ASSESSMENT OF AIR CARGO LOGISTICS AND ROLE OF CIVIL AVIATION IN EXPORT OF AGRICULTURAL PRODUCTS

Thesis
Submitted to the University of Calicut
for the award of degree of
Doctor of Philosophy in Commerce

By

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DECLARATION

I hereby declare that the work presented in the thesis entitled **"Assessment of Air Cargo Logistics and Role of Civil Aviation in Export of Agricultural Products"** is based on the original work done by me under the guidance of **Dr. Nissar P,** Assistant Professor, Department of Commerce and Management Studies, PSMO College, Tirurangadi and has not been included in any other thesis submitted previously for the award of any degree. The contents of the thesis are undergone plagiarism check using iThenticate software at C.H.M.K. Library, University of Calicut, and the similarity index found within the permissible limit. I also declare that the thesis is free from AI generated contents.

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This is to certify that the thesis entitled **"Assessment of Air Cargo Logistics and Role of Civil Aviation in Export of Agricultural Products"** is a bonafide record of research work carried out by **Ms. Nahla Banu K** under my supervision and guidance for the award of Ph.D. Degree of the University of Calicut. No part of the thesis has been presented for the award of any degree, diploma, or other similar title or recognition of any other university or institution before.

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NAHLA BANU. K

Assessment of Air Cargo Logistics and Role of Civil Aviation in Export of Agricultural Products

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Abstract

This study encompasses an investigation on significance of civil aviation in facilitating the export of agricultural products. An examination of the major challenges in the air cargo logistics industry and the service performance of the key players such as third-party logistics service providers and airlines are the best part of this research. Moreover, Worldwide supply chains experienced interruptions as a result of the COVID-19 pandemic, which is supposed to have a significant effect on international trade and logistics due to lockdowns, travel restrictions. Therefore, this research also attempts to shed light through a broader and narrower perspective, regarding the precise effects of the pandemic on the agricultural export industry, civil aviation and export performance of the shippers.

The study used both primary and secondary data analysis. Primary data is collected from various shippers and third-party logistics providers for measuring the problems in air cargo logistics sector in Kerala and service performances of airlines with respect to cargo movement. The researcher selected 144 respondents for data collection. Secondary data comprises of export volume of agricultural product , and air freight movement collected from various sources like world bank, ministry of commerce, DGCIs and APEDA websites.

The study has used different statistical and mathematical tools for analysing both primary and secondary data. Analytical tools such as CAGR, growth rate analysis were actually used for secondary data analysis. For primary data analysis the researcher has used various parametric tests including T test, Anova, AHP technique, CART analysis and Partial Least Square Structural Equation Modelling.

The findings of the study revealed that Several agricultural and food products, including Non-Basmati rice, Dairy products, Milled products, and Betel Leaves & Nuts, Wheat, Animal casings are currently witnessing significant growth trends. The most of India's agricultural exports are towards South Asian nations (32% of total exports in the year 2021-2022) followed by West Africa (16%), ASEAN (14%), GCC (10%).Hence, Kerala predominantly exports agricultural perishables via air , with a significant portion destined for GCC countries. This trade primarily involves transporting fresh agricultural products such as fruits, vegetables.

The findings demonstrate the efficient functioning of the customs department in Kerala, nevertheless study also highlights several challenges like cargo congestion and employee's carelessness, Non-availability of space, inadequate shipping routes, excessive freight charges, cargo offloading problem, lack wider body aircraft etc.

The study further figure out that Covid does not affected Indian agricultural export in a broader perspective, However, the exporters with poor financial capability struggled to survive in their export business, some of them switched their operation permanently. Shippers are not satisfied with existing flight routes and availability of cargo space, which prompts dedicated freighter services to accommodate larger shipments and ensure better service quality. The results of the structural equation model indicate that logistics service quality has a significant impact on satisfaction and loyalty, the study has further proven that LSQ contributes to export performance.

In order to ensure better export performance and overall economic development of the nation the study has suggested initiatives such as dedicated freighter services and incentives for cargo-only flights are needed to implement to enhance logistics efficiency and affordability. Additionally, for augmenting air transportation capabilities study recommends to upgrade airport infrastructure to accommodate wider body aircraft.

Keywords: Air Cargo, Civil Aviation, Air Cargo Logistics, Logistics Service Quality, Export Performance.

കാർഷിക ഉൽപ്പന്നങ്ങളുടെ കയറ്റുമതിയിൽ എയർ കാർഗോ ലോജിസ്റ്റിക്സിന്റെയും സിവിൽ ഏവിയേഷന്റെയും പങ്കിനെക്കുറിച്ചുള്ള പഠനം

നഹ്ല ബാനു കെ
ഗവേഷക

ഡോ. നിസ്സാർ പി.
ഗവേഷണ മാർഗ്ഗദർശി

സംഗ്രഹം

കാർഷിക ഉൽപ്പന്നങ്ങളുടെ കയറ്റുമതി സുഗമമാക്കുന്നതിൽ വ്യോമയാനവകുപ്പിന്റെ പ്രാധാന്യത്തെക്കുറിച്ചുള്ള അന്വേഷണമാണ് ഈ പഠനം ഉൾക്കൊള്ളുന്നത്. ലോജിസ്റ്റിക്സ് സേവനദാതാക്കളുടെയും, എയർലൈനുകളുടെയും ചരക്ക് നീക്കവുമായി ബന്ധപ്പെട്ട സേനവമികവിനെക്കുറിച്ചുള്ള അന്വേഷണം ഈ പഠനത്തിന്റെ മറ്റൊരു പ്രധാന സംഭാവനയാണ്. ലോക്ഡൗണുകളും യാത്രാനിയന്ത്രണങ്ങളും കാരണം അന്താരാഷ്ട്ര വിതരണശൃഖലകൾ തടസ്സങ്ങൾ നേരിട്ടതിനാൽ, കാർഷിക കയറ്റുമതി വ്യവസായം, സിവിൽ ഏവിയേഷൻ, ഷിപ്പർമാരുടെ കയറ്റുമതി കാര്യക്ഷമത എന്നിവയിൽ പാൻഡെമിക്കിന്റെ കൃത്യമായ പ്രത്യാഘാതങ്ങളെക്കുറിച്ച് പഠിക്കാനും ഈ ഗവേഷണം ശ്രമിക്കുന്നു.

പഠനത്തിനായി പ്രാഥമികവും ദ്വിതീയവുമായ ഡാറ്റാവിശകലനം ഉപയോഗിച്ചു. കേരളത്തിന്റെ എയർ കാർഗോ ലോജിസറ്റിക്സ് മേഖലയിലെ പ്രശ്നങ്ങളും ചരക്ക് നീക്കവുമായി ബന്ധപ്പെട്ട് എയർലൈനുകളുടെ സേവന കാര്യക്ഷമത അളക്കുന്നതിന് വിവിധ ഷിപ്പർമാരിൽ നിന്നും ലോജിസ്റ്റിക്സ് ദാതാക്കളിൽനിന്നും പ്രാഥമികവിവരങ്ങൾ ശേഖരിച്ചു. എന്നാൽ ദ്വിതീയ ഡാറ്റയായ കയറ്റുമതിയുടെ അളവും വിമാന ചരക്കിന്റെ അളവും ലോകബാങ്ക്, വാണിജ്യ മന്ത്രാലയം, ഡി.ജി.സി.ഐ.എസ്., അപെഡ തുടങ്ങിയവയുടെ വെബ്സൈറ്റുകളിൽനിന്നും ശേഖരിച്ചു.

പഠനത്തിന്റെ ഭാഗമായി വ്യത്യസ്ത സ്റ്റാറ്റിസ്റ്റിക്കൽ ഗണിതശാസ്ത്രവിദ്യകൾ ഉപയോഗിച്ചു. ദ്വിതീയ ഡാറ്റ വിശകലനത്തിന് വാർഷിക വളർച്ചാനിരക്ക്, വളർച്ചാനിരക്ക് എന്നീ വിശകലനവിദ്യകളും പ്രാഥമിക ഡാറ്റ വിശകലനത്തിനായി വിവിധ പാരാമെട്രിക് ടെസ്റ്റുകളും എ.എച്ച്.പി, കാർട്ട്, സ്കേച്ചറൽ ഇക്വേഷൻ മോഡലിംഗ് മുതലായവ ഉപയോഗിച്ചു. ബസ്മതി അരി, പാലുൽപന്നങ്ങൾ, വെറ്റില, പരിപ്പ്, ഗോതമ്പ്, മൃഗങ്ങളുടെ കേസിംഗുകൾ മുതലായവ കാർഷിക ഭക്ഷ്യ ഉൽപ്പന്നങ്ങൾ നിലവിൽ ഗണ്യമായ വളർച്ചയ്ക്ക് സാക്ഷ്യം വഹിക്കുന്നുണ്ടെന്ന് പഠനകണ്ടെത്തലുകൾ വെളിപ്പെടുത്തി. ഇന്ത്യയുടെ കാർഷിക

കയറ്റുമതിയിൽ ഭൂരിഭാഗവും ദക്ഷിണേഷ്യൻ രാജ്യങ്ങളിലേക്കാണ് (മൊത്തം കയറ്റുമതിയുടെ 32%). പശ്ചിമാഫ്രിക്ക (16%), ആസിയാൻ (14%), ജി.സി.സി. (10%) എന്നീ മേഖലകളാണ് ഇന്ത്യൻ കാർഷികോൽപ്പന്നങ്ങളുടെ മറ്റ് പ്രധാന ഉപഭോക്താക്കൾ. എന്നാൽ കേരളത്തിൽ ചരക്ക് നീക്കത്തിന് വ്യോമയാനമാർഗ്ഗം ഉപയോഗിക്കുന്നവരിൽ ഭൂരിഭാഗവും ജി.സി.സി. രാജ്യങ്ങളിലേക്കാണ് കയറ്റുമതി ചെയ്യുന്നത്. ഈ വ്യാപാരത്തിൽ പഴങ്ങൾ, പച്ചക്കറികൾ പോലുള്ള കാർഷികോൽപ്പന്നങ്ങളാണ് പ്രധാനമായും തിരഞ്ഞെടുക്കുന്നത്.

ജീവനക്കാരുടെ അശ്രദ്ധ, സ്ഥല ലഭ്യതക്കുറവ്, അപര്യാപ്തമായ ഷിപ്പിംഗ് റൂട്ടുകൾ, അമിത ചരക്ക് നിരക്കുകൾ, കാർഗോ ഓഫ്‌ലോഡിംഗ്, വലിയ വിമാനക്കമ്പനികളുടെ അഭാവം എന്നിവയാണ് ലോജിസ്റ്റിക്സ് മേഖലയിൽ ഷിപ്പേഴ്സ് നേരിടേണ്ടിവരുന്ന പ്രധാനപ്രശ്നങ്ങളായി ഈ പഠനത്തിലൂടെ കണ്ടെത്തിയത്. കൂടാതെ കേരളത്തിന്റെ കസ്റ്റംസ് വകുപ്പിന്റെ കാര്യക്ഷമമായ പ്രവർത്തനവും പഠനം ചൂണ്ടിക്കാണിക്കുന്നു.

കൂടാതെ ഇന്ത്യൻ കാർഷിക കയറ്റുമതിയെ കോവിഡ് ബാധിച്ചിരുന്നില്ല എന്ന് ഈ പഠനം തെളിയിക്കുന്നു. എന്നിരുന്നാലും, സാമ്പത്തികശേഷി കുറഞ്ഞ കയറ്റുമതിക്കാർ തങ്ങളുടെ ബിസിനസ്സിൽ അതിജീവിക്കാൻ ബുദ്ധിമുട്ടിയിരുന്നു. നിലവിലുള്ള വിമാനറൂട്ടുകളിലും വിമാനത്തിലെ പരിമിതമായ സ്ഥലലഭ്യതയിലും ഉപഭോക്താക്കൾ സംതൃപ്തരല്ല എന്നതിനാൽ മികച്ച സേവനം ഉറപ്പുവരുത്താനും, കൂടുതൽ ചരക്കുവിമാനങ്ങൾ അനുവദിക്കാനും ഈ ഗവേഷണം അഭിപ്രായപ്പെടുന്നുണ്ട്. ലോജിസ്റ്റിക്സ് സേവന നിലവാരം - സംതൃപ്തി, വിശ്വസ്തത, കയറ്റുമതി കര്യക്ഷമത എന്നിവയിൽ സ്വാധീനം ചെലുത്തുന്നുണ്ട് എന്നത് ഈ പഠനത്തിന്റെ മറ്റൊരു പ്രധാന കണ്ടെത്തലാണ്.

രാജ്യത്തിന്റെ സാമ്പത്തിക വികസനവും, കയറ്റുമതി കാര്യക്ഷമതയും ഉറപ്പാക്കുന്നതിന് മിതമായ വിമാന നിരക്കിന്റെയും കൂടുതൽ ചരക്ക് വിമാന സേവനങ്ങളുടെയും ആവശ്യകത ഈ പഠനം ചൂണ്ടിക്കാണിക്കുന്നു. കൂടാതെ, വ്യോമഗതാകതശേഷി വർദ്ധിപ്പിക്കുന്നതിന് വലിയ വിമാനങ്ങൾക്ക് അനുമതി നൽകാനുതകുന്ന അടിസ്ഥാന സൗകര്യങ്ങൾ അന്താരാഷ്ട്ര വിമാനത്താവളങ്ങളിൽ ഉറപ്പുവരുത്താൻ ഈ പഠനം ശുപാർശ ചെയ്യുന്നു.

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LIST OF ABBREVIATIONS

AHP	:	Analytical Hierarchy Process
AIFTA	:	Asean India Free Trade Agreement
APEDA	:	Agricultural and Processed Food Products Export Development Authority
APTA	:	Asia Pacific Trade Agreement
ASEAN	:	Association of South East Asian Nations
CAGR	:	Compound Annual Growth Rate
CAR	:	Central African Republic
CART	:	Classification And Regression Tree Analysis
CIS	:	Common wealth Independent States
DGCIS	:	Directorate General of Commercial Intelligence and Statistics
EFTA	:	European Free Trade Association
EU	:	European Union Countries
FTA	:	Free Trade Agreement
GCC	:	Gulf Cooperation Council
LSP	:	Logistics Service Provider
LSQ	:	Logistic Service Quality
NE Asia	:	North East Asia
PLS-SEM	:	Partial Least Square Structural Equation Modelling
SACU	:	Southern African Customs Union
SAFTA	:	South Asia Free Trade Agreement

Chapter 1

Introduction and Research Methodology

1.1 Introduction

For developing and underdeveloped countries, exporting perishable and exotic commodities is a viable opportunity for exporters in the international market (Vega, 2008). Promotion of agricultural exports is needed not only to assure precious foreign exchange for the nation but also to fulfilling the goal of 'Aatmanirbhar Bharat,' for which agricultural trade plays a pivotal role (Kumar, 2021). India treats Free Trade Agreements (FTAs) as 'building blocks' towards the overall objectives such as trade liberalisation, peace and stability between nations and increased market access (Economic Survey, 2022).To some extent the integration of nation is depending upon the distance between exporting and importing countries (Kurihara, 2011). There are different modes of transportation like sea, air, and land facilitating the international flow of goods (Jha & Gupta, 2020). However, highly perishable and time-sensitive products such as fruits, vegetables, meat and dairy products are relying on air mode of transportation as it is the quickest mode of transportation (Vasantha, 2019).

The main advantages of air freight are its quick delivery, ability to handle high-value low-volume products, ability to move freight from terminal to terminal, ability to serve areas with higher cargo demand, minimal transit times, reliability and flexibility, fewer losses and damages, less need for packaging, and the possibility of reducing inventory costs through Just in Time (JIT) supply strategies (Larrodé et al., 2018). An increasing amount of air travel is now included in the nation's foreign trade and more than 95% of all air exports are made up of fish, flowers, fruits and vegetables which are the main products relying air shipment (Mawanga, 2017). Over the past few

decades, the air cargo business has experienced substantial expansion, as a result of the liberalisation of global trade. However, the cargo sector is highly operational, involving numerous parties, complicated procedures and immense sensitivity (Huang & Lu, 2015).

Besides, the Airlines and International airports, and third-party logistics providers make it easier to deliver the appropriate goods to clients in the right quantity, at the right time, and at the right location, which is crucial for exploring foreign markets as exporters are concerned. Third-party logistics providers have been providing an efficient organizational set-up to fulfil the needs of clients for logistics solutions such as storage, order processing, shipping and receiving (Panayides & So, 2005).

Ahn & Steinbach (2022) reported that a significant trade impact of about 35.9% noted in the agriculture and food sector hindered exports due to temporary non-tariff measures caused by covid pandemic. Mitra et al. (2022) found out that fall in demand and cancellation of foreign marketing, flower export has been affected adversely, causing farmers strive to survive. Shanker et al. (2022) in his study reported that customers are being alarmed over the virus spread, resulting in low level sales. Restriction of international transportation, fear of disease, social distance protocols imposed by the health sector, and even a lockdown of market centres affect the whole functioning of the supply chain (Ababulgu et al., 2022).

Based on the literature review, it appears that the quality of logistics services will influence not only LSP performance but also agricultural trade and shipper's export performance. Because of the current competitive environment of international trade and the increased necessity of integration of supply chain, the researcher intends to examine the trends in farm exports and integration in the LSP-client relationship via satisfaction-loyalty link in the air cargo logistics sector. It is also crucial to examine the service performance of key parties especially 3PLs and Airlines as they play pivotal role in freight movement. An attempt was made to find important criteria considered by LSP clients in the selection of service providers and the effect of

logistics service quality on the shipper's export performance. A thorough analysis is imperative concerning the challenges faced by shippers and covid disruptions in the aviation industry, particularly in terms of cargo movement.

1.1.1 Key Parties in the Air Cargo Logistics Industry

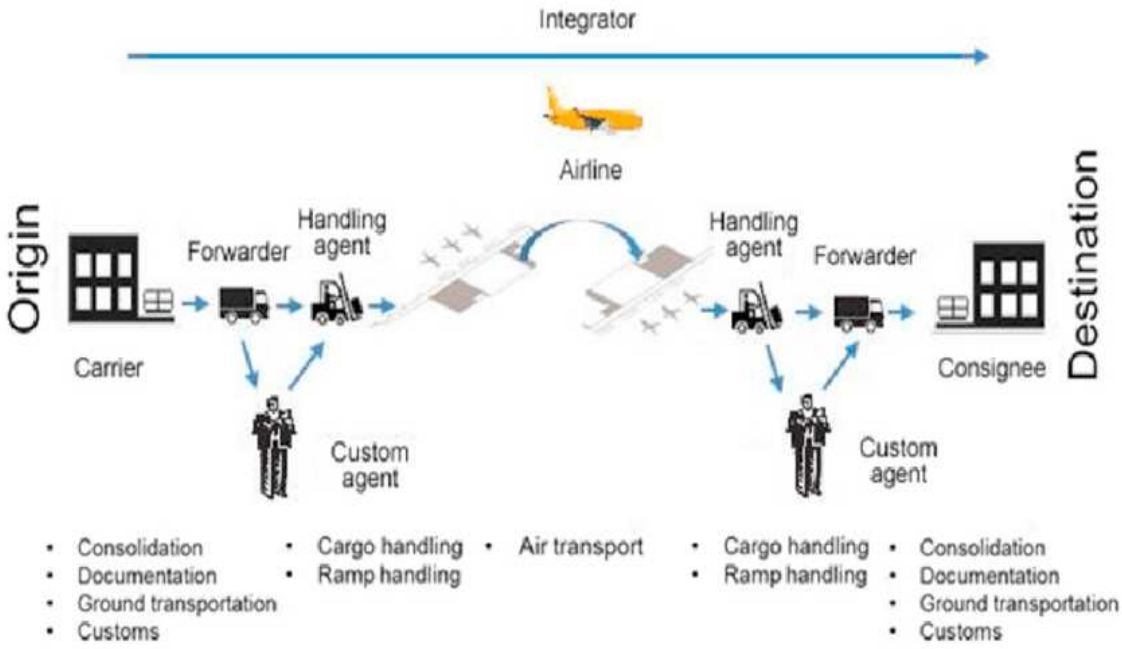
- **Shippers**: Shippers are the exporters, might be firms, manufacturers or individuals who need to transport and sell their goods in the foreign market. The exporters play a pivotal role in encouraging national collaboration and economic development of home and host countries. Exporters must deal with the complexities of many markets, trade laws, and cultural differences to start and grow international commercial relationships. They outsource the logistics activities such as customs clearance, documentation, air freight space booking etc. in collaboration with third-party logistics providers.

- **Third-Party Logistics (3PL) Providers**: Also known as freight forwarders, are acting as intermediaries between the shippers and airlines. They offer a wide range of services such as logistics and supply chain operations, including air freight movement. They help shippers for the smooth functioning of logistics activities such as warehousing, documentation, customs clearance and distribution. Apart from that, they also offer some value-added services like supply chain optimisation and cargo tracking.

- **Airlines**: The primary carriers of the goods are called Airlines. Cargo movement from one place to another place is the responsibility of airlines. They manage cargo aircraft and allot cargo space for the carriage of products on passenger flights. While some airlines just provide air cargo services only, some airlines combine passenger and cargo services.

Figure 1.1

Supply Chain and Cargo Logistics



A model of the logistics and supply chain concept is shown in the picture above, where the cargo from shippers is taken to the warehouse which in turn is forwarded either through ocean or air freight after customs clearance. Similarly, import clearance is performed by the handling agents and freight forwarders in foreign nations. Later on, the imported goods are then taken to distribution centres by the consignee.

1.2 Significance of the study

The research comprehensively explores various aspects of Indian agricultural products and emphasises the importance of air cargo logistics and civil aviation in the shipping process. The primary aim of this work is to gain economic implications for policies, business investments, and strategies that can improve economic growth and stability. Eliminating supply chain disruptions offers farmers substantial benefits by enabling efficient transportation of agricultural products, minimal spoilage, and diversified market access for better prices. A resilient supply chain further facilitates market diversification, fostering long-term partnerships and sustainability in the agricultural sector. The research addresses challenges encountered by shippers in

cargo logistics, contributing to the enhancement of efficient supply chain management and the streamlining of shipment complexities. The examination of the service quality of third-party logistics providers and airlines, the study becomes instrumental in elevating the efficiency of air freight movement. This, in turn, empowers businesses to foster customer relationship management, make better strategic decisions, and uphold their competitiveness through higher service standards and reliability.

Its focus on examination of the implications of virus outbreaks in agricultural trade and the air cargo sector further equips enabling stakeholders especially government and disaster management sectors to be well-prepared in handling and mitigating the specific challenges that may arise from natural disasters like virus outbreaks in these sectors. In short, this study is significant in economic, and logistics, offering valuable insights to bring forth better strategies, policies and practices in the agricultural trade and air cargo logistics sectors.

1.3 Scope of the studies

This study offers a comprehensive view of India's agricultural product exports and examines the involvement of civil aviation in facilitating the transportation of these products. To achieve the research goals, the researcher has conducted both primary and secondary data analyses. In the secondary data analysis, the study assesses the trends and potential opportunities in India's agricultural exports by considering various agricultural products and the specific regions to which India exports these products. The product composition primarily focuses on prominent products regulated by APEDA, while the regional focus includes ASEAN, SAARC, GCC, EU, CIS, American, and African regions.

To investigate the impact of civil aviation, the research initially evaluated the movement of airfreight in various states across India. Subsequently, the study focused on assessing the contributions of the aviation sector to international trade by examining the operations of three international airports: Calicut International Airport, Cochin International Airport, and Trivandrum International Airport.

Apart from the secondary data, the study also involves primary data analysis, focusing on the perspectives of shippers and third-party logistics providers (3PLs) who use the services of the three international airports in Kerala. This primary data helps to explore information such as the major challenges faced by shippers, criteria for selecting third-party logistics providers and their export performance in different periods. Additionally, the research assesses the quality of airline services by gathering the viewpoints of third-party logistics providers.

1.4 Statement of the Problem

Despite there being many free trade agreements in order to promote international trade export, Kohl (2014) in his work reported that the majority of trade agreements do not encourage international flow of goods and services, smaller exporters and the poorest nations do not benefitted the effect of Preferential Trade Agreement (Foster et al., 2011).

