forwarder airport preferences for export shipments and airline preferences for airports, research from Ohashi et al. (2005) focusses on the choice of air cargo transshipment airport in Northeast Asia. They found that freight forwarding companies' choices for transshipment airports are more sensitive to connecting time at an airport than airport charges. This underpins the preferences freight forwarders have for both cost effectiveness and transportation time.

3.4. Geographical differences

Research by Bookbinder and Tan (2003) ranked logistics systems in Europe and Asia in logistics tiers, applying cluster analysis. Both regions are evaluated providing a social, economic and geographical overview. They compared and ranked the attributes of 47 European and Asian countries, using the four general attributes identified by Wood et al. (2002). These include infrastructure, performance, information systems and human resources. In addition, Bookbinder and Tan (2003) have added two more attribute categories, namely business and political environment. Through a statistical cluster analysis and using data from the World Competitiveness Yearbook, a ranking on attributes per country was determined. The outcomes show that within Europe there are significant differences in scores and ranking. Overall European countries scored better than South Korea and Taiwan, from which research, regarding decision factors of freight forwarding companies selecting transport service providers, is known. Bookbinder and Tan clarified these differences by adding that Europe is more affluent and economically developed than Asia. Also, intra-European trade benefits from one common currency in the EU, where trucking services have been deregulated (Wood et al., 2002). Although both Asia and Europe have highly diverse business cultures and languages, Europe sees higher numbers of cross-border trade (Bookbinder and Tan, 2003). Since the studies by Chu (2014), Yoon and Park (2015) and Park et al. (2009) were all conducted in either Taiwan or South Korea, it is not straight forward to conclude similar

decision-making behaviour of air cargo freight forwarders in Europe and Asia, given the differences in logistics systems as identified by Bookbinder and Tan (2003). Adding to what was found by Bookbinder and Tan (2003), Van Asch et al. (2019) found that differences in customs processes are limited within Europe but can be significant outside Europe. This has an impact on the easiness of cross border road transport and the number of alternative airports and airlines a freight forwarding company can choose from.

4. Discussion: Decision making in the transportation chain

Within the air cargo transportation chain freight forwarding companies select transport service providers, being airlines and trucking companies, on behalf of their customers, the shippers. In turn, airlines select airports they operate into and handling companies at those respective airports (Dožić et al., 2023). Figure 1 shows the air cargo transportation chain in which air cargo freight forwarding companies select the transportation service providers. Examining available literature in the domain of air cargo freight forwarding decision-making shows that literature is available regarding the selection of airlines by freight forwarders, solely from Asia (South Korea and Taiwan). Price, promptness, reliability and customised solutions turn out to be dominant decision factors when freight forwarder companies from South Korea and Taiwan select an airline. No recent literature is available regarding decision making of air cargo freight forwarders for airlines for European exports. To the knowledge of the authors, no literature is available regarding air cargo freight forwarders selecting trucking companies.

However, research is available regarding the preferences that shippers have for air cargo freight forwarding companies and transport service providers (Feng et al., 2015; Holter et al., 2008; Mesa-Arango and Ukkusuri, 2014; Voss et al., 2006; Wen et al., 2011) and preferences cargo-carrying airlines have when selecting airports to operate from (Gardiner et al., 2005; Kupfer et al., 2016). Table 1 provides an overview of the decision factors revealed by publications included in this systematic literature review.

Both Taiwan and South Korea have geographic specifics that do not allow for road transport to neighbouring countries and in doing so selecting transport service providers from a wider range of airports within trucking reach. In Europe this geographic situation is different with the easiness of transporting air cargo by road between different EU-member states, which consequently may lead to different decision making. Insight in the decision factors of European based air cargo freight forwarding companies can be beneficial for transport service providers and their proposition to the freight forwarding sector in Europe. It is suggested to research how increased transportation options influence the relative importance of decision factors when air cargo freight forwarders select an airline.

Table 1. Overview of decision factors per decision maker

Decision maker	Selecting	Dominant decision factors	References
Shipper	Freight forwarder and transport service provider	Price, time, delivery reliability, carrier reputation, shipment visibility	(Feng et al., 2015; Holter et al., 2008; Mesa-Arango and Ukkusuri, 2014; Voss et al., 2006; Wen et al., 2011)
Freight forwarder	Airline	Price, promptness, reliability, customised solutions	(Chu, 2014; Geimba De Lima et al., 2007; Park et al., 2009; Yoon and Park, 2015)
	Airport	Cost effectiveness, total transport time, safe handling	(Dožić et al., 2023; Ohashi et al., 2005)
Airline	Airport	Demand of freight forwarders, minimized operational cost, opening hours, positive reputation	(Boonekamp and Burghouwt, 2017; Gardiner et al., 2005; Kupfer et al., 2016; Van Asch et al., 2019)

5. Conclusion and future research

Air cargo freight forwarding companies decide for transport service providers on behalf of their clients, the shippers. Literature of the past 25 years focusses on Asian exports regarding decision making at air cargo freight forwarding companies when selecting a transport service provider in air cargo. In the reviewed research a combination of interviews and multi criteria decision making techniques are applied, including AHP. No research is available about the decision factors of air cargo freight forwarding companies in Europe when selecting airlines for European exports. To the knowledge of the authors also no research is available regarding selection of trucking companies by freight forwarders as part of the air cargo transportation chain. To fill this gap future research should prioritise empirical studies to identify decision factors and their importance for European air cargo freight forwarders when selecting airlines for European exports. Also, future studies should investigate the decision factors of air cargo freight forwarders when selecting trucking companies for pick-up services at the shipper. By revealing these decision factors, transport service providers can benefit from this knowledge and will be better able to tailor their propositions to the air cargo freight forwarding marketplace, such that the likelihood increases of an air cargo freight forwarding company selecting a specific transport service provider.

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