For export promotion logistics activities especially freight logistics play an important role (Banomyong & Saopath, 2011). Offering effective and efficient logistics services may improve a company's edge over competitors (McDuffie & John, 2001). Logistics not only save costs, but they may also raise the overall quality of the company's supply of goods (Mentzer et al., 2004). Due to its substantial effect on customer satisfaction and loyalty, LSQ has been acknowledged as an essential aspect which aids 3PLs in creating and sustaining long-term relationships with shippers (Rafiq & Jaffar, 2007). Many third-party logistic providers use price competition and sales-influenced strategies to face competition, which insists stronger relationship with trading partners (Banomyong et al., 2020). Palmer et al.(2005) suggested that conventional marketing strategies such as pricing and sales promotions may not work in this competitive world.

However, few previous studies emphasized the issues that prevailed in the logistics industry, even though air transportation is quick and reliable, the demand for air freight is comparatively lesser due to its excessive charges (Ministry of Civil Aviation, 2012).

Lack of human resources , insufficient physical equipment and transaction uncertainty are the driving factors for outsourcing their work to a third party (Zailani & Rizaimy, 2015). However, hurdles in the dependence of freight forwarders are another big deal raised by Gadde & Hulthén (2009). As a result of provider opportunism and unfair profit distribution, the inseparability of service inputs and limited provider capabilities may affect client relationships (Selviaridis, 2016).Tsai et al.(2008), noted in their analysis that the two most significant risks associated with outsourcing are those related to assets and competence, among which information risk and loss of control values are regarded as serious obstacles for the parties involved. Major problems that are common in some developed nations are shortage of truck drivers, capacity restrictions, and talent management difficulties, which means that logistics managers need to figure out and come up with solutions (Lieb & Lieb, 2016). Similarly, with respect to airline services, the punctuality of flights is another major issue pointed out by clients (Wang, 2007). Meanwhile, Huang et al. (2016) reported imperfect cargo delivery, lack of shipping spaces, accuracy issues in cargo delivery and employee's professional knowledge are the serious issues. Naturally, epidemics have a greater influence on air and land freight, but they have a statistically minimal effect on ocean freight (Xu et al., 2021). The suspension of foreign travel encountered an impact on the global supply chain and air freight flow, but it did not affect the export of medical accessories or agro-perishables (Bouali et al., 2020). Documentation complexities, along with export and logistics restrictions, pose challenges for exporters when they reopen after the first lockdown (Geldres-Weiss et al., 2021).

In such context, this study tries to answer the following questions.

1.5 Research Questions

- What are the trends and prospectus of agricultural exports from India?
- What is the role of civil aviation in the shipment process of agricultural products?
- What are the major problems faced by the shippers in the air cargo logistics industry?

- What are the service attributes considered by the shippers in the selection of logistics service providers?
- Whether there is any influence in logistics service quality on satisfaction and loyalty?
- Whether there is any relationship between the logistics service performance and export performance of the shippers?
- What is the intensity of covid outbreak among different shippers and its impact on the export performance?
- Whether the third-party logistics service providers are satisfied with the service performance of airlines in the air shipment process?

1.6 Objectives of the Study

- To explore the trends and prospectus of Indian agricultural exports from India.
- To examine the role of civil aviation and air cargo traffic in Agro-based product shipment in Kerala.
- To study the challenges in air cargo logistics and the effect of virus outbreaks in freight movement and shipper's export performance.
- To investigate the criteria chosen by shippers to select LSPs and the influence of logistics service quality on export performance, customer satisfaction and loyalty.
- To measure the cargo service performance of airlines perceived by third-party logistics providers.

1.7 Research Hypotheses

Table 1.1

Hypotheses of the study

Objective 3: To examine the major challenges encountered by shippers in the Air Cargo Logistics sector.	
Hypotheses	**There is a significant difference in the opinion of shippers regarding the problems of cargo logistics in accordance with demographic profiles.**
	H1a *There is a significant difference in the opinion of shippers regarding the problems of cargo logistics in accordance with the type of business.*
	H1b *There is a significant difference in the opinion of shippers regarding the problems of cargo logistics in accordance with the availability of export promotion schemes.*
	H1c *There is a significant difference in the opinion of shippers regarding cargo logistics problems based on their experience.*
Objective 4: To investigate the criteria chosen by shippers to select third-party logistics providers and the influence of logistics service quality on export performance, customer satisfaction and loyalty.	
Hypotheses	***There is a significant difference in the perception of shippers regarding export performance based on the demographic profile of the shippers,** ***LSQ positively influence export performance, customer satisfaction and loyalty.**
	H1a *There is a significant difference in the perception of shippers on export performance in the pre-COVID period based on the type of business.*
	H1b *There is a significant difference in the perception of shippers regarding export performance in the pre-COVID period based on years of experience.*
	H1c *There is a significant difference in the perception of shippers regarding export performance in the COVID period with respect to years of experience.*
	H1d *There is a significant difference in the perception of shippers regarding export performance in the post-COVID period based on years of experience.*

	H1e	*There is a significant difference in the perception of shippers regarding export performance during COVID period and pre-COVID period.*
	H1f	*There is a significant difference in the perception of shippers regarding export performance during covid era and post-COVID era.*
	H1g	*Logistics service quality positively influences export performance of the shippers.*
	H1h	*There is a significant influence of logistics service quality on satisfaction.*
	H1i	*There is a significant influence of logistics service quality on loyalty.*
	H1j	*There is a significant influence of satisfaction on customer loyalty.*
	H1k	*Satisfaction mediates the relationship between logistics service quality and loyalty.*
Objective 5: To measure the cargo service performance of airlines perceived by third-party logistics providers.		
Hypotheses	**There is a significant difference in the perception of Third-Party logistics providers with regard to satisfaction of airline service in cargo shipment based on their demographic profile.**	
	H1a	*There is a significant difference in the perception of Third-Party logistics providers with regard to satisfaction of airline service in cargo shipment based on the state.*
	H1b	*There is a significant difference in the perception of Third-Party logistics providers with regard to satisfaction of airline service in cargo shipment based on experience.*

1.8 Theoretical foundation and measurement scales

Choosing the right third-party logistics service provider (3PL) has become increasingly challenging as the 3PL industry expands. The abundance of qualified 3PLs and the diverse range of services cause immense difficulties among the shippers for making the optimal selection (Perçin & Min, 2013). Service quality is generally meant by offering the best product features capable of meeting customer requirements and satisfaction (Guran, 1999). SERVQUAL model proposed by Parasuraman and Zeithaml consists of five broad dimensions like Tangibles, Assurance,

Responsiveness, Reliability, and Empathy. The scale has been widely adopted in various sectors such as marketing, management, health, supply chain, CRM etc. SERVQUAL model is an attempt to measure customer's expectations and perceived quality of service (Parasuraman et al., 1985). However, the scale was modified and created a new model SERVPERF solely based on performance measures, while ignoring expectation of quality assessment (Cronin & Taylor, 1994). Several empirical studies across a range of service settings demonstrate the relevance of Parasuraman, Zeithaml and Berry's (1988) scale (Agrawal et al., 2016; Ahuja et al., 2011; Al-Azzam, 2015; Almigheerbi et al., 2019; Barroso & Carri, 2010; Falkendal et al., 2021; Jonkisz et al., 2022; Kulašin & Fortuny-Santos, 2005; Miguel et al., 2006; Singh & Puri, 2018; Sulieman, 2013; Zaim et al., 2013; Zeise et al., 2001) Gradually the SERVQUAL Model has been modified and altered by different authors contextually.

1.8.1 Logistics Service Quality

In the process of selecting a 3PL, measurement of service quality is one of the most important considerations. Through analyses of the differences between customer perceptions and actual customer service on various attributes, service quality aims to understand customer satisfaction (Banomyong & Supatn, 2011). Liberatore et al. (1995) claimed that selecting the right 3PL affects the overall performance of the logistic channel. Meanwhile, in the study of Wilding & Juriado, (2004), the authors argued that selection and renewal of 3PLs were largely driven by service quality and cost. Several studies have been conducted and developed numerous scales to measure logistics service quality during the last four decades. The holistic perspective of some authors regarding the service attributes of logistics is mainly marketing customer service and physical distribution service. Where the quality of physical distribution is referred to as ensuring the right quantity of products at the right time at the right destination (Mentzer et al., 2001). As a result, this concept led to form another measurement scale called PDSQ (Physical Distribution Service Quality. Beinstock et al.(1997) Contributed the measurement of PDSQ with three broad dimensions namely condition, accessibility and timeliness. Nevertheless Mentzer, in his prominent work

claimed more broadening is necessary other than these PDSQ elements, especially in the wake of value-added operational tasks. Therefore, the author formulated a nine-dimension LSQ scale by incorporating Parasuram's five-dimension SERVQUAL Model (1985) to pursuit the competitive advantage of the market. The scale comprises key constructs namely personal contact quality, order release quantities, information quality, ordering procedures, order accuracy, order condition, order quality, order discrepancy handling, and timeliness. The scale was further validated in his work in 2001 and hypothesized the relation between these dimensions and customer satisfaction (Mentzer et al., 2001). Similarly, several works validated the scale in different contexts. Kamble (1998); Rafiq & Jaffar (2007) applied this in logistics industry, while Xiong et al. (2007) brought some modifications in the scale for measuring the logistics service quality of online shopping. The measurement scale of Mentzer's model was further examined and validated by adding technical capability and tested in the logistics industry (Bienstock et al., 2008).

Uvet (2020) in his study measured LSQ, compressed the key dimensions into personal contact quality, Order discrepancy handling, Timeliness, and Order Condition and added a new construct namely 'operational information sharing' to make possible the client's expected service quality. Panayides & So (2005) hypothesized a positive connection between relationship orientation and third-party logistics provider's performances, the author considered reliability, timely response, documentation accuracy, information accuracy, service fulfilment, problem-solving skill and empathy as the scale of measurement. Likewise, some authors evaluated and confirmed timeliness, order quality, and information quality as the key constructs of the LSQ Measurement scale. Thai (2013) modified this by adding corporate image and customer focus to the LSQ. Liang et al. (2006) brought a different logistics service quality measurement instead of the above basic common dimensions, consisting of responsibility and operation convenience, integrated service, transportation ability and price. According to Banomyong & Supatn (2011) the selection criteria are relatively different, and included 31 sub-constructs under seven prominent dimensions namely carrier reliability, promptness of delivery cycle, carrier prestige, financial opportunities, reliability and quality of operation management,

collaboration easiness, accurate order receipt. Bottani & Rizzi, (2006) stated that the selection criteria of logistics services curtailed into appropriate service, physical equipment and information technology. Goh and Pinaikul (1998) suggested service delivery reliability, supplier flexibility and responsiveness, customer orientation of the suppliers and the rates of services as selection factors of LSQ in Thailand. In contrast, Rafele (2004) contributed a different logistics service quality model with three broad classifications tangible components, ways of fulfilment, and informative actions, hence these criteria indirectly matching to the five basic SERVQUAL dimensions. Moreover, Saura, Francés, et al. (2008) suggested a two-dimensional model adapted from Mentzer's model, comprising personal quality, information quality, and order quality are collectively under one dimension and timeliness belongs to another dimension. In addition to that Jari et al. (2010) suggested operation quality, technical quality, and information quality as significant components to measure LSQ in the satisfaction-loyalty paradigm. Apart from that an express service quality evaluation tool was introduced by Meng & Zhou (2016) with five primary dimensions namely Tangibility, Reliability, Response, Guarantee, and Empathy purely based on SERVQUAL Model. Besides the criteria discussed above the work of Larrodé et al. (2018) incorporated economic factors, operative logistics factors, technological factors, and social , legal, and environmental factors.

Despite there are numerous LSQ Measures, In this study the researcher selected the scale proposed by (Banomyong & Supatn, 2011) as it is found highly reliable and appropriate to the context of the research area. The scale is based on the SERVQUAL Model proposed by Parasuraman, and comprises of five key factors. Firstly, **Tangibility** comprises of availability of equipment and machines, physical facilities and data transmission channels. The second key element is **Reliability,** which covers the accuracy and authenticity of services offered. Thirdly **Responsiveness,** measuring the attitude of service providers to assist customers by ensuring immediate services. Likewise, to measure the knowledge, expertise, creditworthiness and trustworthiness of 3PL another construct namely **Assurance** is being used as the fourth key element. At last, the factor called **Empathy** measures the willingness of the service provider to sense the needs and wants of the customers. Besides the five critical SERVQUAL

factors, the author has added the **Cost** as a sixth prominent factor to the scale, supported by adequate literature, as it was found to play a crucial role in LSQ provider selections.

Table 1.2

Factors influencing the selection of third-party logistics providers

Constructs	Sub Constructs
Reliability	➢ Accuracy of Documents ➢ Short transit time ➢ Consistency of the service
Assurance	➢ Firm's reputation ➢ Track and trace service offering ➢ No damaged goods while in transit ➢ Staff's knowledge and expertise ➢ Offering of one-stop service ➢ High standard service
Tangibility	➢ Location of the 3PL ➢ Modern equipment ➢ EDI and e-commerce service offering ➢ Owned CFS (Container freight station)
Empathy	➢ Keep customer's information confidentially ➢ Care for customer's needs and interests ➢ Customer Relationship Management (CRM)
Responsiveness	➢ Fast responses to customer's requests ➢ World-wide service offering ➢ Offering of updated freight rates ➢ Good care of the customers ➢ Owned overseas network ➢ Consolidation offering ➢ Variety of services ➢ Express delivery service offering ➢ Responsiveness of the service ➢ Staff willingness to provide Service
Cost	➢ Reasonable price ➢ Ease of Payment ➢ Appropriate credit term ➢ Discount offering

Source: Literature Review

1.8.2 Logistics Service Quality, Satisfaction and Loyalty Paradigm

Several studies brought the sequential paradigm of service quality, satisfaction and loyalty in different contexts (Akbar & Parvez, 2009; Auka, 2012; Bui et al., 2023; Bunlertvanich, 2019; Butt & Aftab, 2013; Chinomona et al., 2013; Demir et al., 2015; T. Gong & Yi, 2018; Haron et al., 2019; Jari et al., 2010; Kasiri et al., 2017; Keshavarz & Jamshidi, 2018; Lee et al., 2019; Mansori et al., 2014; Maroco & Maroco, 2013; Omar et al., 2009, 2013; Priporas & NikolaosStylos, 2017; Ratanavaraha et al., 2016; Shpëtim, 2012; Subandi & Hamid, 2021; Swaid & Wigand, 2007; Tefera & Govender, 2015; Tsoukatos & K.Rand, 2006; Zia, 2020).

Basically, there are two broad approaches in the conceptualisation of logistics service quality, the first approach is determining the quality standard by the service providers, whereas in the second approach, service quality specification is defined by the customers. Most of the works of Mentzer belong to the second approach (Beinstock et al., 1997; Mentzer et al., 2001; Mentzer et al., 2004). Furthermore, many research scholars surveyed LSQ and how it reflected in the overall satisfaction and loyalty. Despite the concept of measuring service quality prevailing in earlier times, studying service performance is necessary since it provides information on limitations and areas that can be improved within an organization. It is ultimately meant to enhance quality.

In the case of LSQ, Satisfaction and Loyalty linkage, strong literature support is available for model development, which is highly validated in diverse contexts around the world. LSQ was measured using timeliness, availability, condition and return in the omni-channel purchasing scenario and correlated with satisfaction and loyalty (Cotarelo & Haydee Culderou, 2021). In addition to that, an analysis of the moderating effect of information technology is conducted on the sequence of quality, satisfaction and loyalty (Saura et al., 2008). This same theoretical model has been tested for sustainable business performance and found that procedural switching costs moderate the relationship between logistics service satisfaction and loyalty (Soh et al., 2015). Apostolos et al. (2013) hypothesised that satisfaction enhances loyalty, which is confirmed by the observation that loyalty and LSQ dimensions are associated

together in a B2B setting. However Grant & Philipp (2014) in their study demonstrate that the influence of B2B on satisfaction and loyalty in contrast to most LSQ literature bases that are predominantly composed of satisfaction, and loyalty dominated by B2C concepts. Similarly, another work tells in the retail business, quality of information, product condition, and reverse logistics are the most significant variables that affect customer satisfaction, which in turn affects customer loyalty (Hafez et al., 2021). Likewise, a third-party logistics outsourcing relationship with a shipper is examined to determine how perceived service quality contributes to shipper satisfaction and loyalty (Gupta et al., 2022). Politis et al. (2014) recommended his method as a barometer to measure, control, and improve the LSQ provided to manufacturing companies and other businesses, suggesting this method can be considered as a permanent customer satisfaction indicator. The moderating effect of cross-border e-commerce was examined in the satisfaction and repurchase intention network and findings have shown an increased moderating effect between LSQ and Satisfaction, with LSQ measures being Personnel Quality, Timeliness and Price. They also recommended that these findings be used in the CBEC logistics service strategies abroad (Do et al., 2023)

In the light of the above contribution, the researcher defined the conceptual framework and formulated the following hypothesis.

Table 1.3

Key Performance Indicators of logistics service quality

Key Performance Indicators of LSQ	Sub Constructs
Customer focus quality (Thai, 2013)	➢ Response to meet customer needs ➢ Expertise and knowledge to meet customer wants ➢ Competence of staffs ➢ Handling of customers' claim, complaints and returns
Order fulfilment quality (Thai,2013)	➢ Order accuracy (meeting customers' requirements) ➢ Order condition (free of damage, fault or loss) ➢ Order discrepancy handling ➢ Service performance Consistency ➢ Delivery without loss or damage

Key Performance Indicators of LSQ	Sub Constructs
Timeliness (Thai,2013)	➢ Total order cycle time ➢ Order placement convenience ➢ Transportation time ➢ Back-order time
Information quality (Thai,2013)	➢ IT and EDI application in customer service ➢ Introduction of IT innovation in customer service ➢ Order information availability
Satisfaction (Saura et al., 2008)	➢ We are happy with overall distribution service relationship with them ➢ We wish more of our suppliers like this
Loyalty (Saura et al., 2008)	➢ Consider this supplier your first choice to buy these services ➢ If all the other attributes are similar (price, product, quality……) we will buy always to this supplier by their logistics Service

Source: Literature Review

1.8.3 Scale to measure export performance

Generally, it is possible to assess export performance both subjectively and objectively. Objective measures are based on actual figures such as sales volume, profit etc. while subjective measures are based on the perception of respondents. Here the researcher used subjective measures as the study considered different shippers handling different products. The study used subjective measures with the help of self-evaluation techniques using a five-point likert scale ranging from poor to excellent. In this study, the scale such as achievement of the company's export goals and objectives, relative export sales and growth performance, market share in target markets and perception of export profitability with respect to major competitors were used to measure export performance (Yeung, 2006).

1.9 Conceptual frame work

Model 1: Research Hypothesis

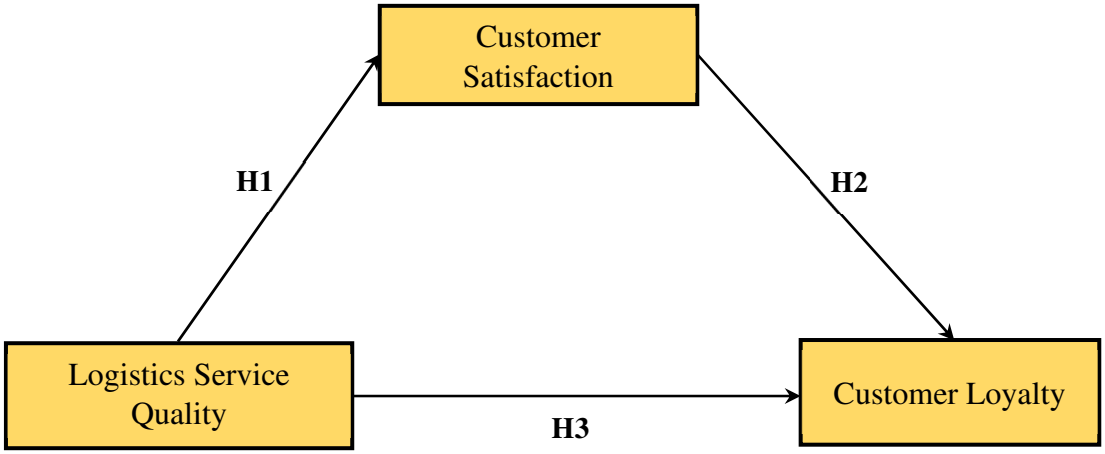
H1: The logistic service quality has a direct influence on the customer's satisfaction.

H2: The customer's satisfaction has a direct influence on the customer loyalty.

H3: The logistic service quality has a direct influence on the customer's loyalty

Figure 1.2

Conceptual Model 1

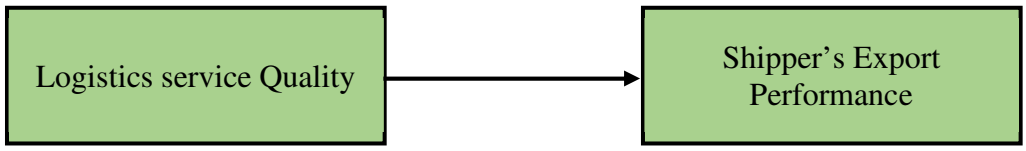


Model 2: Research Hypothesis

H1: Logistics Service Quality has a direct influence on Export Performance

Figure 1.3

Conceptual Model 2



1.8.4 Problems in Air Cargo Logistics

To know the problems in air cargo logistics, the researcher has used the following scale (Vasantha, 2019)

Table 1.4

Problem faced by shippers in air cargo logistics

Problems	Sub Constructs
Infrastructure related problems	Airport is incapable to deal future demand cargo
	Cargo Congestion in the airports
	Equipment's are not utilized properly
	Not adoptable to new technology style
Cargo operations related problems	Lack of skilled manpower
	Inadequate use of technology
	Lack of dedicated terminal space and facilities for airlines
	Delay in custom procedure and documentation
	Lack of efficiency level of ground handling agents within airports
Packaging related Problems	Improper packaging of cargo leads to damage
	Pilferage
	Carelessness of employees leads to damage
	Improper handling leads to damage
Customs related Problems	24*7 services are not available
	Clearing process are sometimes delayed
	Documentation is not completely digitalized
	Proper officers are not available at all time
	Single window system is not effective
Truck lay bay and spill over related problems	Cargo gets delayed due to increase in cargo
	By loading spill over cargo exact cargo to load in airline gets damaged
	Lack of parking space
	System procedural delay

Source: Literature Review

1.8.5 Airline Service Performance

Measuring the service performance of airlines with regard to cargo handling is another part of this study. There are many research works on the subject of freighter service quality, and different writers have used various assessment scales to assess how well airlines have performed. Wang (2007) used quality function deployment (QFD) to combine internal quality technology with external customer feedback and illustrate the company's performance using the house of quality. Here, the author used three main categories: professionalism, physical service, correctness, and positivity. To measure the service quality of cargo handling by airlines, Park & Ha (2013) selected four key factors: supply ability, reliability, responsiveness, and security. The majority of studies examining the level of service offered by the air cargo industry have focused on forwarders or air cargo logistics. Hu et al. (2018) developed a scale to evaluate issues with air cargo terminals using Parasuram's SERVEQUAL paradigm. Aside from these scales of measurement, different authors have developed their models to gauge the quality of the air freight service mostly of service performances of airports, or freight forwarders. However, there aren't many studies about the level of airline service with respect to cargo movement. The scale developed by Huang et al., (2019) was utilised in this study since it was determined to be accurate and to encompass all aspects of cargo handling service quality.

Table 1.5

Airline service performance indicators

Key Performance Indicators of Airlines	Sub Constructs
Tangibility	Adequate shipping spaces
	Adequate shipping Routes
	Adequate shipping flights
	Adequate service branches
Transportation Capability	Punctual cargo delivery
	Perfect cargo delivery
	Accurate cargo delivery
	Compensation for service misses

Key Performance Indicators of Airlines	Sub Constructs
Convenience	Information system support Flexible payment ways Convenient inquiry service Flexible booking time
Personnel service	Professional capability Response for complaint Unified service window

Source: Literature Review

1.9 Research Methodology

1.9.1 Research Design

Descriptive in nature.

1.9.2 Source of data

Used both primary data and secondary data.

a) Secondary data:

Secondary data is collected from various sources such as the world bank, ministry of Commerce, DGCIs and APEDA websites. For fulfilling the first objective the study has made use of export volume which was retrieved from various secondary sources to explore the composition of agricultural exports, exports towards various regions, and changes in the trade trend before and after covid virus outbreak. The air cargo traffic of different international airports of Kerala is also measured to understand the role of civil aviation in agricultural export.

b) Primary data:

The study also incorporated primary data analysis based on the perception of shippers as well as third-party logistics providers. Problems in air cargo logistics, factors determining the selection of third-party logistics service providers, satisfaction level of 3PLs services and their export performance were measured from the shipper's standpoint. The service performance of airlines with regard to freight movement is

measured from the perception of third-party logistics service providers as the shippers do not have direct contact with the airlines.

Furthermore, an AHP technique was used to determine the best mode of transportation for agricultural commodities. For that, a separate questionnaire is also prepared to collect the data from the respondents. The study's respondents are a panel of experts characterized by high levels of knowledge, expertise, and experience.

1.9.3 Sampling design

The list of shippers and third-party logistics providers was obtained from three international airports such as Calicut International Airport, Cochin International Airport, and Trivandrum International Airport. As the number of shippers and logistics service providers is limited, the researcher decided to include all available respondents in the field survey.

1.9.4 Sample size

For primary data analysis, the researcher collected data from 144 respondents relying on civil aviation as a mode of transportation. According to the list obtained from international airports in Kerala, 44 shippers utilizing aircraft as a mode of transportation were identified and the researcher could successfully collect 42 responses, however, two remained unanswered. In the case of third-party logistics service providers, out of a sample size of 115, the researcher obtained 102 responses.

Furthermore, for the AHP (Analytical Hierarchy Process) analysis, data were gathered from a panel of 6 respondents, they are experts with substantial knowledge and expertise in the shipping industry.

1.9.5 Instruments used for the study

Three questionnaires have been constructed for this study. The first questionnaire is designed from the perspective of shippers, aiming not only to gauge the challenges within the air cargo logistics sector in Kerala but also to cover the service performance of third-party logistics providers. The second questionnaire is structured to evaluate airline service quality, focusing on the perception of third-party logistics service

providers. These questionnaires are constructed based on review of literature and discussions with cargo managers of three international airports. Additionally, a distinct questionnaire, employing Saaty's 9-point scale, has been crafted for the Analytical Hierarchy Process (AHP) technique. This questionnaire serves as a specialized tool for drawing responses from a panel of experts in the shipping industry, allowing for a detailed and systematic analysis.

1.9.6 Pretesting and revision of the instrument

Pretesting is a valuable step in identifying weaknesses or flaws in a questionnaire. It involves assessing factors such as the time required for completion, clarity and potential bias in sentences, the presence of irrelevant or ambiguous questions, and the overall flow and continuity of the instrument. In this pretesting process, the researcher has chosen three shippers, three logistics service providers (LSPs), and one subject expert in the field. Through collaborative discussions, the questionnaires were refined by eliminating ambiguous questions. Additionally, the participants suggested incorporating the implications of COVID virus on air cargo movement.

1.9.7 Pilot Study

To ascertain the validity and reliability of the research instrument, a pilot study was undertaken. This preliminary investigation offered valuable insights to the researcher, enabling improvements to be made to the research instrument before proceeding with the final data collection phase. The pilot study covered 10 respondents among shippers and 20 from third-party logistics service providers. After the pilot study, necessary modifications were implemented to enhance the effectiveness of the research instrument before the commencement of the main data collection.

1.9.8 Reliability

In research, reliability refers to measuring an instrument’s consistency and dependability. An effective tool should provide consistent results regardless of the conditions under which it is used. An indicator of internal consistency reliability is Cronbach's alpha, which measures the consistency of results within the same

instrument. A reliability test measures the stability of results over time, ensuring that the same outcomes are achieved on repeated processes.

1.9.9 Scale Reliability

Prior to conducting any kind of inferential analysis, the reliability of each constructed scale has been checked using Cronbach's alpha. The following table shows the reliability of factors such as cargo logistics problem, 3PL selection criteria, and airline service performance indicators. The reliability and validity of LSQ service attributes, satisfaction, loyalty and export performance are attached with model development, and is given in their respective chapter. As the value of Cronbach's Alpha of every scale is higher than 0.7 as given in the Table, it is concluded that all the scales constructed are reliable and can be used for inferential analysis.

Table 1.6

Reliability of Logistics-Related Issues

Sl. No.	Scale	Cronbach's Alpha
1	Infrastructure related issues	0.775
2	Cargo operations related problems	0.849
3	Customs clearance and documentation	0.752
4	Packaging related issues	0.887
5	Spill over related issues	0.768

Source: Author's calculation based on the field survey

Table 1.7

Reliability of 3PL Selection Criteria

Sl. No.	Scale	Cronbach's Alpha
1	Tangibility	0.979
2	Assurance	0.975
3	Reliability	0.938
4	Responsiveness	0.981
5	Empathy	0.979
6	Cost	0.893

Source: Author's calculation based on the field survey

Table 1.7

Reliability of factors of Airline Service Quality

Sl. No.	Scale	Cronbach's Alpha
1	Tangibility	0.902
2	Transport Ability	0.892
3	Convenience	0.939
4	Personnel Service	0.949

Source: Author's calculation based on the field survey

1.9.10 Validity

Validity simply refers to the accuracy of the research instrument. Which means the capability of research tools to measure the concept in an exact manner. In other words, the extent to which an instrument accurately measures what it is intended to measure. Hair Anderson states that valid instruments guarantee that the data collected accurately represents the accuracy of the construct or concept under study.

1.9.11 Content validity

Content validity assesses whether a measuring tool comprehensively encompasses every aspect of the concept. Expert judgment is crucial to ensure the thoroughness and appropriateness of the instrument's items. In this study, content validity was ensured with the aid of experts in the shipping industry, including managers and airline staff. The questionnaire underwent scrutiny by statisticians, the supervising guide, and senior academicians. Additionally, an extensive literature review in the domain of export and air cargo logistics was conducted, which helps in the identification and modification of scale items to align with the specific requirements of the situation.

1.9.12 Convergent validity

Convergent validity is a crucial aspect of validation because it enhances the overall credibility and confidence in the measurement instrument. Convergent validity is established when the items within a scale are significantly correlated with the latent variable they represent. This form of validity is demonstrated by a positive correlation between measurement and other measures of the same underlying construct. To

ensure convergent validity, researchers assess the strength of these relationships by examining the outer loadings of indicators. The average variance extracted (AVE) is also considered, providing a measure of shared variance between the latent variable and its indicators.

The general rule is that each indicator's variance should be largely explained by a latent variable, usually by not less than 50%. As a result, it is advised that an indicator's outer loading should be greater than 0.7 because squaring this number yields a value of 0.50.

1.9.13 Discriminant validity

To ensure the discriminant validity of the constructs, the researcher used HTMT Analysis and Forner-Larcker Criterion (explained in detail in the Analysis part).

1.9.14 Normality of variables

As the study incorporates various parametric tests, the researcher first ensured the normality of the variables used for the analysis. Normality of the problems with respect to Infrastructure, Cargo operation, Customs clearance and Documentation, Packaging, Spillover is computed using skewness and kurtosis. Similarly, the normality of the selection criteria of third-party logistics providers is also computed, which comprises Tangibility, Assurance, Reliability, Responsiveness, and Cost. The researcher also attempts to check whether LSQ performance indicators as well as export performance indicators are normally distributed. It is considered that, if the value of skewness and kurtosis are between + 1 and -1 the distribution is not outside the range of normal distribution. Here the values of skewness and kurtosis of all the variables are in the stipulated range and near zero, the distribution of these variables does not deviate significantly from normal distribution.

Table 1.8

Normality of cargo-related problems

Sl. No.	Scale	Skewness	Kurtosis
1	Infrastructure related issues	-1.00	.521
2	Cargo operations related problems	-.270	-.613
3	Customs clearance and documentation	.669	.915
4	Packaging related issues	.434	-.422
5	Spill over related issues	.714	.759

Source: Author's calculation based on the field survey

Table 1.9

Normality of 3PL selection criteria

Sl. No.	Scale	Skewness	Kurtosis
1	Tangibility	-.408	-.602
2	Assurance	-.162	-.915
3	Reliability	-.439	-.762
4	Responsiveness	-.391	-.773
5	Empathy	-.449	-.618
6	Cost	-.347	-.725

Source: Author's calculation based on the field survey

Table 1.10

Normality of LSQ attributes, Overall Satisfaction, Loyalty

Sl. No.	Scale	Skewness	Kurtosis
1	Customer Focus Quality	-.794	-.658
2	Order fulfilment Quality	-.833	-.727
3	Timeliness	-.595	-.926
4	Information Quality	-.529	-.832
5	Satisfaction	.779	.855
6	Loyalty	-.834	-.919
7	Export Performance	-.724	-.856

Source: Author's calculation based on the field survey

Table 1.11

Normality of Airline Service Performance Indicators

Sl. No.	Scale	Skewness	Kurtosis
1	Tangibility	.075	-.742
2	Transportability	-.296	.428
3	Convenience	-.583	-.106
4	Personnel service	-.079	-.333

Source: Author's calculation based on the field survey

1.9.15 Tools Employed for Data Analysis

Following are the tools and tests used for primary and secondary data analysis

- ***Mean, Standard deviation, percentage***

The mean, a crucial measure of central tendency, represents the average derived from the dataset, reflecting its central characteristics. Standard deviation, on the other hand, is the square root of the mean of the squared deviations from the arithmetic mean.

Percentage analysis involves assessing the proportional distribution or contribution of individual components within a whole data, often expressed as a percentage of the total.

- ***Independent sample t-test***

To compare the means of two independent groups and ascertain whether there is a significant difference between them, the independent t-test is utilised. This test can be used when there are two different experimental conditions, each using different subjects or categories.

- ***One-way ANOVA***

One-way ANOVA is a parametric test designed to compare means across more than two groups. An assumption of ANOVA is the homogeneity of variance among the groups, which can be assessed using Levin's statistic. If the p-value is below 0.05, indicating heterogeneous variance, the F-test should be adjusted. In such cases, the

Welch test is employed to correct for the heterogeneity and provide reliable comparisons among the group means. Post hoc analysis should be employed when there is a significant difference is found among different categories.

- ***Paired T Test***

A paired t-test is a statistical test that is commonly employed in experimental and pre-post designs, where measurements are obtained both before and after an intervention. The term "paired" refers to the fact that the test compares measurements from the same subjects or individuals under different conditions.

- **CAGR**

CAGR is an abbreviation of Compound Annual Growth Rate. It provides a growing trend of a particular phenomenon. This technique is useful for comparing investments or business performance over a specified period. The following formula is used to calculate the CAGR Analysis

CAGR = (Ending Value / Beginning Value) ^ (1 / Number of Years) – 1

- **AHP**

The Analytic Hierarchy Process (AHP) is a technique for organizing and analysing complex decisions, using mathematics and psychology. It was invented by Thomas L. Saaty in the 1970s and has further undergone refinement. This technique involves three levels: the first level is setting up the goal, secondly sort the criteria, based on which the final decision is taken. Through pair-wise comparisons, stakeholders rank the importance of criteria. At last, sort out the alternatives, they are the possible solutions. The complete formula, procedure, and matrixes have explained in detail in the respective chapter.

- **CART**

CART, or Classification and Regression Trees, is a kind of decision tree algorithm employed in machine learning and data mining. It was propounded by Leo Breiman and is a famous technique for predictive modelling and data analysis. In addition to

classification tasks, CART can also be utilised for regression analysis. Furthermore, the interpretability and capacity to handle large-size numerical data and categorical variables enhances the applications of this technique.

- **PLS SEM**

Structural equation modelling (PLS-SEM) is an effective statistical method used for analysing structural relationships, which is frequently applied in the social sciences, management, marketing, and information systems. PLS-SEM is particularly helpful when dealing with complex systems of relationships between latent (unobservable) variables and observed variables. It allows the researchers to expand common multivariate analysis techniques, like regression, factor analysis, correlation, and analysis of variance, to support the research and theories.

1.10 Period of Study

- ***Secondary Data*:**

The study relies on secondary data to explore various facets of international trade. To comprehend the growth trends and opportunities over the past decade, export reports from 2011-2012 to 2021-2022 were analysed. A regional-wise analysis is conducted using export data from 2009 to 2019. Additionally, to examine recent trends and the effects of the COVID-19 outbreak, data spanning from 2018 to 2022 is incorporated into the study. The study also analysed air cargo traffic of each international airport from 2014 onwards.

- ***Primary Data:***

Primary data was gathered from shippers and third-party logistics service providers during the last quarter of 2021 and the first quarter of 2022. To assess the post-covid impact on export performance, again the data was collected from shippers in the last quarter of 2022.

1.11 Limitations of the study

- The findings on trends and prospects of agricultural exports are solely based on the analysis of export volume data.
- The study faced limitations in obtaining data on international airport airline freight movements, citing confidentiality issues associated with customs reports.
- The construction of a model using CART (Classification and Regression Trees) and SEM (Structural Equation Modelling) may encounter challenges due to a limited sample size.
- Reluctance among third-party logistics service providers to cooperate in the field survey may affect the data comprehensiveness.
- The feasibility of conducting a comparative study using CAGR for pre-covid and post-covid periods is hindered by the truncated timeframe after the COVID outbreak, which limits meaningful analysis of growth trends over time.

1.12 Organisation of Thesis

The chapter scheme of the thesis is given as follows.

Chapter 1: Introduction and Research Methodology

This chapter comprises of introduction, problem statement, need for study, research methodology, objectives, hypothesis, conceptual model, variables, tools and tests and limitations of the study.

Chapter 2: Literature Review

This chapter explains the previous research work in the research domain. The review of literature aims to pinpoint areas of research that have not been previously explored. Here the researcher has conducted the review of literature based on the preliminary objectives of the study. The study systematically investigates topics such as logistics service quality determinants, international trade, and logistics outsourcing. The study

used both quantitative techniques, specifically bibliometric analysis, and qualitative methods through thematic discussions with the aid of different software.

Chapter 3: International Trade and Air cargo logistics in India: Theoretical framework.

This chapter will give us a detailed insight into international trade, trade theories, global trade agreements, foreign trade performance analysis, modes of shipment, Air cargo logistics, features, importance of air cargo logistics to global cargo, major challenges in India etc.

Chapter 4: Indian agricultural Product export trends, prospectus and role of civil aviation in freight movement.

This chapter provides us with a holistic perspective of Indian agricultural trade and the contribution of civil aviation to the export of agricultural commodities. This chapter analyses the secondary data associated with the evaluation of the composition and pattern of agricultural exports from India, major importing regions and country's export trend before covid outbreak and after covid outbreak. Besides that, the study also encompasses the contribution of civil aviation in trade and the repercussions of covid outbreak in the international movement of agricultural products from India.

Chapter 5: Challenges in the air cargo logistics: A shipper's perspective.

This chapter deals with an analysis connected with the challenges in the air cargo logistics industry from the perception of shippers. It comprises of demographic profile of the shippers, frequency of exports to various destinations, usage of various bodies, institutions etc. for identification of buyers, frequency of dependency of various international airports in Kerala and perception of shippers with regards to challenges in the air cargo logistics industry.

Chapter 6: Shipper's decision-making process: criteria influencing LSPs selection and effect of LSQ on export performance, satisfaction and loyalty.

This chapter also includes the analysis related to factors influencing the selection of third-party logistics providers, the relationship of LSQ and export performance of

shippers, and the relationship of LSQ -Satisfaction-Loyalty. All of these analyses are purely based on the primary data, from the perception of shippers.

Chapter 7: 3PL - Airline service quality in cargo operation

This chapter deals with the measurement of satisfaction of airlines with respect to air freight movement from the perception of third-party logistics service providers. Some parametric tests were employed to know the difference in the perception of 3PLs with respect to their demographic profile.

Chapter 8: Findings and Conclusion

This chapter stands as a comprehensive report covering the entire scope of the work undertaken. It describes a concise summary of the research, highlights key findings obtained through analysis and concludes the study in a formal manner.

Chapter 9: Recommendations and Further Scope

This chapter explains the recommendations and further scope of this study.

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Chapter 2

Review of Literature and Research Gap

2.1 Introduction

Review of literature serves an overview of existing body of knowledge on research area which enables the researchers to understand past research contributions. In this study the process of literature review is structured in to three segments.

The first segment deals with bibliometric analysis on studies connected with logistics. Bibliometric analysis is a quantitative evaluation of the research works, like citation analysis, publication trends, and authorship patterns. Thus, the researcher is able to gain an in-depth view of the academic contributions in the logistics research, through a systematic investigation. In the second segment a detailed thematic discussion on the important areas of research have conducted. Themes such as logistics service quality, logistics outsourcing, antecedents of LSQ, covid impact and international trade were actually discussed in this part.

2.2 Bibliometric Analysis

The systematic literature review is a method of identifying the prominent articles which enables to draw conclusion , subsequently aids in the identification of the gaps for potential future research areas (Denyer.D & Tranfield, 2009). Similarly, bibliometric analysis is a multidisciplinary research that utilises statistical and mathematical methods to explore bibliographic data (Broadus , 1987). It is regarded as a typical technique for examining the previous work (Diem & Wolter, 2011). By using the science mapping and performance evaluation the researchers are able to explore the academic trends of prescribed study area (Ren et al., 2020). Science mapping is a quantitative analytic method which evaluates bibliographic networks (such as academics, institutions, themes, keywords, and journals) using some mathematical statistics and visualisation tools. This technique has used in certain

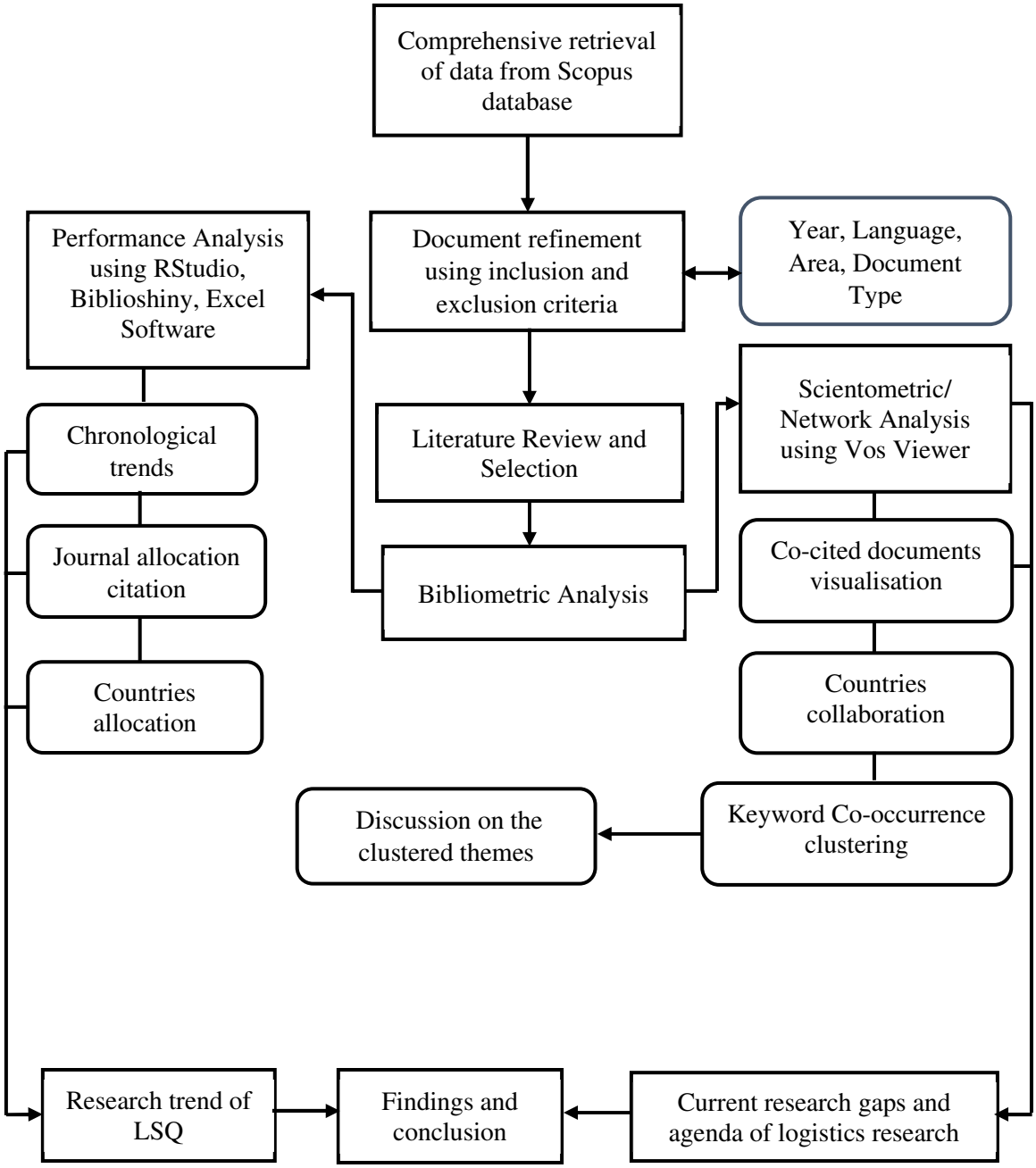
areas such as waste management (Chen et al., 2018), city logistics (Hu et al., 2019), environmental science and sustainable transportation (Wang et al., 2018).

2.3 Over view of review protocol

The following diagram explains the complete literature review process.

Figure 2.1

Literature Review Process



2.4 Data Collection and Procedures

2.4.1 Source of data:

The data file for the bibliometric analysis is extracted from Scopus database. It is major source of scholarly publications and is widely recognized as a reputable and large academic database especially for social science studies. The data file provides relevant information about academic articles namely author details, title of the publication, year of publication, journal name, affiliation of the author, keywords, funding details, and publisher information.

2.4.2 Keyword selection:

A set of keywords has been chosen in the field of logistics and 3PL (Third-Party Logistics) selection to specify the data collection process. These keywords include "Third Party Logistics Selection," "3PL Selection Criteria," "Reverse Logistics Selection," "Selection Criteria of 3PL," "Logistics service quality," and "LSQ." Researcher has employed "OR" Boolean operators in order to combine these keywords in search queries. These keywords act as essential search terminologies to gather connected research articles, papers, and knowledge on the subject.

2.4.3 Data refinement process:

During the refinement process, the study used several filtering techniques to make sure that the dataset remained appropriate to the study's objectives. The first review protocol is the exclusion of specific publication types, like conference articles, book chapters, books, and notes. That means for doing the bibliometric analysis only those articles which are published in journal only is considered for the study. Afterwards, the researcher extends some area specifications which comprises of Business, Management, Accounting, and Social Science. This delineation ensures that the research and data collection efforts are focused within these specific academic domains, allowing for more specific and relevant analysis of literature and information in these areas. Furthermore, to have better understanding and preciseness, the researcher finally implemented an additional filter by restricting the dataset to articles written exclusively in the English language.

Well-structured inclusion and exclusion refinement process assure the precision and relevance of the dataset, which ensures that pertinent research works are considered and also improve the authenticity of research outputs and insights. The prescribed refinement process also enables to simplify the research process and saves time and resources since this technique focuses on closely connected literature reviews based on the research objectives.

2.4.5 Final Result data set after filtering:

Following the application of the above filtering criteria, a total of 407 articles were retrieved, which meets the predefined criteria and treated as a basis for the bibliometric analysis.

2.5 Data analysis

Initially, the researcher conducted a quantitative analysis on the trends of scholarly articles on the research domain over the past few decades. This performance analysis includes several aspects like chronological trend, journal allocation, most cited, impactful articles, countries contribution etc.

Secondly, the use of science mapping intended to demonstrate visual representations of the relationships between different research publications, authors, and keywords. The purpose of this technique is to gain an in-depth insight of the interconnectedness of ideas and topics in the academic literature. It enables to locate groups of connected studies, as well as notable authors, works, and developing trends, by visualising these linkages.

Finally, the researcher carried out detailed descriptive analysis, which involves more in-depth examination of individual research papers. This method allows for a qualitative assessment of the themes and contents of important research works. It involves a detailed evaluation of the research problems, methodologies, findings, and conclusions within each paper. This qualitative analysis helps the researcher to gain a deeper understanding of the background and contributions of specific research articles.

2.6 Tools used for bibliometric analysis:

- **Excel:** is a user-friendly tool for data analysis and organisation. It is frequently used by researchers to clean, arrange, and summarise their data. Excel may have been used in the context of the study to perform operations like deleting repeated items, computing fundamental statistics, and producing graphical visualisations like bar charts or histograms.

- **R Software**: R is a programming language and platform for statistical computation and data analysis. The software is usually used by researchers and analysts to carry out more complex statistical studies and data mining. Besides that, it also helps in bringing unique visualisations which may help the researchers to sense a bird's eye view. An insight on connections in the dataset, including co-authorship networks or keyword co-occurrence is possible using this platform.

- **Biblioshiny**: Biblioshiny is a specialised R-built web application that makes bibliometric analysis more reliable and efficient. It is an easy-to-use interfaces for researchers to browse and display bibliographic information. This package helps researchers to get integrated visualisations, investigate citation networks, and obtain insights into publication trends and author partnerships.

- **VOS Viewer Software**: VOS Viewer is a distinct tool for bibliometric network analysis and visualisation. The software is used in producing maps and other visual presentations of scientific study topics. Thus, the researchers are able to view co-authorship networks, citation networks, and keyword co-occurrence networks. In our chosen topic, these visualisations help in locating important research themes, impactful works, important contributors, and well-known journals.

Figure 2.2

Chronological Scientific Production

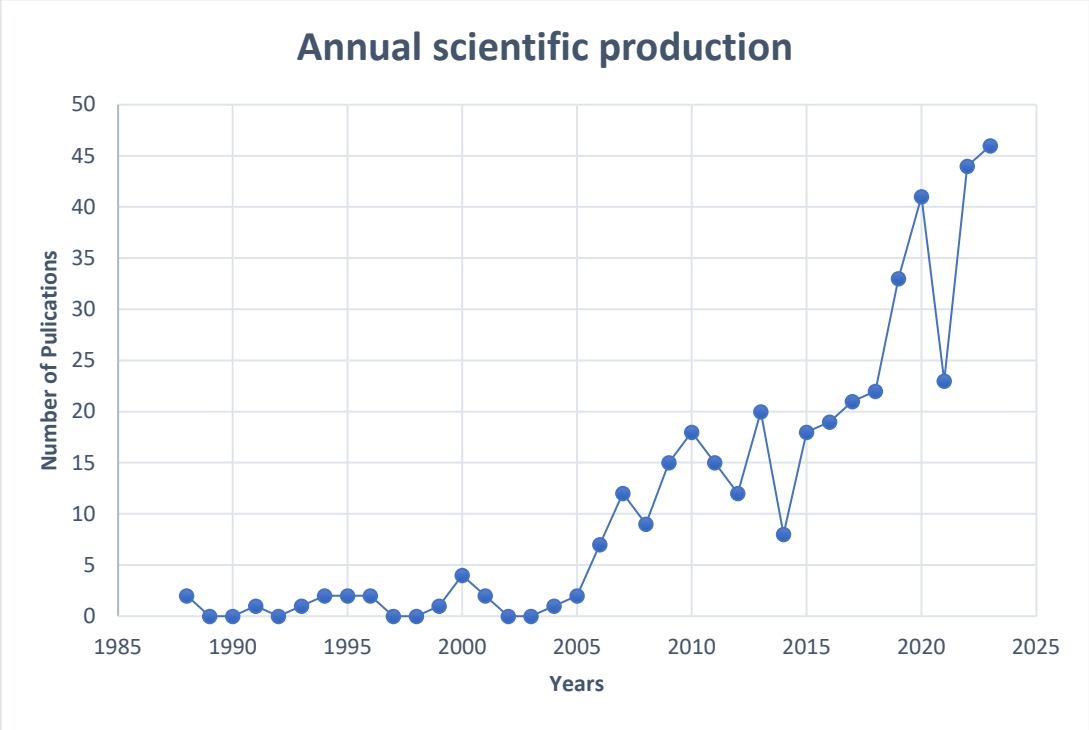


Figure 2.1 shows the annual publication statistics spanning from 1988 to 2023 within the portfolio. It's worth noting that there was a period of relative stagnation in research related to LSQ especially in a period between 1985 and 2005. However, since 2010, there has been a notable and consistent increase in publications each year. By the year 2023, 46 articles were found in this domain. Gradual improvement in the academic research indicates that expansion and diversification of studies related with logistics outsourcing. Moreover, by analysing the number of publications and current discussions on topics related to Logistics Service Quality, it is evident that there is a notable upward trend in public awareness, market acceptance, social demand, and the practical application of logistics measures.

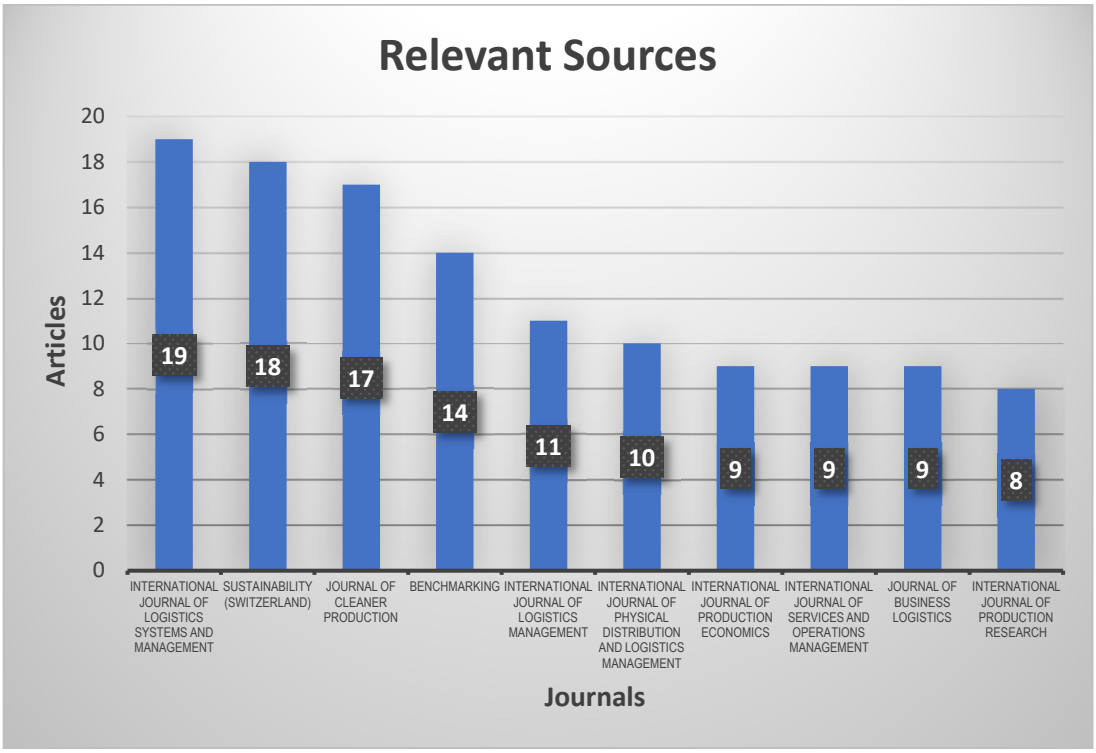
2.7 Journal allocation

It was discovered that 407 articles were published in 181 different journals. Among these, the top 10 journals, namely International Journal of Logistics Systems And Management, Sustainability, Journal of cleaner production, Benchmarking,

International journal of logistics management, International Journal of Physical Distribution and Logistics Management, International Journal of Production Economics, International Journal of Services and Operations Management, Journal of Business Logistics, and International Journal of Production Research, contributed 124 papers, which make up 30% of the overall publications.

Figure 2.3

Journal Allocation



2.8 Most cited documents

The table below lists the research articles with the highest citations. It also includes total citations per year and normalized total citations. The paper which has highest citation (TC=559) is of Mentzer et al. (2001) work ,is published in journal of marketing. . The authors extended an empirical evidence for nine related logistics service attributes under large logistics organizations. This article had vital impact on the research area as it developed a good measurement scale. Another notable research work is done by Jharkharia & Shankar (2007) the study recommended comprehensive methodology for LSPs selection by using analytic network process (ANP). The third

most cited work is the work of Govindan & Soleimani (2016) it has cited by many works as it being a review paper on reverse logistics and closed -loop supply chain. The work was published in cleaner production journal, which ranks third among the most relevant sources. As well, a multi-attribute approach known as fuzzy Topsis has been used to support outsourcing services for logistics (Bottani & Rizzi, 2006). Wolf & Seuring (2010) explored whether environmental considerations had an impact on the supplier choices made by businesses using third-party logistics (3PL) services. Likewise Nunes & Bennett (2010) conducted research into green operations initiatives in the automotive industry that was documented in the environmental reports of specific manufacturing businesses. This research is frequently cited and accepted by many authors. Govindan et al. (2019) in his another work ,in the same field of closed loop supply chain ,employed fuzzy decision making trial and evaluation laboratory (FDEMATEL), and multi-objective integrated-integer linear programming (MOMILP) models. Murfield & A (2017) extended a research model on logistics service quality, satisfaction and loyalty paradigm in the field of omni channel retailing. Saura on the investigation of the same concept also caught wider attention in the field of research. While Jayaram & Tan (2010) measured the inter-connection of information integration, 3PL selection criteria, performance evaluation, and relationship building with firm performance level. Most of the highly cited documents are studies connected with identification and classification of selection criteria of logistics service providers, where different authors applied different techniques. Qureshi used FMICMAC, Govindan et al.(2019) used DEMATEL approach, Gl & Catay (2007) used AHP technique, Falsini et al. (2013) used an integrated model of AHP, DEA, and Linear programming. Besides the papers of selection criteria, assessment made by Panayides & So (2005) on interconnection of capability and relationship management on firm performance drew vital significance in the area of research.

Table 2.1

Most Relevant Documents

Paper	DOI	Total Citations	TC per Year	Normalized TC
MENTZER JT, 2001,	10.1509/jmkg.65.4.82.18390	559	24.3	1.93
JHARKHARIA S, 2007,	10.1016/j.omega.2005.06.005	540	31.76	6.67
GOVINDAN K, 2017,	10.1016/j.jclepro.2016.03.126	429	61.29	8.3
GOVINDAN K, 2012,	10.1016/j.ijpe.2012.01.043	340	28.33	5.99
BOTTANI E, 2006,	10.1108/13598540610671743	247	13.72	3.05
WOLF C, 2010,	10.1108/09600031011020377	188	13.43	4.21
NUNES B, 2010,	10.1108/14635771011049362	175	12.5	3.92
GOVINDAN K, 2020,	10.1016/j.jclepro.2019.118317	170	42.5	9.33
MURFIELD M, 2017,	10.1108/IJPDLM-06-2016-0161	165	23.57	3.19
JAYARAM J, 2010,	10.1016/j.ijpe.2010.02.014	165	11.79	3.70
QURESHI MN, 2008,	10.1108/13555850810864579	162	10.13	2.87
GOVINDAN K, 2016,	10.1108/IMDS-05-2015-0180	141	17.63	4.63
GL H, 2007,	10.1108/13598540710826290	134	7.88	1.65
CENTOBELLI P, 2022	10.1016/j.im.2021.103508	130	65.00	14.74
FALSINI D, 2012,	10.1080/00207543.2012.657969	124	10.33	2.19
PANAYIDES P, 2006,	10.1108/14601060610707876	119	6.61	1.47
SAURA IG, 2008,	10.1108/02635570810876778	118	7.38	2.09
RICHEY RG, 2007,	10.1002/j.2158-1592.2007.tb00237.x	114	6.71	1.29
RAO S, 2011,	10.1111/j.2158-1592.2011.01014.x	113	8.69	2.58
GUARNIERI P, 2015,	10.1016/j.jclepro.2014.05.040	105	11.67	3.61

Note: TC denotes total citations

Table 2.2

Most cited countries

Country	TC	Average Article Citations
India	1861	28.20
USA	1133	29.80
Denmark	1117	159.60
Italy	716	102.30
United Kingdom	683	52.50
China	556	13.60
Turkey	363	36.30
Spain	242	30.20
Australia	240	30.00
Canada	224	24.90

Note: TC denotes total citations

The table presents the top 10 countries with the highest number of citations in research within the logistics domain. India stands out prominently in terms of citations, followed by the USA and Denmark. Additionally, countries such as Italy, UK, China, and Turkey have made significant contributions to logistics research. India is also at the forefront in terms of scientific output among countries. Similarly China and USA, also shows substantial scientific production.

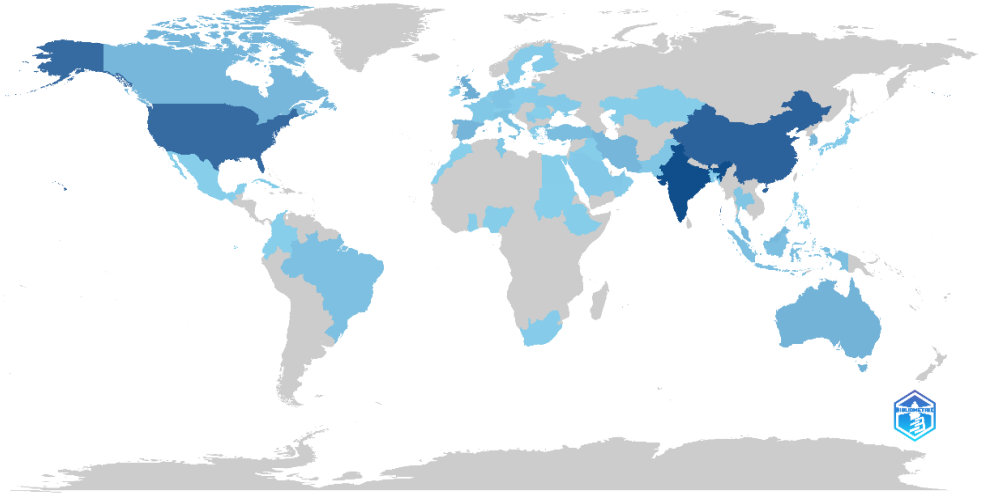
Table 2.3

Countries scientific production

Region	Frequency
India	151
China	126
USA	114
UK	38
Australia	31
Spain	28
Iran	27
Canada	26
South korea	26
Malaysia	24

Figure 2.4

Countrie's Scientific Production

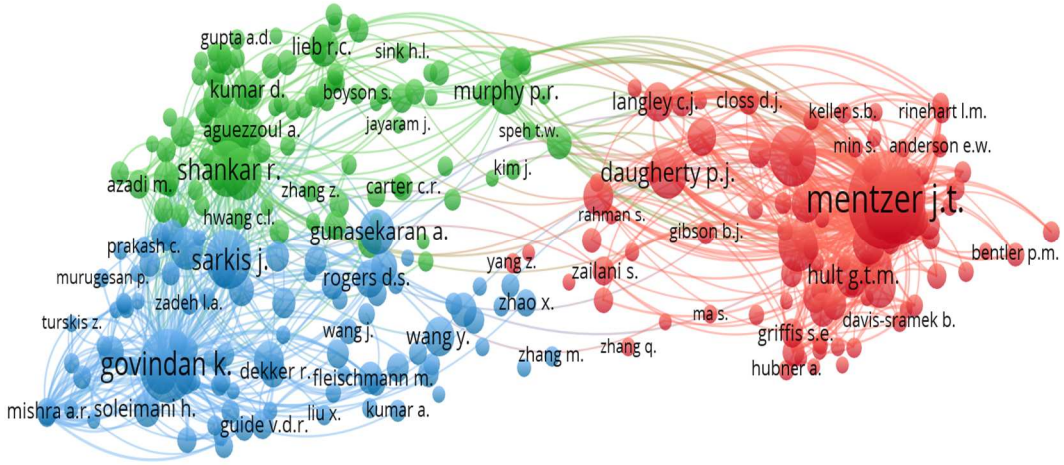


2.9 Influential Research Highlight (Co-citation Analysis)

The researcher examined the most significant papers in the field of logistics during the past few decades using the document co-citation analysis, and the study subsequently built a co-citation network. As a result, a co-cited visual network map with 296 elements were obtained using VOS viewer, as shown in Figure 2.5. Nodes on this map stand for documents that are recognised by the initial author's name. The color-coding of nodes and links reflects how closely two papers are cited in one another, and the significance of research impact is reflected in the node size, which means that as node size increases the level of influence also increase.

Figure 2.5

Co-citation Analysis



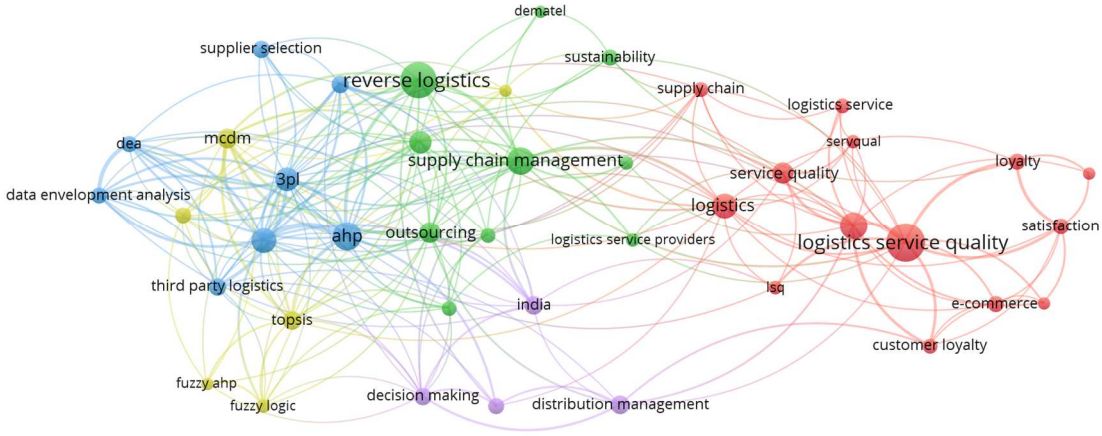
In this network visualisation Mentzer's work is highlighted with large node size indicating that the most profoundly impactful work in the subject of logistics. Similar to this, Govindan's research has received the most co-citations, demonstrating its great influence in the same field. Furthermore, the study carried out by Jharkharia and Shankar in 2007 is also a noteworthy research work. With the use of the Analytic Network Process (ANP), their study offered a thorough technique for choosing logistics service providers (LSPs). Especially in relation to LSP selection procedures, this research has received vital acceptance for its substantial contributions to the field of logistics.

2.10 Keyword Co-occurrence

Researchers can find significant trends in academic literature by using the bibliometric technique of keyword co-occurrence analysis. This approach gives useful insights into thematic linkages and developing trends within a specific topic by examining how frequently various keywords appear together in scholarly articles.

Figure 2.6

Keyword Co-occurrence Analysis



By analysing keyword co-occurrence, four clusters have been identified in the network visualization. There are 13 items in Cluster 1, denoted by the colour red, and they are grouped into domains such as Customer Loyalty (7,TLS=13), Customer satisfaction (23,TLS=30), E-commerce (8,TLS=7), Logistics service Quality (5,TLS=5), Logistics (19,TLS=22), Logistics Service (7,TLS=6), Loyalty (8,TLS=14), LSQ (6,TLS=7), Repurchase Intention (5,TLS=8), Satisfaction (9,TLS=16), Service Quality (16,TLS=12), SERV equal (6,TLS=6), Supply chain (7 TLS=14), Supply Chain (7,TLS=11). According to cluster 1, customer satisfaction is the theme with the highest number of occurrences (23, TLS=30).

Cluster 2, presented in green, consists of 10 items, including DEMATEL (5,TLS=4), Logistics outsourcing (7,TLS=11), Logistics Service Provider (6,TLS=6), outsourcing(15TLS=32), Reverse logistics (42,TLS=33), Supply chain management (24,TLS=38), Sustainability(8,TLS=8), Third party logistics (6,TLS=4), 3PL(18,TLS=42), Third Party Logistics Providers (7,TLS=10).

Cluster 3, indicated in blue, contains 8 items, such as 3PL (7, TLS=10), AHP (25, TLS=64), Analytical Hierarchy Process (20, TLS=58), Data Envelop Analysis (9, TLS=27), DEA (9, TLS=31), Multi-Criteria Decision making (9, TLS=15), Supplier selection (10, TLS=8), Third Party logistics (16, TLS=24).

Finally, Cluster 4, visualized in yellow, includes 9 items like Fuzzy AHP (5 TLS=9), Fuzzy Logic (6, TLS=14), MCDM (13, TLS=42), Multi Criteria Decision Making (9, TLS=15), Selection (5, TLS=11), TOPSIS (12, TLS=28), Analytical Hierarchy process (8, TLS=11), Decision making (11, TLS=19), Distribution management (11, TLS=14)

2.11 Countries Co-citation Analysis

Figure 2.7

Co-citation Analysis (Country wise)

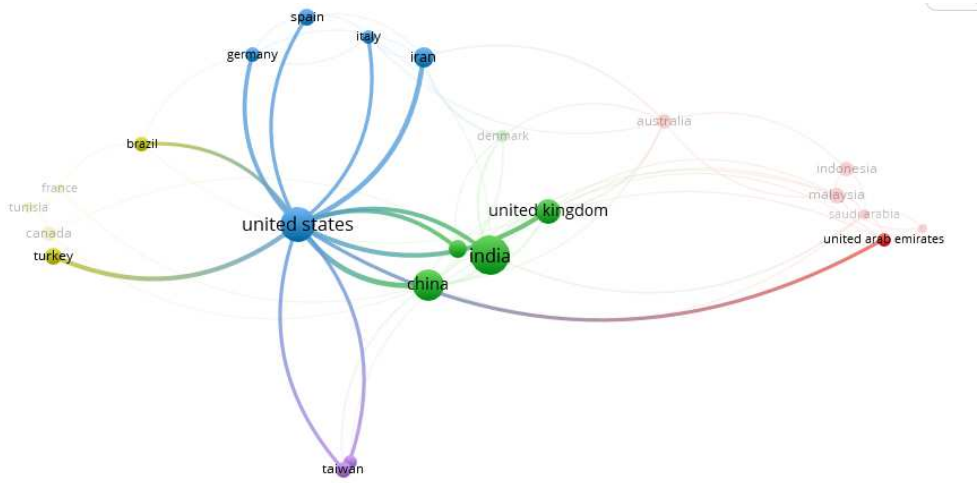


Figure 2.8

Co-citation Analysis (Country wise)

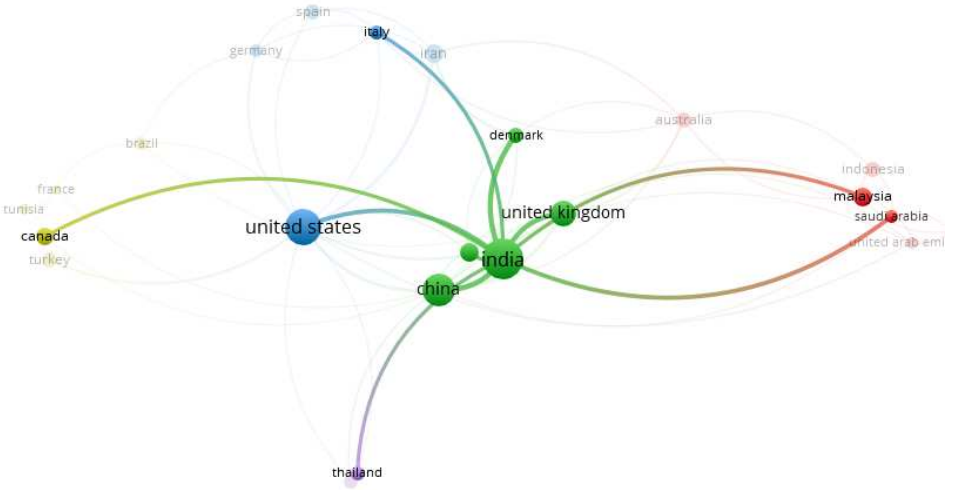
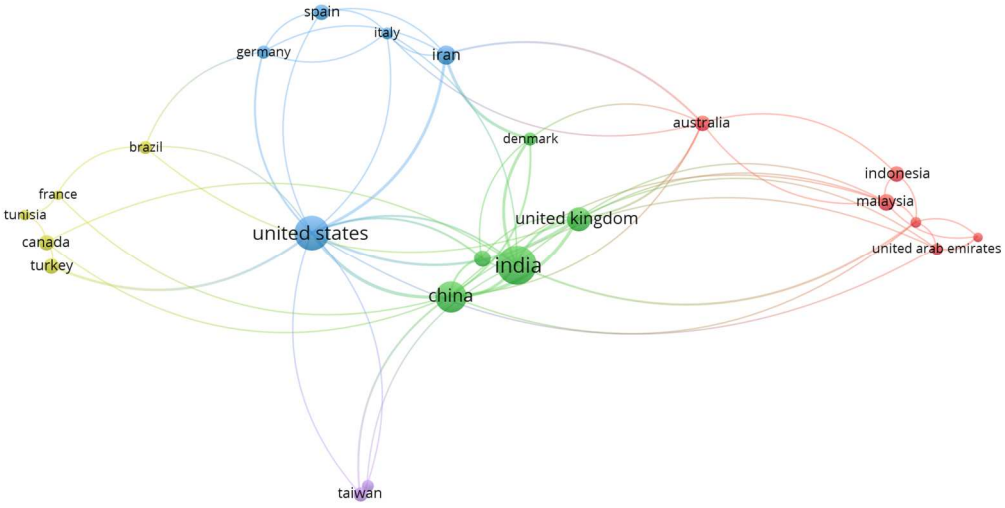


Figure 2.9

Co-citation Analysis



India has the largest international network of co-authorships, particularly with authors from countries like China, South Korea, Denmark, and the UK. In this diagram, this network constructs a distinct cluster that is given in green. The second-largest node, which represents the USA, is related to authors from Germany, Spain, Italy, and Iran via strong ties, forming a distinct cluster that is shaded by the colour blue on the visualisation. The data shows that authors from Saudi Arabia, Malaysia, Indonesia, Pakistan, and the United Arab Emirates have visual collaborations in the selected topic. However, this collaboration is represented in smaller node size. These unique co-authorship clusters highlight the upward trend of international scientific collaboration between different nations.

By analyzing bibliometrics, researchers can learn how research on global logistics services has developed, what topics have been studied, and what is currently trending. In spite of this, it's important to remember that numbers and statistics don't always provide a complete picture. Researchers need to review the most important papers in this field to understand what's missing.

Apart from the bibliometric analysis, a detailed thematic discussion on the research topic is also underwent. These themes include areas like outsourcing in logistics, the

factors that affect the quality of logistics services,antecedents of LSQ, how COVID-19 has impacted logistics, and the challenges related to exporting goods. Besides that the researcher also made an effort to understand the previous studies in the area of international trade,all may help the researcher to identify the research gap of the study.

2.12 Logistics outsourcing

According to McIvor (2009) Logistics outsourcing refers to the reliance of external third party logistics service providers to undergo logistics activities, earlier it was carried in house. As the market demands becoming more complicated and commercial enterprise competition increasing, logistics outsourcing, or "third-party logistics" (3PL), has gained popularity as a means of enhancing client services, minimising costs, and gaining a competitive advantage (Zhu et al., 2017). Mellat-Parast & Spillan (2014) found that logistics and supply chain has a vital role in the competitiveness of manufacturing firms .

There are several reasons on why the users outsource their logistics activities , primarily depend the resources provided by 3PL providers, including physical assets, information, skilled workers (Mentzer et al., 1999).While Lee et al.(2012) discovered that a recently introduced delivery outsourcing arrangement reduces the average customer lead-time and overall cost through milk run system. Besides the basic transportation and storage services, some of the logistics providers extended additional services like procurement assistance, especially in the health care sector amid covid outbreak (Bian et al., 2021). Hsiao et al.(2010) argued that service performances particularly, reliability of delivery and flexibility are triggering factors of outsourcing, nevertheless performance varies according to classification of the products. In addition to that , long-term business relationships give partners a competitive advantage, In Japan, most business partners are able to perform better in the social and economic spheres (Shi et al., 2022). Shippers consider 3PLs as providing a one-stop shopping experience for them by combining standard transportation and warehousing services with tailored capabilities like inventory management, integrated supply chain management, and consulting (Barker et al.,

2021). Evidently according to Yuan et al. (2020) maintenance of Extended Resource Based View (EBRV) leads success of logistics outsourcing but theory works in the existence of alternative third party logistics providers. However, the main forces behind competitive advantages like long-term profit and revenue growth are possible through resource planning and structuring (Yew Wong & Karia, 2010).

Similarly, as per the findings of Solakivi et al.(2013), Companies with higher degrees of outsourcing are seeing lower levels of logistics expenses compared to those with lower levels of outsourcing, demonstrating a relationship between

logistics costs and outsourcing of logistics. The same author in his another work extended an empirical study on the logistics cost and market development of Finland and Estonia and found out the logistics costs are relatively higher in Finland compared to Estonia and also found the probability of logistics outsourcing is greatly influenced by logistics cost (Solakivi et al., 2022). Hence as a result of increased logistics cost, dealers are forced to market their products at higher prices which negatively affect the comparative advantage (Chang & Lai, 2017).

Moreover, it is preferable for them to set limits on their core competencies in service pricing and quality level for ensuring long term revenue. Bahamdain et al. (2022) conducted a sentimental analysis of covid impact among the customers in Saudi Arabia, shows that there is an increased necessity of improvement in the service quality of LSPS, Further the author recommended Radio Frequency Identification (RFID), facilitates shippers to trace the goods and get rid of shipment losses.

Some of the studies highlighted the issues prevailed in the industry, Insufficient manpower support, physical equipment's and transaction uncertainty drives the users to outsource their work to third party (Zailani & Rizaimy, 2015). Moreover, difficulties in the implementation of third party logistics arrangements is another concern raised by Gadde & Hulthén (2009). Likewise Zailani et al. (2017) found out lack of human and physical resources, along with transaction uncertainty, are the key factors leading to different logistics outsourcing practises and also discovered that "strategic focus" enhances outsourcing performance. The inseparability of service inputs and limited provider capabilities are the two main issues that have been

identified as potentially damaging client relationships due to provider views of opportunism and unfair distribution of profits (Selviaridis, 2016b). Tsai et al. (2008), in their work highlighted that, the important outsourcing risks are asset risks and competent risk, out of which values of information risk and loss of control are considered to be severe challenges of the parties. Insufficient Truck drivers, capacity constraints, and talent management challenges are some of the issues prevalent in the north america, demanding logistics managers to bring strategies to tackle them (Lieb & Lieb, 2016).

Similarly a couple of studies argued that Third-party logistics providers should be completely aware of the strategic movements of their peer groups in order to have a competitive strategy (De & Singh, 2022; Wan et al., 2019). Moreover, Gadde & Hulthén (2009) discussed difficulties in the implementation of third party logistics arrangements. 3PL users see more risks in switch dependence situations and more potential for gains in goal dependence situations. In order to respond to switch dependence, 3PL users adopt a cautious strategy and active strategy to respond to goal dependence (Huo et al., 2017).

For individuals to be able to collaborate effectively, they must have the necessary mentality, personality, and skills (Fawcett et al., 2012).Prataviera et al.(2021) proposed a multi-model approach for determining the size of logistics outsourcing segmentation in Italy ,where the determinants are number of players, LSPs type and turnover. The study's findings of Gotzamani et al. (2010) demonstrated a strong correlation between financial performance and the level of service quality in logistics..

Some of the studies pointed out the determinants of logistics outsourcing in various contexts**,** The researcher pointed out decision on logistics outsourcing is closely associated with supply chain complexity, core closeness and asset specificity (Hsia et al., 2010). According to Tsai et al. (2007) despite the fact that price is the primary criterion for shippers in the logistics industry, it was discovered that there was a huge demand for high-quality services, especially from high-tech firms that have the highest express service expectations. Núñez-Carballosa & Guitart-Tarrés (2011) ,in their work outlined that the primary justifications for organisations choosing to

outsource logistics, the relationships they develop with suppliers, and the level of participation they require from suppliers in the management of their supply chains. As a result, the author advises choosing a provider with a good financial standing, a long track record, and service guarantees (Gotzamani et al., 2010).

There is a debate on logistics outsourcing and its impact on performances of the firm, Joong-Kun Cho et al. (2008) argues logistics outsourcing do not positively enhance the performance especially in e-commerce market. In addition to that the information sharing such as benefits and burdens of client firms do not create any impact on the performance, But various other customer partnering behaviour like planning, operational information transfer and extendedness etc are greatly leads to better performance of the firms (Hartmann & Grahl, 2012). Furthermore, In the case of advanced logistics outsourcing the users must be cautious as it does not help the shippers cost reduction or delivery improvement (Zhu et al., 2017). Hence some dealers preference is on punctuality, secured delivery and loss of control (Tsai et al., 2012). Zhaofang et al., is on an opinion that relationship with logistics service providers enhances the firm level performance. From the numerical investigation, it can be seen that TPL service and production disruption have a greater impact on the performance of the supply chain, whereas the effects of repurchase and revenue sharing contracts are more likely to be neutral for relatively high disruption probabilities (Thulasiraman et al., 2021). But in china survey report of Yuan et al. (2018) discussed that, trust and learning orientation are largely influenced by performance in the supply chain.

Huiskonen & Pirttilä (2002), concluded competitive advantage can be gained through the development of bilateral coordination and marketing strategies. Long-term cost reduction and increased network governance efficiency are two benefits of the vertical outsourcing model. The vertical outsourcing model may, however, have higher immediate expenses. While the horizontal mode encourages agents to spend in long-term relationship development, such as research and development, quality, and information systems (Juntunen, 2010). However Huo et al. 2018 is on an opion that

demand, supply, and technology are intimately linked to opportunism in the realm of logistics in the relationship between transaction cost and opportunism.

According to study, a company's long-term orientation (LTO) towards its connection with its 3PL is positively impacted by its relationship marketing orientation (RMO) towards its consumers, which eventually enhances the operation performance (Hofer et al., 2014).The importance of information sharing is pertinent as per several literatures. Positive impact of integrative mechanism on logistics outsourcing is studied and the author suggested information sharing is better (Liu et al., 2015). Tsai et al. (2012) found out that the most significant predicate of the partner connection is the presence of poor communications. For B2B Set up contractual agreement is considered as the ultimate base for esteemed interaction and openness (Selviaridis, 2016a). Similarly Hofer et al. (2015), the study shown that the positive impact of communication and cooperation with third party logistics providers enhances the goal achievement and goal exceedance. At the same time Yang (2018) argued that the level of corporate confidence, level of trust determines readiness to share information, if trust is stronger in companies, will have a greater willingness to share information. An industry's internal IT investment and external logistics now complement one other, It implies that because of the distinctive features of the internet as a facilitator, can ensure decreased external transaction costs (Gong et al., 2016).

Therefore Z. Liu et al. (2012) suggested risk management should be the first and foremost priority of the users. It has been hypothesised that supply chain logistics process integration has a substantial impact on firm competitiveness. Businesses could improve their competitiveness by successfully integrating interorganizational operations spanning logistics and supply-chain operations (Mellat-Parast & Spillan, 2014). Cai et al. (2013) brought an incentive scheme which includes two agreements namely wholesale market clearance (WMC) which is between producers and distributers and whole sale price discount sharing among producers and third-party logistics producers. Furthermore Lai et al. (2013) developed a guanxi model with an aim to enhance the interpersonal interaction in order to ensure mutual exchange favours among dealers, however the prescribed model is found to be potential only

under uncertain circumstances. To deal with environmental instability and dependence, 3PL suppliers in China have developed and relied on guanxi. However, the need for guanxi to address these issues varies depending on the type of economic partnership (Chu et al., 2021).

Likewise shippers mostly rely on basic outsourcing, the dependence on advanced outsourcing such as inventory management is limited (Bajec, 2013). Similarly logistics goal achievement and goal exceedance are widely influenced by cooperation and pro -active measures (Deepen et al., 2008). Taxonomy of transaction specific investment's performance-improving effects may be attained by cooperative behaviours (Yang et al., 2019). Furthermore some studies revealed outcomes of third-party logistics services improvise the relationship among customers (Hofer et al., 2012; Huo, Ersity, et al., 2016) .While Huo et al.(2016) conveyed contract application process increases opportunistic behaviour of service providers. It is determined that for successful supply chain collaboration, both "hard" contractual aspects and "soft" relationship features are crucial (Hofenk et al., 2011).

Similarly according to the work of Huo et al. (2015) trust and contracts are two crucial governance measures that have a substantial impact on opportunistic interactions between 3PL providers and users. It has been noted that the majority of researchers have adopted the multi-criteria decision-making (MCDM) approach, heavily utilising the Analytic Hierarchy Process (AHP), Technique for order of preference by similarity to ideal solution (TOPSIS), and its fuzzy form (Akhtar, 2023). Several studies are done in outsourcing decision making (A et al., 2010; Aktas & Ulengin, 2005; Cheng & Lee, 2010).

2.13 Antecedents and dimensions of logistics selection

Mentzer et al. (2001) proposed a model with nine factors : information quality, ordering procedure, ordering release quantity, timeliness, order accuracy, order quality, order condition, order discrepancy handling and personnel contact quality. Grant (2004) studied food supply chain based on the Mentzer's scale in United Kingdom and the scale consist of availability, order cycle time and time of delivery. This is crucial when investigating service quality because the company wants to

increase performance to keep existing customers and draw in new ones. It also suggests the idea of forming lasting relationships rather than transactional ones. Mentzer's scale of measurement is also used in the work of (Rafiq & Jaffar, 2007),by bringing some modifications and replacement of variables, the study added flexibility, simplicity, time and effort.

Several studies are belongs to South East Asian regions, for instance (Banomyong & Saopath, 2011) which is about the logistics service performance of Thailand. Among those some of the measures are extremely based on the service quality of LSPs (Grant, 2004).Similarly Le et al. (2020) connected to Vietnam, Meanwhile Thai (2013) studied in the context of Singapore. Moreover (Karim et al., 2018) studied LSP's performance of Malesia concentrated on warehousing related issues.,Banomyong & Saopath (2011) measured Thailand logistics performance using three dimensions namely cost, time and reliability. Another study found a negative relationship of logistics service quality and cost, that means as the cost increases performance decreases (Banomyong et al., 2020).

The following table shows different measurement scales of prominent works

Table 2.4

Details of important measurement scales

Authors	*Dimensions*	*Details*	*Tools/techniques*
Hasan Uvet (2020)	Personnel contact quality, timeliness, order condition	Customer satisfaction	Structural equation Modelling
Photis M Panayides & Meko So (2005)	Reliability, Timely responsiveness, Accuracy in documentation, Accuracy in information, Service fulfilment, Problem solving ability Empathy	Relationship of logistics and performance	Structural equation Modelling
(Thai, 2013)	Order fulfilment, information quality, corporate image, Timeliness, customer focus	Scale development of logistics service quality	Confirmatory factor Analysis
(Liang et al., 2006)	Response ability and operations convenience, Integrated service, Transportation ability, Price	Service management requirements of freight forwarders	Fuzzy quality function deployment (FQFD)
(J. Mentzer et al., 2001)	Personnel contact quality, Order release quantities, Information quality, Ordering procedures, Order accuracy, Order condition, Order quality, Order discrepancy handling, and Timeliness	Logistics service quality measurement	SEM
(Phuong Vu et al., 2020)	(Modified scale of Mentzer,2001) added more variables like after sale support, helping behaviour of representatives, trustworthiness, Commitment, integrity.	Logistics service quality	Qualitative technique

Authors	*Dimensions*	*Details*	*Tools/techniques*
(J. T. Mentzer et al., 1999)	*Personnel contact quality, *Order release quantities, *information quality, *Ordering procedures, *Order accuracy, *Order condition, *Order quality, *Order discrepancy handling, and * Timeliness.	Logistics service quality	Scale validation
(Xiong et al., 2007)	Same as Mentzer's scale, added 'convenience)	Online shopping logistics	Exploratory analysis
(Saura et al., 2008)	personnel quality, information quality and order quality (dimension 1) timeliness (dimension 2)	Logistics service quality-Satisfaction-Loyalty Paradigm	SEM
(Jari et al., 2010)	Operation Service quality Personnel Service quality Technical Service quality	Perceived service Quality-Satisfaction-loyalty relationship	SEM
(Mitropoulou & Tsoulfas, 2021)	SERVEQUAL Dimensions	Quality of B2C logistics	GAP analysis of expectation and perception
(Larrodé et al., 2018)	Operative factors, Technological factors, Social-legal-environmental factors, Economic factors	LSQ	AHP

Authors	*Dimensions*	*Details*	*Tools/techniques*
(Sramkova et al., 2018)	TARRQUAL Dimension	Selection criteria of freight forwarding services	Delphi technique (decision making matrix)
(Beinstock et al., 1997)	Timeliness, availability, condition, global quality	Selection criteria	Path model (LISREL)
(Govindan et al., 2019)	Rate, customer service operation, reputation, Infrastructure, Scheduling,	Benchmarking the service quality (among competitors)	AHP Technique
(Chen & Wu, 2011)	Service cost, operation performance, company performance, logistics technology, Service quality	Decision on local/Domestic/International logistics providers	Analytical Network Process (ANP)
(Işiklar et al., 2007)	Strategic evaluation Criteria, Case features, logistics features evaluation criteria.	3PL Evaluation and selection	Case and Rule based reasoning using fuzzy technique
(Perçin & Min, 2013)	Voice of Companies, Customer needs	3PL Evaluation Criteria	QFD & Fuzzy linear regression
(Chen et al., 2011)	Transport cost, Frequency of shipments, IT communication, Quality performance, Order to shop time	Competitive strategy of third party logistics providers	Negotiation mechanism and AHP
(F. Li et al., 2012)	Management success, Business strength, Service quality, Business growth	3PLSupplier selection	Fuzzy

Authors	*Dimensions*	*Details*	*Tools/techniques*
(Wong, 2012)	Non tariff trade barriers, Global scope, Reliability of delivery, quality of service	Provider selection (selected three providers as alternative)	Fuzzy Analytical Network Process (FANP)
(Rafiq & Jaffar, 2007)	Information quality, Ordering Procedures, order release qualities, Timeliness, Order Accuracy, Order Quality, Order condition, Order Discrepancy handling, Personal contact quality	Third party provider selection	Scale development and validation

Source: Combined from Literature Review

2.14 Covid and export impediments

Notably Previous studies evaluated substantial heterogeneity across sector in trade impediments due to corona virus. (Ahn & Steinbach, 2022) reported a greater adverse trade impact of 35.9% noted in agriculture and food sector due to temporary non-tariff measures that restrict exports. In addition to that, several literatures discusses the rigours of pandemic in varied dimensions ; fragile sectors like fish and agriculture were impacted by misleading advertising, inadequate marketing assistance, and financial insecurity. Mitra et al. (2022) assessed that reduction in demand and cancellation of overseas marketing, the horticulture sector has been affected heavily, with prices of flowers such as Gladiolus, marigold, rose, tuberose, and gerbera plummeting which lead farmers in a difficult position. Besides price fluctuations, Shanker et al. (2022) revealed consumers being alarmed over virus spread, resulted in low level consumption. Furthermore; lack of transportation, fear of disease, social distance restrictions imposed by the government, and even a lockdown of market centres disrupt the full functioning of the value-chain and supply chain of perishable goods (Ababulgu et al., 2022). Similarly, some works (Daley et al., 2022; Sari et al., 2021; Siddiqua et al., 2022) exposed the issues like lack of demand, lack of hatcheries, and the increased processing and carriage charges. Shrimp farmers vigorously struggled (Pazir et al., 2022). In Senegal non availability of agricultural inputs, planting difficulties ,declined supply of livestock feed were found as major barriers (Middendorf et al., 2021a). Meanwhile Banerjee et al. (2021) reported ;Saudi Arabian authorities restricting hajj pilgrims to combat with novel corona virus, triggered a fall in meat supply due to a hit on livestock exports. According to Sornsena et al. (2021) there was a 50% decline in domestic sales for Thai mango exporters, despite shipping high quality mangoes to overseas destinations like China, South Korea, and Japan. Zhou et al.(2021) discussed European and American markets switched imports of aqua food from china in response to the fear of virus spreading, resulting in a glut of catfish on the Chinese market . Nevertheless ,amid the ongoing discussions over the covid repercussion ;some studies shows insignificant impact on exports of goods like eggs, staples , whereas meat exports have a detrimental impact (Mallory, 2021). A few studies argues intensity of impact varies with respect to the

demographic profile, Careabians with lower financial soundness and small-scale enterprises seemingly susceptible to the vulnerabilities of crisis (Daley et al., 2022).The impact degree was severe among self-employed individuals and daily wage workers (Zhai et al., 2022). In US vulnerability varies by its size, religion, or gender, for example, black entrepreneurs, small businesses, and women faced huge obstacles (Lopez-Ridaura et al., 2021). Besides , There were several problems faced by the south African farmers at the beginning of the pandemic, including a lack of livestock feed, a lack of ability to sell the livestock and yield, lack of manpower, and the fact that most of the markets that farmers usually buy their necessities from the markets have vanished permanently (Haqiqi & Bahalou Horeh, 2021; Lopez-Ridaura et al., 2021; Middendorf et al., 2021b). According to Fang et al. (2021) Broiler farms in Myanmar remained silent during the crisis because they had a shorter production cycle than layer farms and were also able to reopen in the second wave. In contrast, increased egg production rates and temporary closures of layer farms have caused insufficient nutrition for the general population (Talar & Kos-Łabędowicz, 2021). There is a wide variation in export performance after a pandemic depending on the sector, such as retail, wholesale, manufacturing, and tertiary, The unanticipated shocks affected households even as much as their daily food arrangements (Middendorf et al., 2021) and the closure of animal slaughterhouses and the decline of restaurant food demand negatively affect the meat supply chain (Wickramasuriya et al., 2021)

The gross annual value of the Indian and Chinese food and beverage sectors declined significantly even though the nations introduced a number of technological advances to reduce labour involvements (Memon et al., 2021). Inherently, airfreight and land freight are more affected by outbreaks, whereas ocean freight is statistically insignificantly impacted (Xu et al., 2021). Global supply chain and air freight flow were affected by international travel suspension; however, exports of medical accessories and agro-perishables were not affected (Bouali et al., 2020). In addition to export and logistics restrictions, documentation complexities pose a challenge for exporters when they reopen their businesses after the first lockdown (Geldres-Weiss et al., 2021).Veeramani & Anam (2021) explains services such as travel and tourism

and financial services exports have also shown a significant impact. As the majority of countries are heavily dependent on one or two nations for the supply of staples, export prohibition led to extreme difficulties among the nations (Koppenberg et al., 2020). likewise market shift were observed in India in the midst of the pandemic, traders are no longer importing Chinese goods (Khurana, 2022).

Hence ,India is expected to counter the situation if the government and authorities bring new economic reforms including reduction of fiscal rates and tax rate in the export should be continued (Kumar Poddar et al., 2020).Some authors recommended certain remedial measures to reduce the disruptions of pandemic like digital marketing of fish and export promotion schemes as means of reducing market inaccessibility and financial insufficiency (Straume et al., 2022). Moreover, As a part of non-pharmaceutical measures, the Canadian government secured certain financial assistance to food processing firms, which included a rise in lending credit about 5 million dollars and 75% salary subsidies (Hailu, 2020). Meanwhile Xie et al. (2021) suggests social assistance such as monetary support from family members and authorities can eradicate the risk occurred in the crisis and also encourages the farmers to continue their production process. Abu Hatab et al. (2021) argued that a "just-in-time" concept and absence of proactive and preventive risk management in Egypt reduce the ability of agri-food SMES to withstand the pandemic. Singh & Neog (2020) suggested the manufacturing and export of medical accessories would be encouraged during the crisis due to the increased demand for masks, sanitizers, and personal protective equipment. It has been reported that export performance in Benin has declined by 53% during the pandemic, authors recommending that taxation be ceased in order to facilitate their operation (Chabossou et al., 2021). Bartle et al. (2021) suggests removing older high fuel-consuming vessels to improve the efficiency of containers sailing quickly into the same routes; in other words, the study recommends taking immediate measures and providing faster service during peak demand occasions. Lopez-Ridaura et al. (2021) found out that adaptation of agricultural mechanisms such as new ideas in agricultural supply chain and delivery system keeping protocol and digitalisation enable the cultivators to eradicate the problems such as fluctuating price, non-accessibility of inputs etc. Due to lack of

agricultural inputs, difficulty in selling and marketing, changes in consumer behaviour, and low family income, China faces the greatest threat in the horticulture and animal sectors, suggested more improvisation with updated technologies, such as e-commerce (Varshney et al., 2021). In an attempt to stagnate cross-border trade, exporters chartered flights, but were not able to reach out to the level anticipated (Sornsena et al., 2021). But Chinese tea exporters switched their focus to domestic markets, adapted sustainable practices in cultivation, and thus struggled greatly with weather conditions and land-insufficiencies (Gerasimova et al., 2021). As part of the Sino-US Economic and Trade Agreement (SUETA), China was able to increase its pork export volume, however in value terms, it did not contribute significantly (Cao et al., 2021). To counter future virus outbreak the Singapore civil aviation recommended the airports to be equipped with a transnational response mechanism (Arora et al., 2021). Australia residents however recommend keeping exports and domestic consumer needs equal, investing in the internal food supply chain to ensure more sufficiency (Kent et al., 2022).

2.15 International trade

(Kurihara, 2011)The author investigated on effect of regional trade on bilateral trade, as per the gravity model, trade flows are depending upon the GDP and the distances between the nations. And the results found that, because of RTA the flow of goods and services is higher in OECD countries compared to non OECD Countries.

(Kohl, 2014) Studied the economic integration agreements on the international trade, the results shows that despite there are many relaxations as part of the agreement,50% of the trade is promoted by trade agreements and the rest shown no significant impact in the trade flow due to EIAs. However, the study concluded that one third of agreements do encourage in the international flow of goods and services.

(Matthew, 2010) A critical evaluation of empirical works on implication of free trade agreement on international trade is conducted. Based on 10 year records of literatures the usage of gravity model is examined and found that majority of the scholars have applied the prescribed model in order to know trade implication and performance.

(Johns, 2014) The study encompasses the consequence of the depth and rigidity in free trade agreement. The study has found out that as the depth increases the compliance and stability of trade regime is possibly decline. Meanwhile, increase in the rigidity causes increase in likelihood of compliance and a falling stability. However, the researcher argues that both depth and rigidity can reduce the tariffs to some extend whenever there is no failures in obligations.

(Shaffer et al., 2005) A negative side of free trade agreement is addressed and found that trade negotiations provide the tobacco industry an unjustified chance without facing public scrutiny. Trade agreements give the business more resources to thwart control initiatives at all levels and in both developed and developing nations, which in fact threaten the public health.

(Foster et al., 2011) The author used gravity equation model to grasp the extensive and intensive margin and the results shows that the creation of a PTA between nations has a favourable impact on exports, in volume wise as well as and composition of products. The study also demonstrate that larger exporters and larger nations are actually benefited Preferential Trade Agreement.

(Campi & Dueñas, 2016) this paper explored the effect of agreement on Trade Related aspects on Intellectual Property Rights (TRIPS) on agricultural trade. The investigation relied on an annual index of intellectual property rights for sixty industrialised and developing countries from 1960 to 2000 (the Post-TRIPS era). IPR had a significant impact on global commerce, bilateral trade, and trade margins.

(Marchant, 2006) The author examined the role of agricultural products like rice, soy, and coffee in both domestic and international trade, using the spatial distribution of production capacities, the territorial analysis of exports and imports across the global market. Besides that, qualitative evaluation of the details of selected export commodities and their role in the economies of countries, including the importance of their role in the labour market is also assessed.

(Esmaeili & Pourebrahim, 2011) Using a gravity model, the research attempted to comprehend Iran's trading potential in the agriculture sector. The analysis was

conducted using data from the IMF and the World Bank, which also included information on the 70 members who have bilateral agreements with Iran. According to the study's findings, developing nations had higher export volumes than OECD counterparts. The paper contends that the decline in effectiveness of incentives is due to an incorrect understanding of the differences in trade structures and economic conditions between nations.

(N. Li & Ren, 2013) This study analysed the quantity of food and agricultural exports from 14 emerging countries, including Iran and India. The Gross Domestic Product, RTAs, and the distance between the nations all play a considerable effect in the balance of trade between the countries, Additionally, the report suggested reducing transportation costs and stressing the importance of regional trade agreements to boost agricultural trade internationally.

2.16 Research gap and Conclusion

From both bibliometric analysis and thematic discussion on the research domain the researcher could understand that the majority of research works are primarily focused on either scale validation or logistics service quality measurement. Seeking a research gap there is an increased necessity of studying the influence of logistics service quality on export performance of the shippers. To gain a comprehensive understanding, this study extends a broader approach by analysing the export of agricultural products, with a focus on the role of civil aviation in international trade. This study also provides a more comprehensive understanding of the major challenges prevailed in the air cargo logistics sectors and service performance of airlines and third-party logistics providers from the perception of shippers and 3PLs.

Moreover, this research takes a unique approach by exploring the effect of COVID-19 on international agricultural exports and air freight movements. The pandemic has disrupted global trade dynamics in significant ways, but the effects on agricultural exports remain understudied. Therefore, a unique aspect of this study is that it examines both macro and micro aspects of agricultural export, as well as air freight transportation.

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Chapter 3

International Trade and Air Cargo Logistics in India: Theoretical Framework

3.1 Introduction

Through this chapter the researcher's objective is to gain profound insights regarding the fundamental aspects of international trade, Countries merchandise trade and air cargo logistics on the current scenario. This chapter covers various topics such as reasons for international collaborations, international business theories, trade agreements of India etc. In addition to that the chapter also explores many other concepts like different modes of transportation, importance of cargo operations, limitation in the air cargo logistics in India.

3.2 International Business

International business refers to any kind of business operation which crosses national boundaries. It can also define as an organisation which buys and sells the goods and services beyond the national territory. In a broad sense it is regarded as "A giant firm, having operational units outside the home country. Despite there are several definitions for the term "International Business", no universally accepted definition is found (Bhalla & Ramu, 2004).

3.3 Reasons for international business expansion

- ***Broadening Market Reach***:

Businesses expand internationally to explore a larger and more diverse consumer market, which can lead to increased sales and increased revenue due to large economies of scale.

- ***Resource Acquisition***:

International ventures assure wider opportunities to acquire foreign cash inflow, technology, and knowledge which enhance product quality, differentiation, and helps to improve overall competitiveness in terms of market share and profits.

- ***Risk Mitigation***:

By entering international markets, firms can reduce their vulnerability to economic fluctuations specific to single nation, which helps in safeguarding their sales and profits during recessions and expansions.

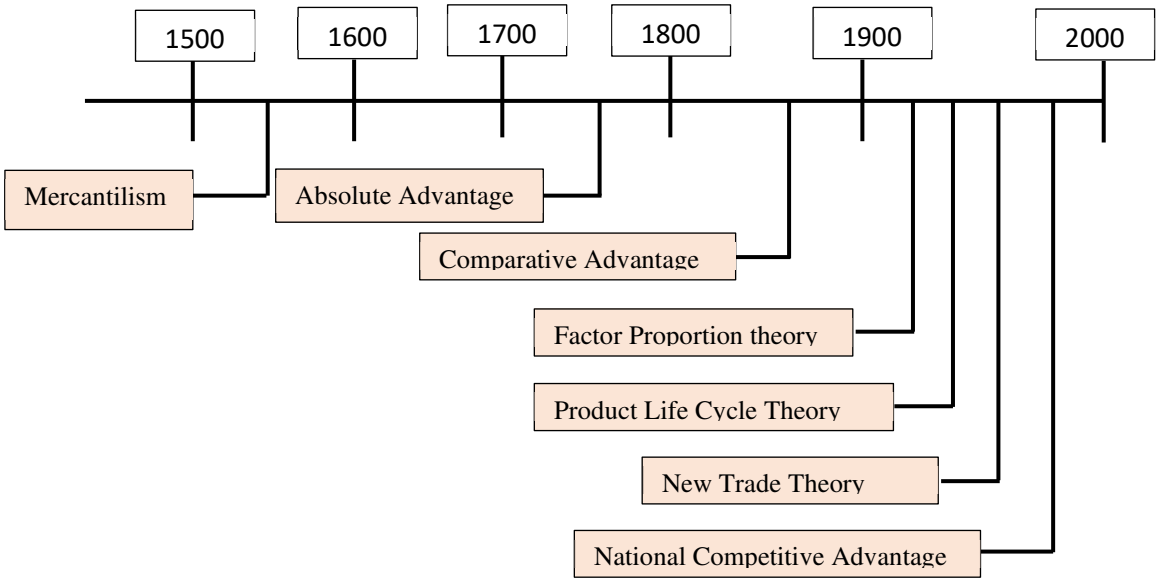
These are the main motivations behind a company's decision to engage in international business activities (Sinha & Sinha, 2008).

3.4 Theories of trade

The key concern that now arises is: Why would enterprises from one country seek to expand into another country? when those countries both produce and sell goods? What is the foundation of the idea of global trade? Many theories have developed to explain the origins of global trade. A timeline showing the introduction of the major theories of international trade is shown in Figure 3.1.

Figure 3.1

Theories of International Business



- ***Mercantilism***

Early in the 16th century, England developed the first international trade theory, called mercantilism. During 17 the century, gold and silver are considered as the indication of national wealth and essential to commerce and trade, exports of goods could generate gold and silver. In the same manner, importing goods from other country would result in gold and silver flowing to the same country. Mercantilism states that a country should maintain a trade surplus by increasing exports than its imports. In this way, a country can gain wealth and prestige and ensure accumulation of gold and silver. However international trade experts criticise the doctrine of mercantilism that it is based on zero sum game. This theory also criticised as it is found to be too simple (Aswathappa, 2006).

- ***Theory of Absolute Advantage***

Adam Smith, regarded as the father of economics, is the contributor of this theory. As per to this theory, countries should concentrate in producing goods for which they have a complete competitive advantage before trading those goods to other nations.

- ***Theory of Comparative advantage***

This theory was brought by David Ricardo. In his book titled 'Principle of Political Economy', published in 1817, presents the case that it is rational for a nation to specialise in the production of the things which can produce more efficiently and to purchase those goods of which production is poor. According to this concept, countries should produce the commodities for which they have a substantial comparative advantage. The drawback of this concept is that it only considers the production and consumption of two products in two countries. This theory also assumes that the cost of transporting commodities from one nation to another is zero. However, in real sense the primary cost in international trade is transportation costs (Aswathappa, 2006).

- ***Factor Endowment Theory***

According to this theory, countries with an abundance of capital are likely to concentrate in capital-intensive commodities like cars and aeroplanes and will export portion of their specialties in order to import more labour-intensive commodities. Similar to this, labour-rich countries will specialise in things that require a lot of labour and export those products for importing capital intensive products. In nutshell: trade will be based on differences in factor endowment and will alleviate factor scarcity in each nation (Bhalla & Shivaramu, 2008).

- ***Product life cycle theory***

According to this theory, a product goes through three distinct stages. new product, maturing product, and standardised product.

a) New stage product:

A new product is something that is novel or different in some way. Initially consumption is in the domestic country price is inelastic, profits are large, and company focus to sell the clients willing to pay a premium price. When there is abundant production and exceeds the requirement of local consumption, triggers market expansion to foreign countries.

b) Maturing product stage:

As years pass by, the products come to the phases of maturity in its life cycle, a growing percentage of revenues are made by exporting. Competitors in other developed nations will be working in the same way to create a replacement so they may replace the original product with one of their own. In due course, the company will shift its focus from production to market preservation due to the availability of these alternatives and a consequent decrease is found in demand for the original product.

c) Standardised product stage:

Once a product becomes standardized and its technology is widely available the manufacturing of products typically shifts to low-cost areas such as underdeveloped countries and offshore locations. Companies will also strive to differentiate the product to mitigate the challenges associated with price competition in this stage.

- ***New Trade Theory:***

This theory concentrates on productivity rather than available resources of a nation. The theory states that,

(1) Economies of scale and specialisation may enhance the gains.

(2) Market leaders have the ability to set up any barriers against competitors.

(3) The government may assist the domestic-based businesses in different ways (Aswathappa, 2006).

- ***Competitive advantage***

The theory of competitive advantage is propounded by Michael porter. According to porter, firms competitive advantage is depends upon factor conditions, strategy and competition, demand conditions, related and supporting industries (Aswathappa, 2012).

3.5 India's Global Trade Engagements

The era of globalization has brought a surge in trade agreements and the rise of competing trade blocs. These developments have significant implications for businesses, industries, and nations, making it a complex challenge for policymakers worldwide to stay informed about and adapt to these changes. Governments are engaging in international trade cooperation for various reasons, including the promotion of peace and stability, expanding market access, and safeguarding against unfavourable trade policies implemented by other countries.

The open, equal, predictable, non-discriminatory, and rule-based international trading system has always been supported by India. India views the regional trading agreements (RTAs) as "building blocks" that contribute to the multilateral trading system and trade liberalisation. Since the start of the last decade, India has been engaged Comprehensive Economic Cooperation Agreements (CECA) with certain nations. These agreements includes free trade arrangements for goods, services, and investments, while also outlining specific areas for economic collaboration. This reflects that Regional Trade Agreements (RTAs) will remain as an important factor in global trade.

The fundamental economic motivation behind Free Trade Agreements (FTAs) for India was to increase and broaden the country's exports to its trading partners. This was driven by the aim of creating a collaboration with other nations that ensures preferential access to the nations of trading partners. Additionally, FTAs were seen as a means to secure easier access to raw materials and intermediate goods at reduced costs, thereby stimulating value-added domestic manufacturing. In the cases of agreements with the Association of Southeast Asian Nations (ASEAN), Korea, and Japan, these FTAs also aligned with India's geopolitical strategy, which was closely linked to its "Look East Policy."

India has entered into 13 Free Trade Agreements (FTAs) and 6 Preferential Trade Agreements (PTAs) so far. Among the most recent agreements are the India-UAE Comprehensive Economic Partnership Agreement (CEPA), signed on February 18, 2022, and officially enacted on May 1, 2022, and the India-Australia Economic Cooperation and Trade Agreement (Ind-Aus ECTA), signed on April 2, 2022, and put into effect on December 29, 2022. Additionally, India is presently in negotiations for FTAs with several trading partners, including the India-UK FTA, India-Canada Comprehensive Economic Partnership Agreement (CEPA) or Early Progress Trade Agreement (EPTA), and India-European Union (EU) FTA. Furthermore, India has initiated the process of reviewing some of its existing FTAs, including the India-Singapore Comprehensive Economic Cooperation Agreement (CECA), India-South Korea Comprehensive Economic Partnership Agreement (CEPA), and India-ASEAN

Trade in Goods Agreement. Discussions have also been initiated for the Comprehensive Economic Cooperation Agreement (CECA) with Australia, as outlined in the India-Australia Economic Cooperation and Trade Agreement (Ind-Aus ECTA) (Economic Survey, 2022)

Table 3.1

Trade Agreements of India

Sl. No.	*Acronym*	*Groupings*	*Member countries*	*FTAs/PTAs*
1	APTA	Asia Pacific Trade Agreement	Bangladesh, China, India, Republic of Korea, Srilanka	PTA
2	*AIFTA*	India ASEAN Trade in Goods Agreement	Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, Vietnam and India	FTA
3	BIMSTEC	Bangladesh, India, Myanmar, Sri Lanka, Thailand Economic Cooperation	Bangladesh, India, Myanmar, Sri Lanka, Thailand, Bhutan and Nepal.	*Under negotiation*
4	GSTP	Global System of Trade Preferences	Algeria, Argentina, Bangladesh, Benin, Bolivia, Brazil, Cameroon, Chile, Colombia, Cuba, Democratic People's Republic of Korea, Ecuador, Egypt, Ghana, Guinea, Guyana, India, Indonesia, Iran, Iraq, Libya, Malaysia, Mexico, Morocco, Mozambique,	PTA

Sl. No.	Acronym	Groupings	Member countries	FTAs/PTAs
			Myanmar, Nicaragua, Nigeria, Pakistan, Peru, Philippines, Republic of Korea, Romania, Singapore, Sri Lanka, Sudan, Thailand, Trinidad and Tobago, Tunisia, Tanzania, Venezuela, Viet Nam, Yugoslavia, Zimbabwe	
5	IBSA	India Brazil and South Africa	India, Brazil and South Africa.	Under negotiations
6	SAFTA	South Asia Free Trade Agreement	India, Pakistan, Nepal, Sri Lanka, Bangladesh, Bhutan and the Maldives	FTA
7	ISLFTA	Indo Sri Lanka FTA	Sri Lanka, India	FTA
8	IMCECA	Indo Malaysia CECA	Malaysia, India	FTA
9	ISCECA	India Singapore CECA	Singapore, India	FTA
10	JICEPA	Japan India CEPA	Japan, India	FTA
11	IKCEPA	India Korea CEPA	South Korea, India	FTA

Source: Ministry of commerce and Industry

Table 3.2

Foreign Trade Performance Analysis India

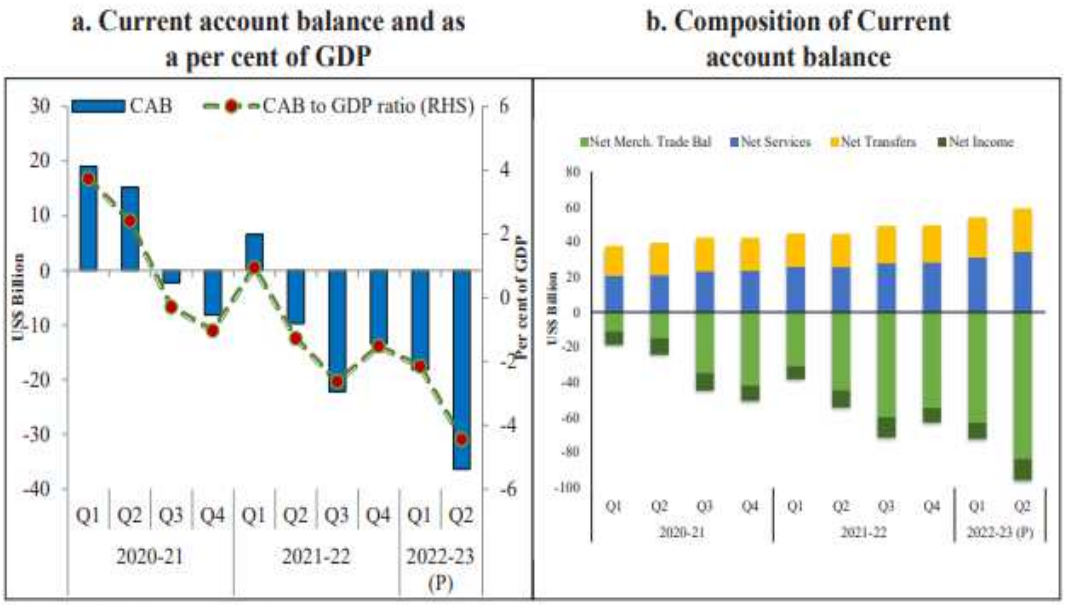
Values in Rs. Crores
(P) Provisional

Region	Apr-Aug 2022	Apr-Aug 2023 (P)	% Growth	% Share
1) Europe	**313,688.87**	**335,771.58**	**7.04**	**23.05**
1.1 EU Countries	240,406.80	251,709.37	4.7	17.28
1.2 European Free Trade Association (EFTA)	6,404.96	6,908.64	7.86	0.47
1.3 Other European Countries	66,877.11	77,153.58	15.37	5.3
2) Africa	**172,357.75**	**150,647.05**	**-12.6**	**10.34**
2.1 Southern African Customs Union (SACU)	33,331.91	31,851.78	-4.44	2.19
2.2 Other South African Countries	12,405.73	11,443.12	-7.76	0.79
2.3 West Africa	62,285.01	47,981.54	-22.96	3.29
2.4 Central Africa	5,346.00	5,681.85	6.28	0.39
2.5 East Africa	36,130.38	30,206.89	-16.39	2.07
2.6 North Africa	22,858.72	23,481.88	2.73	1.61
3) America	**372,624.68**	**347,971.52**	**-6.62**	**23.89**
3.1 North America	308,443.21	295,644.65	-4.15	20.3
3.2 Latin America	64,181.48	52,326.87	-18.47	3.59
4) Asia	**649,551.36**	**589,566.65**	**-9.23**	**40.48**
4.1 East Asia (Oceania)	32,242.21	39,270.45	21.8	2.7
4.2 ASEAN	153,283.06	136,884.45	-10.7	9.4
4.3 West Asia- GCC	171,614.95	170,801.02	-0.47	11.73
4.4 Other West Asia	49,217.44	41,054.08	-16.59	2.82
4.5 NE Asia	140,374.58	121,533.43	-13.42	8.34
4.6 South Asia	102,819.13	80,023.22	-22.17	5.49
5) CIS & Baltics	**12,951.03**	**18,550.55**	**43.24**	**1.27**
5.1 CARs Countries	3,167.00	2,507.19	-20.83	0.17
5.2 Other CIS Countries	9,784.03	16,043.36	63.98	1.1
6) Unspecified Region	**12,521.18**	**13,961.27**	**11.5**	**0.96**
Total	**1,533,694.89**	**1,456,468.63**	**-5.04**	**100**

Data Source: DGCIS, Kolkata, (Ministry of Commerce and Industry, Govt of India, 2022) -NIC

Figure 3.2

Current Account Balance (CAB): Magnitude and Composition



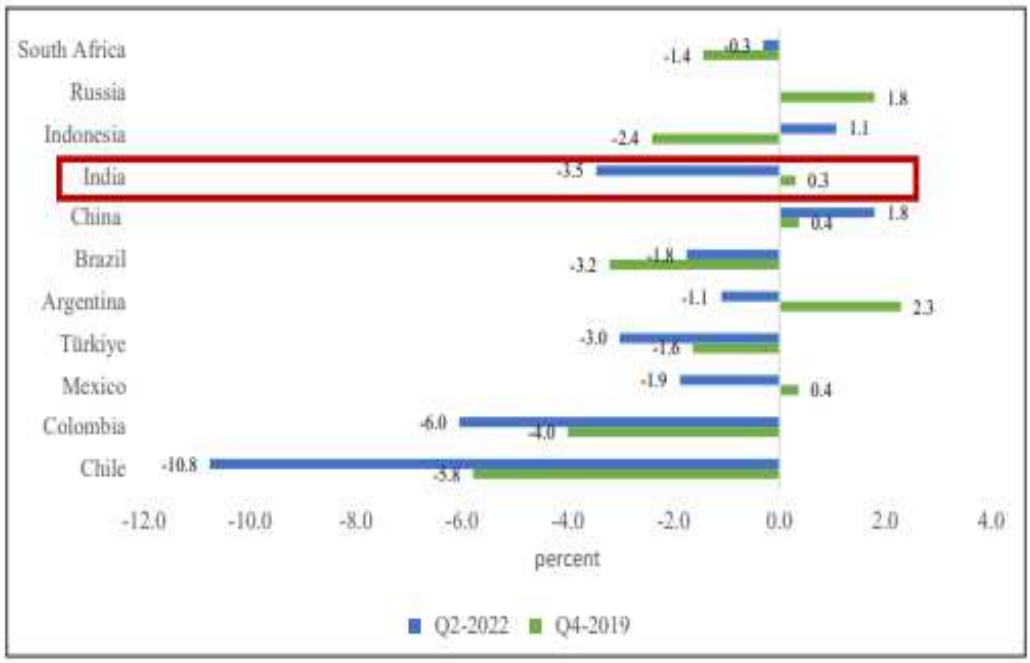
Source: RBI P: provisional

Global difficulties have had a considerable impact on India's foreign economic status, as was mentioned earlier. India's current account deficit (CAD) in the second quarter of FY23 was US$ 36.4 billion, which is 4.4 percent of GDP. Hence the reports of the previous year shows that, there was a deficit of US$9.7 billion (1.3 percent of GDP).

A greater merchandise trade imbalance of US$ 83.5 billion and an increase in net investment income outflows were the main causes of the CAD's rise during Q2FY23. India's CAD increased from 0.2 percent in H1FY22 to 3.3 percent of GDP from April to September of 2022 (H1FY23), primarily due to the growing merchandise trade deficit. But it becomes clear that India's current account deficit (CAD) is still manageably small and moderate when compared to the current account surpluses of a few selected nations (Economic Survey, 2022)

Figure 3.3

Current account balance as percentage of GDP: India vs Select Countries



Source:OECD Economic outlook 112 Database(economic survey 2022)

3.6 Trade: Different Modes of Transportation

Depending upon type of products, urgency, weight, and the needs of each shipment, various transportation modes like land, sea or air transportation is utilized for transporting the cargo. Selection of modes of transportation is a crucial factor. Besides expense consideration the other criteria like urgency, the value of the goods and quantity and size also acting as determining factors.

a) Cargo by land

Transporting goods by land covers either rail or road transportation. Rail freight involves the carriage of cargo in to trains. It can either be a passenger train or a cargo railway (Malagadi) or something else. Meanwhile, trucks of various sizes are utilised for road transport. The recent global pandemic COVID-19, known as the "corona," had a negative influence on freight transportation, but there have also been temporary barriers imposed by other external factors. However, land freight transportation has remained in the top spots in the market. Numerous factors contribute to the high

volume of goods transported by road. Regardless of airport and port operating schedules, both trains and trucks are capable of making effective deliveries at any time.

Today's road transport provides adaptable routing and shipment tracing options too. In order to provide a better tracking experience, transporters use the navigation systems GPS (Global Positioning System) and GLONASS (Globalnaya Navigazionnaya Sputnikovaya Sistema), which is the Russian version of GPS and is the abbreviation of "global navigation satellite system."

b) Cargo by Sea:

The first way of moving commodities was generally by sea, ocean, and river. Traditionally, this mode has always been in use. Using shipping containers that are loaded into container ships, cargo refers to carrying things across the seas. Globally, this is one of the largest shipping businesses. Ships are capable to carry millions of tonnes of cargo every day, crossing seas to get to their destinations in various nations, and making up approximately 90 percent of the amount of global trade. Sea mode of transportation is not only an affordable means of transportation, but it is also effective for big quantities of commodities.

c) Cargo by Air:

Air freight is a speedy way to transport goods around the globe using both passenger and cargo aircraft. For individuals who have strict deadlines to meet, this mode of transportation is much more time-effective. However, it is considered to a relatively expensive mode of transportation (Jha & Gupta, 2020).

3.7 Introduction to air cargo logistics

The demand for quick deliveries and shorter product life cycles have led to rapid growth in air cargo transportation in recent decades. A key competitive factor in this fast-changing business environment is speed-to-market, so moving inventory seems like a hectic task. All stages of the supply chain are viewed as continuous value-adding processes, including raw materials, components, and final delivery. Moreover,

effective supply chain management reduces inventory costs and intermediary costs as well as simplifies ordering, delivery, and customer relationship management processes. In turn, these advantages improve the competitiveness of businesses.

The development of logistics infrastructure is closely linked to the expansion of international trade. In order to support the growth of international trade, infrastructure needs to be developed. Simultaneously, having this infrastructure available at competitive rates improves trade and enhances a country's global competitiveness. Furthermore, the availability of such infrastructure is a significant factor which aids the inflow of foreign direct investment (FDI). In developing countries like India, the development of an effective logistics infrastructure can result decrease transportation costs, which immediately boosts the nation's competitiveness on the world standard. By opening up opportunities in new markets and supporting the quick and effective transportation of goods, an effective logistics sector serves as an economic driver (Ministry of Civil Aviation, 2012).

3.8 Key features of air cargo operations

a) Air cargo operations

The air cargo sector has a complicated supply chain that involves a number of parties, including airlines, customs, ground services, air cargo forwarders, brokers, domestic transportation providers, air cargo terminals, distribution centres, and integrated international express services Airlines, owners of air cargo terminals, and forwarders/cargo.

b) Potential market

A significant factor influencing air freight demand is its cost, which is usually four to five times higher than road transport, and 12 to 16 times higher than sea transport. Therefore, air freight is primarily used for commodities of high value per unit or those requiring fast delivery. Documents, pharmaceuticals, fashion clothing, production samples, consumer electronics, and perishable agricultural and seafood products all fall into this category. The air cargo industry also transports emergency spare parts and inputs essential for just-in-time production.

Landlocked developing nations, where many enterprises often dispatch relatively low-value goods in small quantities through air mode of transportation. From developing countries, cut flowers, electronic components, fresh fruits and vegetables are typically exported by air. Conversely, air freight imports predominantly comprise high-value consumer goods. As a result, the amount and range of goods transported via air are restricted due to a lack of substantial outbound air freight flow.

c) Gaining a Competitive Edge

Using air freight has many advantages in the market. For example, manufacturers may prefer quicker order processing by using air transport, helping to avoid delays in production. Similarly, businesses in areas like textiles and electronics might first use sea freight for large shipments and then switch to air freight for faster restocking when demand is high.

d) Diversification Strategy

Air freight is key component in diversification strategies, such as introducing products with limited shelf life or ensuring reliable delivery of smaller quantities in new markets. Once the market is established and volumes raised, manufacturers can reconfigure their supply chains by adopting more cost-effective modes of transport.

f) Swift Cargo Movement:

Given that one of the primary advantages of air freight is considerably shorter transit times, it is imperative for cargo to move swiftly through airports. The efficiency of cargo operations depends on four key factors: customs clearance procedures, cargo inspection processes, the effectiveness of cargo handlers, and the layout of storage facilities.

g) Customs procedure

Customs procedures are crucial for importing of commodities. This process involves two essential documents: the airway master bill, sent when the flight departs, and the customs declaration, filed by customs brokers after the cargo has been shipped. In certain countries, the customs authority at the airport uses procedures and systems

similar to those at other international gateways In these cases, all transactions are carried out electronically, and cargo can be cleared within just one or two hours, and 24×7 service is available.

h) Inspection equipment

For doing exports, the documents should be submitted at the time cargo arrives at the airport, and the inspection is done at the same time so that cargo can be loaded within a few hours of arrival. Most of the scanners are for baggage and small packages, so the cargo must be unloaded from the truck in loose form and scanned before being built into palettes. In the larger airport station, with significant cargo traffic, full palette scanners allow shippers to build their palettes off-airport and to load them on the aircraft within few hours.

i) Cargo management

In order to make the cargo logistics sector competitive, cargo handlers at the airport need to assure effective and secure handling of the cargo. An exclusive contract is utilised when the cargo volumes are relatively small, and the contractor is required to provide the right tools for unloading the various kinds of aircraft.

In numerous developing countries, the national carrier often holds a monopoly, which can be problematic to poorly managed privately-owned company. Moreover, this situation opens the door to discriminatory practices in handling the goods of competing businesses. In some other airports, a private contractor maintains a monopoly, but productivity incentives are frequently used to control performance. Competition must be created as soon as there is enough cargo, or more carriers should be permitted to operate independently in order to prevent the discriminatory behaviour.

j) Warehousing

Many of the storage facilities at smaller, older airports are quite primitive. Since most cargo doesn't stay at airports, this has little effect on cargo storage. The imports are

typically high-value, quickly moving items, whereas the exports are typically time-sensitive.

To speed up truck turnarounds and reduce vertical cargo movements, modern warehouses integrate loading docks. Large spaces for scanning, inspection, assembling palettes, and gathering of cargo for certain flights are available at export facilities. For easier customs clearance processes and division of goods into truckloads, separate premises like offices and inspection areas are exist for imports. In order to maintain the cold chain between the truck and the aircraft for perishable cargo, these warehouses hold temperature-controlled rooms. Additionally, some warehouses offer some bonded storage for high-value items.

k) Cost

Fuel at present makes up nearly half of the annual cost of operating an aircraft, whether it be for cargo or passengers, as a result of the recent spike in oil prices. The marginal cost of transporting goods is calculated based on weight and destination because fuel consumption is related to aircraft weight and flight distance. In passenger flight since priority is given to passengers and their belongings, the belly space is available for cargo. The charges for charter services are typically higher compared to passenger flights.

Air freight charges per kilometre are greater for shorter journeys. Because the major part of the fuel consumption is for take-off and landing, therefore for domestic export road or rail transportation is advisable (World Bank, 2009).

3.9 Importance of cargo trading and Business

The cargo industry depends upon on the transportation of valuable goods across boundaries. logistics service providers extend a time-saving solution for traders, suppliers, and consumers in our highly competitive and dynamic business environment. The adoption of technology and innovation has enhanced production, but it has also helped in minimising product life cycles, requiring faster transportation.

Cargo companies works under two different models, which leads to distinct names – Shipping Companies and 3PLSPS, both serving to the commercial movement of cargo. Although they seem similar, they differ in the way they handle cargo. Cargo vessels are handled by shipping companies, while freight forwarders provide services in conjunction with shipping companies. The consignee and consignor are both service providers and don't see much difference between them.

Carriage through ocean or air cargo, both shipping liners assure the safe delivery of transported goods. But air cargo ensures speedy delivery of goods, and which is highly appropriate to time sensitive products. Most of the airlines collaborate cargo and passenger operations in the same operation, but this can sometimes causes in operational difficulties. This may affect the service quality and weaker revenue generation, eroding trust. However, in recent times several countries operate separate freighters solely meant to cargo carriage may reduce the disruption happening the passenger flight.

It has been showed that investing time and money in shipping operations would boost earnings and profitability in this cargo sector. Both commercial and residential clients use cargo transportation, which yields significant revenue for both international and local shipping. These businesses often collaborate with regional service providers, which produces revenue and job opportunities. Consignors support businesses who provide convenient shipping services, handle all required procedures and paperwork at competitive rates, and guarantee speedy delivery.

3.10 The importance of air cargo to the global economy

a) Employment Generation:

The International Civil Aviation Organization (ICAO) states that the aviation industry, especially air cargo transport, offers wider employment opportunities. It generates over 29 million jobs globally, both directly and indirectly. These jobs offer is not only involved in aviation sector but also include other employments like customer care executives, suppliers, software developers etc.

b) Availability of Economical Raw Materials:

Air cargo transport simplifies transportation of high-quality raw materials from their place of origin with affordable rate. This lower rate enables traders to reduce their operating and manufacturing costs. As a result, companies can offer their products at competitive prices with a profit margin.

c) Availability of Consumer Market:

Air cargo plays a significant role in online commerce. It guarantees companies to deliver goods promptly, meeting consumers' expectations for prompt deliveries. Consistency in terms of on-time delivery and after-sales service is extremely important for customer satisfaction and trust.

d) Contribution to International Trade:

Air cargo transport makes easier for firms to function globally and create themselves as Multi-National Companies (MNCs). The existence of efficient transport connection is a key factor in the decision-making process for international companies looking to invest in different nations. Extending beyond the boundaries also triggers to the development of better infrastructures.

e) Customer Satisfaction: Customer satisfaction is the most crucial factor for any business's growth and success. Air cargo's role in ensuring on-time and damage-free deliveries contributes to credibility and customer loyalty. When a company consistently meets the customer's expectations, it leads to better customer satisfaction, which, in turn, generates revenues (Jha & Gupta, 2020).

3.11 Major challenges in India

a) Infrastructure

Airports haven't been developed in a planned, comprehensive manner to meet the demands of the cargo industry. The biggest obstacle of India's air cargo industry is the absence of suitable and acceptable air-cargo infrastructure at airports.

The bulk of the air cargo facilities lack the following facility infrastructure:

i. Lack of landside truck docks, a vehicle holding area, and operational space on the airside.

ii. Not enough entrance gates, outdated handling tools, and trolleys.

iii. The absence of specialised facilities for the processing and storage of dangerous, radioactive, and precious cargo.

iv. shortage of enough cold storage space for perishable cargo.

Table 3.3

Cargo Operations: India v/s Global Practices

Global best practices Cargo operations in India	***Cargo operations in India***
Separated facilities for various types of cargo.	Majority of terminals don't assure separate facilities, except cold rooms
Dedicated and specialized perishable handling facilities that cater to end to-end supply chain needs.	Insufficient investments in cold chain infrastructure (temp-controlled, storage trucks) to handle perishables, pharma and other agricultural products.
Adequate parking space for trucks.	Agents utilise the cargo terminal landside as a truck parking / holding area, which causes to congestion in the station.
Agent's storage, office spaces and other processing facilities are near to cargo terminal.	Agent warehouse are often situated within the city.
Encourages transhipment handling/ hub operations	Cargo terminal operators requires distinct license handling space for transhipment operations.
Dedicated facilities for Air Express Operations with access from both the air and the city, as well as several freighter parking bays are offered	There is no set model, and it depends on the choice of the different airport operators. Just a few designated cargo parking spaces are available.

Source: Presentation to WG by AI-SATS, 2011

b) Inadequate X-ray screening facilities and lack of associated trained manpower

The lack of suitable screening equipment, particularly equipment that can handle built-up pallets (BUPs), has caused a backlog in the processing of cargo at the land side, especially when a sizable amount of cargo is tendered at the same time. Additionally, the problem is made worse by the absence of ULD (Unit Load Device) screening facilities for heavy and palletized freight. The issue gets worse by the screening equipment's frequent mistakes, lack of engineers on-site for fast troubleshooting may result in delays in the clearing process and pile-ups of cargo.

c) Air freight stations (AFS)

All tasks associated with handling air cargo, such as weighing, checking, customs inspections, and organizing cargo containers, used to be handled at airport cargo terminals. In the smaller cargo terminal increased cargo volume creates serious congestion issues. The idea of Airport Freight Stations (AFS) was developed as a way to ease this congestion by allowing cargo to be moved to designated or customs-approved freight stations outside the airport using contract trucking services. This approach helps to improve cargo processing efficiency, reduce the time cargo spends waiting, and make better use of the available space. AFS is a good solution that complements the existing airport cargo terminals and is a successful model used internationally, especially in India's maritime cargo sector.

d) Special Cargo Infrastructure

Specialised handling facilities are frequently needed at airports, especially for cargo that is temperature-sensitive, including pharmaceuticals, perishable commodities, and dangerous goods. However, not every airport has specialised space for this kind of cargo. Therefore, there is a need for precise regulations regarding minimum infrastructure at airports in order to successfully manage these shipments. The placement of vital industries like medical research, agricultural exports, and high-tech and electronic equipment companies should be taken into consideration while developing these rules. Separate cold storage facilities for pharmaceuticals and perishable food products, as well as sections for handling dangerous goods, should be

set aside specifically for the proper storage and management of temperature-sensitive goods.

e) Cold storage

Fresh agricultural and food trade is evolving, with an increased emphasis on horticulture products, fruits, vegetables, seafood, and spices. Because of this change, there is now a greater need for airfreight to guarantee on-time deliveries. Gaining a competitive edge depends heavily on the efficiency of the logistics and transportation systems, all require better storage facilities.

f) Security issues in the cargo complex

g) Documentation duplication

h) Lack of close supervision during cargo offloading (Ministry of Civil Aviation, 2012)

3.12 Conclusion

This chapter could shed the light on the concept of international trade, which comprises of its definition, the historical evolution of trade theories, the country's trade balance, and the operations of cargo logistics. Additionally, it also emphasized the significance of air cargo and draws comparisons between cargo operations and global standards.

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Chapter 4

Indian Agricultural Product's Export Trends, Prospectus and Role of Civil Aviation in Freight Movement

Objective: To evaluate the trends and prospectus of agricultural exports in India and the contribution of civil aviation in freight movement.

4.1 Introduction

India is one of the top ten producers of rice, wheat, cow milk, fresh vegetables, sugar cane, potatoes, groundnuts, peppermint, and buffalo meat in the world. Technical advancements, macroeconomic changes, and Uruguay round agreement have influenced agricultural trade (Nageshwara & Rao, 2009). Increasing global demand for Indian agricultural products presents a fantastic opportunity, However, the share of agricultural exports in the nation's overall exports has decreased (Patil, 2020) , India has been able to maintain its comparative advantage on some commodities, like cashew and oil meals, but products like tea, coffee, spices, and marine products have suffered after industrial reforms (Shinoj & Mathur V C, 2008).

A number of studies covered the agricultural trade and changes in India in various contexts. *In this work, the researcher tries to look into the prospects and patterns of the nation's agricultural exports during a specific time period. The researcher divided the investigation into three parts for this section. The first phase addresses the development and composition of the agricultural trade by focusing on a few specific agricultural items that India trades most frequently handle on the global market. The goal of this study is to determine future potential and trends for Indian agricultural products. The study has undertaken Compound Annual Growth Rate Analysis of the last ten year's export records in order to determine the growth of various products. The second step of the analysis comprises seeking comprehensive perspective of India's most important agricultural product-importing regions. The ASEAN, SAARC, GCC, EU, CIS, American, and African countries were among the major trading blocs*

that the researcher considered in this area. Finally, to assess the most recent trend, export data from 2021–2022 is also used. As part of this phase of the study, the researcher also sought to understand the covid recurrence of Indian agricultural trade towards these selected regions. Here the growth of agricultural exports is measured by comparing the pre-covid period to the post-covid period export statistics.

Table 4.1

Commodity wise CAGR Analysis

Product	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	CAGR
	Qty	Qty	Qty	Qty	Qty	Qty	Qty	Qty	Qty	Qty	Qty	%
Non Basmati Rice	3997720	6687991	7133183	8274046	6464570	6770804	8648489	7599674	5040708	13095130	17262235	16%
Basmati Rice	3178174	3459899	3757271	3702260	4045822	3985196	4056759	4414584	4454657	4630463	3948161	2%
Buffalo Meat	987714	1108662	1451942	1476310	1314534	1323576	1350563	1236638	1152547	1085620	1175193	2%
Wheat	740747	6514811	5562375	2924070	666669	265606	322790	226225	217354	2088488	7239367	26%
Maize	3855721	4788328	3954237	2825611	697947	566352	705514	1051856	370066	2879203	3690469	0%
Miscellaneous Preparation	229342	293958	338973	372998	355786	282577	331670	517180	327513	624257	946537	15%
Cereal Preparation	301290	293124	321468	306329	316533	339923	353237	347752	341736	40326`8	415545	3%
Groundnuts	832617	535637	509665	708386	542726	725704	504019	489187	664443	638583	514164	-5%
Processed Vegetables	224506	193099	204663	180388	177333	210582	226484	248122	253277	403355	460621	7%
Processed Fruits, Juices & Nuts	203029	223074	246131	253347	275584	300006	317353	339607	360488	306991	374260	6%
Fresh Onions	1309925	1666873	1482499	1238103	1382960	2415739	1588986	2183766	1149897	1578017	1537497	2%
Guar gum	707326	406312	601945	665178	325251	419948	494101	513212	381880	234871	321395	-8%
Dairy Products	25640	87824	159229	66424	33443	39167	48039	113726	51422	54762	108711	16%
Other Fresh Fruits	262484	256249	232110	261212	362954	394315	321158	372214	496578	609613	761031	11%
Pulses	174625	202751	345277	222262	256052	136968	180194	289618	235699	296170	410376	9%
Jaggery & Confectionery	207694	246567	266472	258253	292841	297681	252143	313870	341155	631896	551717	10%
Milled Products	171158	273584	418398	415984	431465	255804	270377	307368	283381	392935	695780	15%
Fresh Grapes	94860	140967	160256	94377	132648	198471	188221	246134	193691	246107	263076	11%
Other Fresh Vegetables	665419	724231	881599	798601	712562	993117	739055	735743	754008	682086	770233	1%
Alcoholic Beverages	214111	264466	311564	264626	238672	230827	241235	231602	139364	247456	197868	-1%

Product	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	CAGR
	Qty	Qty	Qty	Qty	Qty	Qty	Qty	Qty	Qty	Qty	Qty	%
Cucumber and Gherkins (Prepd. & Presvd)	258603	238625	218750	251183	202954	179661	220939	212820	189343	223516	217521	-2%
Natural Honey	26089	25781	28378	29579	38177	45055	51547	61334	59537	59999	74413	11%
Cocoa Products	16679	19083	15963	20878	32653	25650	29583	27604	27411	25768	27319	5%
Mango Pulp	150499	147816	174860	154821	128866	130886	110924	105873	85726	98370	123477	-2%
Floriculture	30926	27122	22485	22947	22692	22020	20703	19727	16949	15695	23597	-3%
Fruits & Vegetables Seeds	15206	17168	17817	12499	13104	11289	14463	16151	14796	17177	11550	-3%
Casein	839	13651	11462	8168	5898	6130	2670	5639	164	3402	8768	26%
Poultry Products	624181	577864	437674	556699	659304	448725	453967	544985	350818	255687	320240	-6%
Millet	5805	16323	216419	257387	188985	166942	156274	219403	129726	147501	159332	39%
Animal Casings	924	603	352	260	206	173	12425	14883	12816	13888	13827	31%
Sheep/Goat Meat	10085	14891	20426	22828	21636	22009	21907	18425	14129	7051	8696	-1%
Fresh Mangoes	63441	55585	41280	42998	36779	52761	49180	46510	49659	21034	27873	-8%
Others (Betel Leaves & Nuts)	2472	5456	5685	9031	10717	14389	13186	17365	14003	10152	14057	19%
Albumin (Eggs & Milk)	1454	1664	2025	2125	1934	1703	2082	2197	2483	2278	1465	0%
Walnuts	5829	5295	6724	2663	3290	2189	3596	1875	1648	1070	2483	-8%
Processed Meat	576	797	489	406	279	141	270	406	440	774	463	-2%
Other Cereals	212157	636653	441282	430813	80989	1493	1344	5750	1690	2425	2227	-37%

Source: Author's Calculation based on DGCI Report

4.2 Composition and Pattern of Agricultural Exports from India (2011-2022)

The table 4.1 shows India's agricultural trade to the global market from the year 2011-2012 to 2021-2022.The agriculture and allied sector have a crucial role among almost all trade blocs, hence the data reveals both upward and declining trends in agricultural products from India. Exports of Basmati rice in the year 2011-2012 was 3178174.43MT, Worth US$ 3222311119 has increased insignificantly to 3948161 MT (US$ 3540402567), with a compound annual growth rate (CAGR) of merely 2 percent. A significant growth is shown in millets exports with CAGR 39%, being the fast growing APEDA product over the last 10 years, however as both quantity and value of trade is comparatively fewer results insignificant cash inflow. The share of non-basmati rice in the year 2011-2012 is reported to be the highest in terms of quantity and value compared to all other APEDA products (3997720 MT, US$ 6687991), which has also increased over the decades with 16% CAGR. Subsequently wheat exports of the country also remained high growth rate is about 26% CAGR, is absolutely a drastic improvement where export volume shifted from 740747 MT (valued us$ 213422373) in the year 2011-2012 to 7239366.78 MT worth US$ 2121747442 (2021-2022),Therefore wheat exports is a good opening for foreign income to the Indian economy. Furthermore, a progressive trend on dairy products exports (CAGR 16%) is also recorded worth US $ 60350936 in 2011-2012, has now reached US$391591720.The exports details of betel leaves and nuts tells a positive upward trend over the past ten years, showing a 19% CAGR, is also depicts India's future market opportunity. Similarly Compound Annual Growth Rate of processed vegetable and Processed foods is 6% and 7% respectively. The export of fresh fruits in the year 2011-2012 was merely 262484 MT, hence a significant change over trade volume and value (609613 MT, US$761031) is occurred with a 11% CAGR. However, the value compared to the quantity is relatively small. The global economy also demanding constantly some of the Indian Agro based products like animal casings (CAGR 31%) and casein (26%) is a glimmer of hope to the Indian farmers. The exports of fresh grapes (11% CAGR), Pulses (CAGR=9%), Jaggery and confectionary (CAGR=10%) are slightly progressive. Then some of the APEDA products now being facing biggest challenges year by year showing a steep decline in

the exports, especially the products like cereals, which has drop down from 212157MT to 2425 MT, is obviously a worrying news to the Indian economy. In addition, commodities like processed meat, walnuts, fresh mangoes, sheep and goat meat exports, poultry products, fruits and vegetables seeds, floriculture, cucumber, ground nuts have all fallen down prominently while considering the last one decade's report. The regressive trend of these Agro based products is massive hit and awful as India is treated as an agrarian economy.

Apparently international trade is vulnerable to greater extend due to certain factors such as changes in foreign trade policy, free trade agreements, civil unrest, war, inflation etc. Most importantly covid outbreak caused immense shrunk among many of the sectors and industries. Therefore, export growth particularly in the year 2019 to 2022 is seems to be examined to analyse covid repercussions on international trade of agricultural products. The data shows diverse trade effect in response to covid crisis. The export growth of non-Basmati rice in the year 2018-2019 compared to 2019-2020 is negative which is approximately 34%. While basmati export survived in those periods with 1% growth rate. At the same time buffalo meat, wheat, maize all fell down with -7%, -4%, -64% growth rate respectively. Likewise, onion exports devastated by 47%, and a 55% decline was also found on dairy products. The same negative trends occurred in the case of millets, animal casings and walnuts. However, some products like processed vegetables, processed fruits, other fresh fruits, fresh mangoes, meat and processed meats stagnated or survived during the period.

The comparative study results of India's agricultural trade at the very peak time of covid era, that is 2020-2021, shows that, an unbelievable trade growth in almost all APEDA Products. Which means India played as a key supplier in the global economy with respect to farm products exports which has benefited to both shippers and the government, while all other sectors were actually strive to survive. In the year 2020-2021 wheat exports has drastically increased with 861% growth rate compared to the last year, while Maize exported six times more than the last years distribution. A 37% growth rate was visible in the case of onion export, fresh fruits, similarly pulses also increased by 26% and 23% respectively. Moreover, an increasing trend of jaggery and

confectionery (85%), milled product (39%) were actually added up in the agricultural export surplus. However, some of the products were susceptible to the virus spread implications. Products such as buffalo meat, Guargum, other fresh vegetables, coco products, floriculture were vigorously affected.

In the year 2021-2022 the total exports of non-basmati rice have grown from 13095130.21 MT to 17262235.08 MT showing 32% growing rate, in value terms India has earned US$ 1324364111 more than the last years export. However while taking the case of basmati rice a slight decline is revealed (worth US$ -478310526).The export of wheat again follows an immense hike showing a 247% growth rate also contributed US$1572049034 in the year 2021-2022. Furthermore an increasing trend is observed in certain Agro based products such as maize (28%, US$386033852), Miscellaneous preparations (52%, US$200769098), cereal preparations (3%, US$16510606), processed vegetables (14%, US$33364005), processed fruits (22%, US$58192606), guar gum (37%,US$183780722), diary products (99%, US$190225448), fresh grapes (7%, but decline in value terms worth US $7940613),other fresh vegetables(13%,US$1028258). Similarly, a 135% growth rate is found in the exports of Walnuts (earlier in 2020-2021 the growth rate was -34% compared to 2019-2020). When it comes to meat exports, Buffalo meat has rose by 8% growth rate (US$132149902), 23% increase in sheep/goat exports,118% hike in the case of other meats. Nevertheless, the exports of processed meat have declined by 40% in the year 2021-2022.Case in exports subsequently increased with growth rate of 158%, brought worth US$ 54822965 than the last year. The poultry products and fresh mangoes has increased by 25% & 33% respectively. An increase in the exports of betel leaves has shown US$10187107 hike in the year 2021-2022 and in quantity it has grown by 38%. A significant growth (50%) on the exports of floriculture, earlier in the year 2020-2021 it was -7%. In terms of quantity, there is 6% increase in coconut products and a significant increase (26%) in mango pulp.

In nutshell India in Agricultural product exports were resilient on the covid disruption, as food is coming first in the need hierarchy of all living animals. Amid the peak time of covid pandemic the country was non-responsive to a greater extend

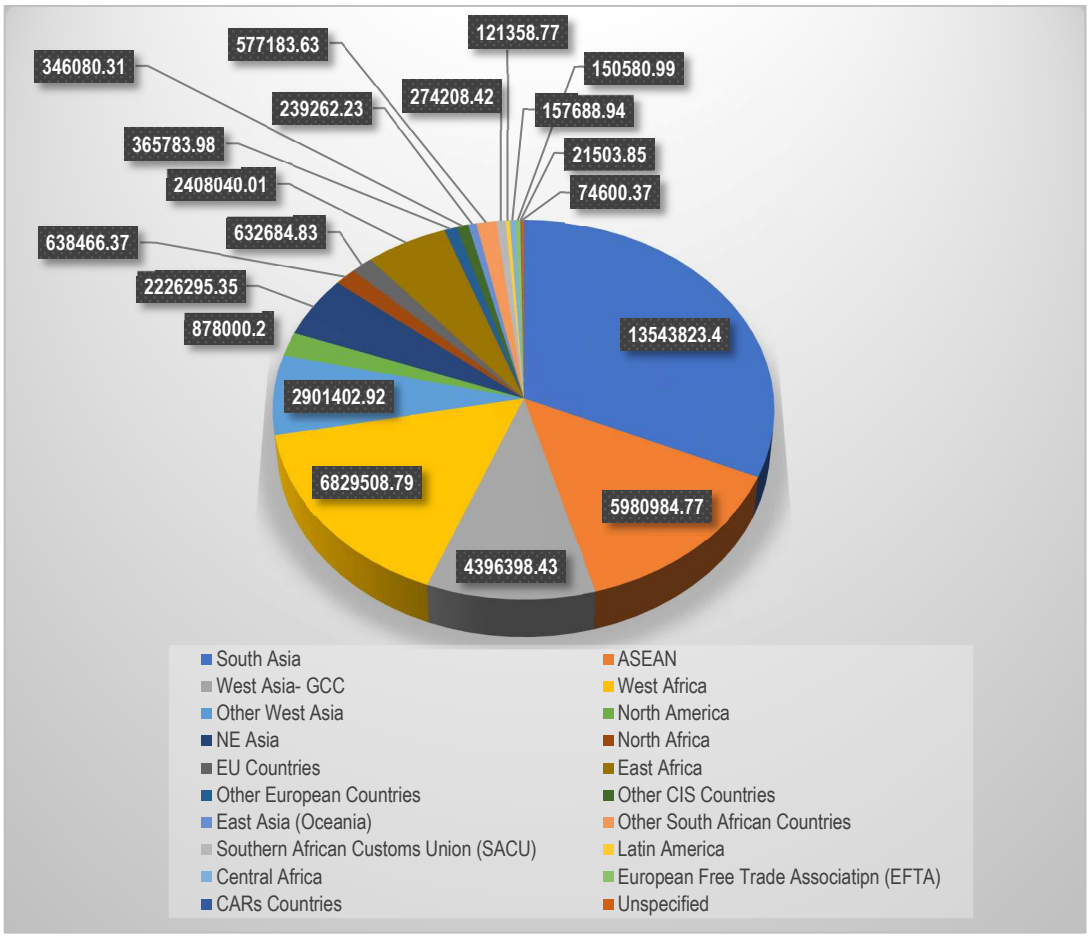
and supplied tremendously to the varied trade blocs across the globe. The export growth intensity varies according to the nature of the product, where some products shown an incredible positive impact and some of them has really struggled or halted temporarily. The products such as wheat, non-basmati rice, dairy products, milled products, buffalo meat, guar gum, case in, walnut, fresh fruits and vegetables etc. had a massive positive impact amid covid era. But on the other hand, products like Basmati rice, cucumber, alcohol beverages, floriculture, other meats have affected insignificantly during the year 2020 to 2022. Certain products such as floriculture, poultry products, other meats, natural Honey came back to the normal state in the year 2021-2022.

4.3 Indian agricultural product export: A regional wise comparison

According to the analysis of India's total agricultural exports to the world market in the years 2021–2022, 32% of its exports go to South Asia. West African regions take second place, accounting for 16% of India's overall exports. Similar to that, 14% of all exports go to ASEAN countries, which is a large amount. Aside from these areas, statistics reveals that GCC imports 10% of India's total agricultural exports, making it one of the major importing nations. According to the data, India sells 2901402 MT to west Asian countries, which is around 7% of its total exports. Additionally, Northeast Asia and East Africa (2226295MT and 2408040MT, respectively) rely more heavily on the Chinese agricultural market. In short, the key international markets for Indian agricultural products are South Asia, ASEAN, the Gulf Cooperation Council, and West Africa.

Figure 4.1

India's Agricultural Exports (2021-2022)



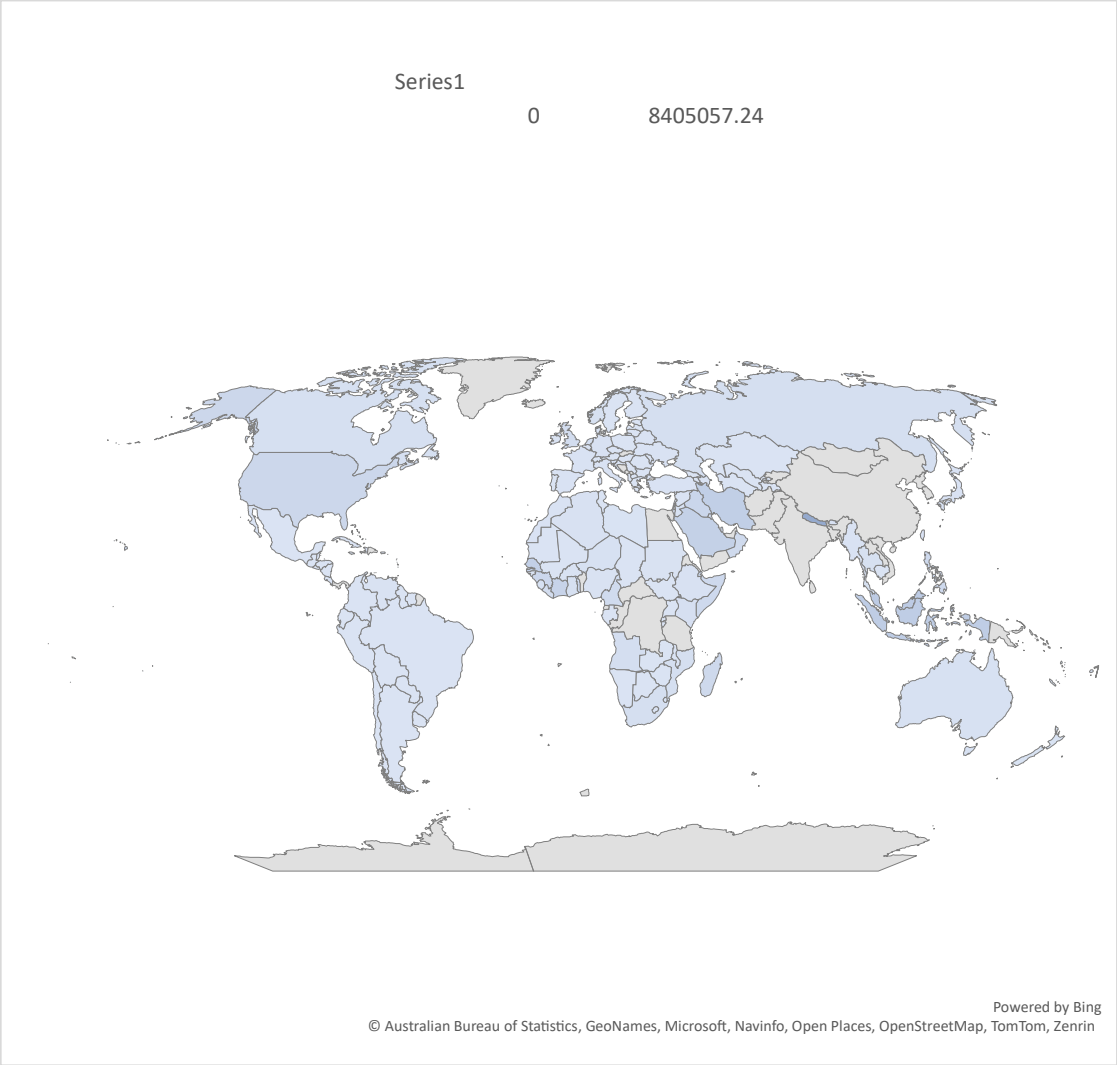
Source: DGCI Report

The above diagram shows the countries' agricultural trade to various regions such as south Asia, ASEAN, GCC, other West Asia, North America, Northeast Asia, EU, North Africa, East Africa, East Asia, other South Asian countries in the year 2021-2022.While analysing the statistical reports the researcher is able to understand India is mostly exporting to south Asian region. The contribution of south Asian countries in the total agricultural exports is 32%. Then second largest importer of Indian agricultural products in the year 2021-2022 is South African region (16%) which is followed by ASEAN (14% Contribution in the total Indian agricultural exports).

Subsequently country export other west Asian countries approximately 7% of its total exports. Similarly, India exports 2226295 MT to Northeast Asia which is about 5% of India's total exports. The remaining regions such as north Africa, EU, East Africa, East Asia, CIS, and other South African countries insignificantly imports Indian agricultural product.

Figure 4.2

Indian Agricultural product exports to various nations (2021-2022)



Source: DGCI and APEDA Report

Besides the analysis of India's agricultural trade between the prominent trade regions, it is also important to know the prominent importing nations relying Indian agricultural exports. It has been found that Bangladesh is the major importer of

agricultural products from India in the years 2021–2022, and the country exports 8405057 MT, valued at 2839047006 US$, to Bangladesh. Bangladesh is a part of the SAARC countries. Nepal, a SAFTA member and the second-largest importer of agricultural products from India, imported 3371058.57 MT (1100361321 US$). Vietnam is an ASEAN country, and India exports 2258621.19 dollars' worth of goods to it, placing it in third place overall. UAE imports goods primarily from India, amounting to 1971478.18MT in volume and 1604778335 US$ in value. In terms of agricultural trade, the nation also plays a crucial role in gaining access to the markets of China, Benin and Sri Lanka. The other ASEAN nations, such as Malesia and Indonesia, rely heavily on Indian agriculture as well; The country exports to these nations 1415584.54 MT and 1319804.13 MT respectively. Further, the country has established trade relations with other trade blocs such as the European Union, the African continent, and the Commonwealth of Independent States, etc. But the trade volume is not significant.

Table 4.2

Compound Annual Growth Rate Analysis: Regional wise (2009 to 2019)

Region	CAGR	Region	CAGR
West Asia- GCC	3%	Other European Countries	8%
ASEAN	-1%	Other CIS Countries	15%
South Asia	1%	Other South African Countries	-5%
West Africa	26%	East Asia (Oceania)	11%
Other West Asia	14%	Latin America	15%
North America	7%	Central Africa	23%
NE Asia	2%	Southern African Customs Union (SACU)	25%
East Africa	17%	European Free Trade Association (EFTA)	27%
EU Countries	6%	CARs Countries	-17%
North Africa	14%		

Authors calculation based on DGCIS report (2009-2010 to 2019-2020)

In this section of the study, the researcher's main goal is to examine the growth and trends in agricultural trade with regions where the country plays a significant role. To do this, the study initially analysed reports from the past decade using the Compound

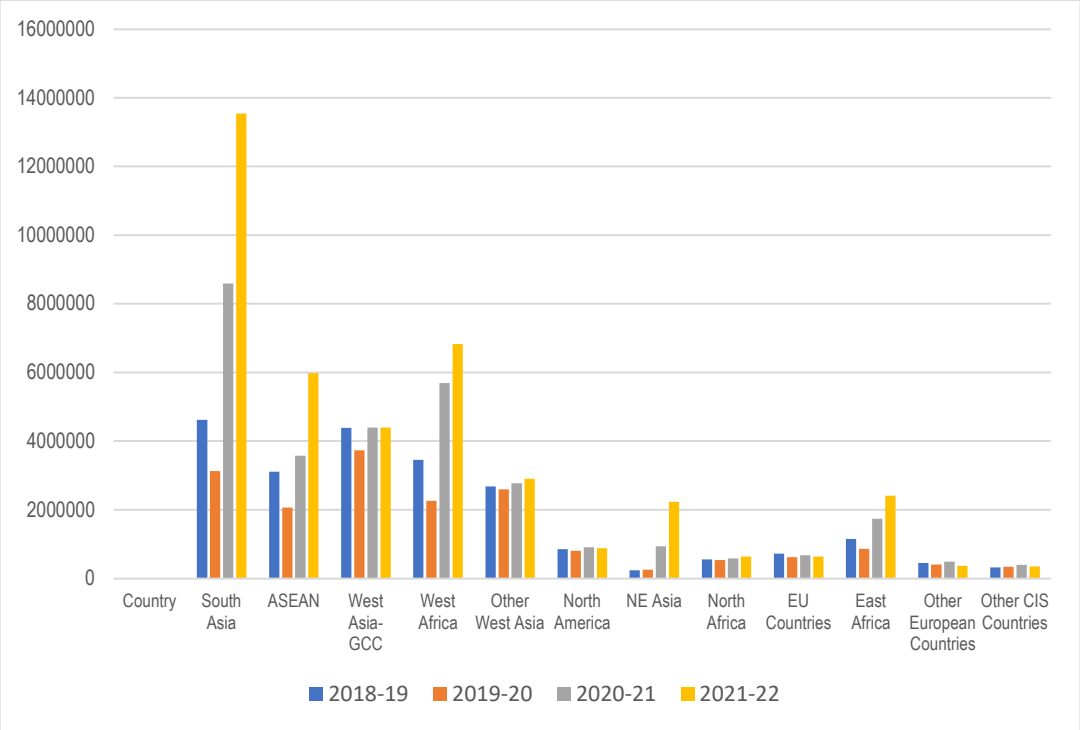
Annual Growth Rate (CAGR). Furthermore, the researcher looked into the statistics of India's agricultural trade from 2018-2019 to 2021-2022 to determine if there were any notable changes in agricultural trade resulting from COVID-19 outbreak.

The above table shows India's agricultural exports to various regions over the year 2009-2010 to 2019-2020.The country exports 2863317 MT to South Asian region in the year 2009-2010 and slight increase is shown in the year 2019-2020 (3126179.66MT) which is just 1% CAGR. South Asian region is the largest market for Indian agricultural products in terms of quantity, and it is followed by ASEAN Countries, an insignificant decline has noted in the exports towards ASEAN region export is 2323891MT, but the export volume in the year 2019-2020 is 2066355.13MT, compound annual growth rate of agricultural exports to ASEAN region is -1%, That means up to 2019-2020 India's agricultural trade to ASEAN countries is a falling trend (-1%). Then, GCC Countries takes third position in importing Indian Agro based products, also shown an insignificant growth with a CAGR 1%. However, exports to West Africa have revealed a slight improvement over the years (CAGR=26%). While Indian export to other West Asian countries and North America have also shown a notable growing trend with CAGR 14% and 7% respectively. In Some of the importing regions such as European, African regions, and American territory, where India do not have any significant contribution, the country's export volume is too less. A growing trend is observed in such regions, especially to EFTA (27% CAGR), SACU (25 % CAGR), Central Africa (23% CAGR), Where the export quantity to SACU was 22893.7 MT (in the year 2009-2010) has rose up to 218110.2 MT in the year 2019-2020.While in the case of EFTA the export quantity was merely 6209.01 MT, but which has now reached 67751.42MT. Similarly exports volume to Central Africa is 64936.15MT (2019-2020), but India exported to the same region around 7869 MT in the year 2009-2010. All the information denotes that the countries progressive trend with respect to agricultural trade towards these regions. However, a regressive trend is visible in CARs and other South African regions (-17% CAGR, -5% CAGR respectively)

4.4 Recent trends of agricultural trade: An overview

Figure 4.3

Indian agricultural product exports to various regions (2018 to 2022)



Source: DGCIS Report

The above graph clearly demonstrates India's agricultural exports during 2018-2019 to 2021-2022.Exports quantity in the year 2018-2019 towards South Asia, ASEAN, GCC, West Africa is ranges between 2000000 MT to 5000000 MT. The remaining regions imports relatively small in quantities lies in between 300000 MT to 900000 MT. In the year 2019-2020 exports to almost all regions diminished in the case of South Asia, ASEAN, GCC, and West Africa. Meanwhile the trade was unvarying in certain regions like North America, Northeast Asia, North Africa, European Union, Other European Countries and Other CIS countries. Trade in 2020-2021 has exponentially increased particularly to the exports to South Asian regions. Apart from South Asian region, there is a significant hike has shown in ASEAN region, GCC, West Africa Northeast Asia and west Africa. Consonantly India exported 4683658825 MT to South Asian region in the year 2021-2022 is a record in the trade history of India. Imports of Indian Agri products in ASEAN region has escalated from 3572185

MT to 5980985 MT, meanwhile trade towards GCC stagnated during these years. Furthermore, regions like West Africa, Northeast Asia, East Africa follows the similar trend.

- **Why India's trade increased amid covid era?**

The agricultural trade in India during the years 2018–2019 to 2021–2022 is depicted in the above bar graph. India's agricultural commerce, particularly in some areas like South Asia, ASEAN, the GCC, and West Africa, exhibits a significant increase in the years 2020–2021, during the peak of the current economic downturn due to virus spread. The COVID-19 pandemic in 2020 significantly impacted the world's economy. The researcher investigated why trade in agricultural products increased while commerce in other sectors and among nations decreased due to the pandemic. Additionally, the study examined the status of the Chinese agricultural market in the context of global trade. Two factors led to compare China's agricultural export performance: first, COVID 19 is originated from China, and second, China is one of the world's major agricultural producers, China is the fourth largest exporter of agricultural products (FAO, 2018). According to figures issued by the General Administration of Customs of China (GAAC, 2020), China's exports declined by 17.2% in January and February of 2020 compared to the same period in 2019. MARA (2020) reported that the Association of Southeast Asian Nations (ASEAN), Japan, the European Union, and the United States are China's top five export destinations, with a combined export value of 54.53 billion USD, or 68.9% of all agricultural exports from China. Fruits, vegetables, tea, and other agricultural products make up the majority of China's agricultural exports. Zheng et al., (2022) reported China's agricultural exports have decreased to various ASEAN nations, including Taiwan experienced a 20% drop, the Philippines 25%, Indonesia 10%, Malaysia 23.6%, and Thailand 20%. The causes of this reduction include, obstructed freight movement, importer nation restrictions, order cancellations or chargebacks. Given that the importing nations for both China and India are the same (Asian countries), it is clear that one of the factors contributing to an increase in agricultural export in India during the years 2020 and 2021 is the sharp decline in agricultural export seen in the Chinese

economy. consequently, Chinese agricultural products were temporarily rejected by importing nations, helping to improve India's exports. In short, the covid 19 has not affected Indian agricultural exports, rather it was positive impact, results stating that it was a blessing in a disguise.

So far, the study has discussed trends and prospectus of agricultural product export in various contexts. The next phase of this chapter is to identify the best mode of transportation (whether air shipment or container shipment) for agricultural products. Obviously, the products either shipped by air or by ocean depending upon the convenience. Therefore, the researcher had used a mathematic technique called Analytical Hierarchy Process to find the best alternative based on the validated responses of the selected Panel of experts in the industry. This technique can suggest the best mode of transportation appropriate to agricultural products by comparing the priority of each criterion taken by the researcher.

4.5 Determination of mode of transportation using AHP technique

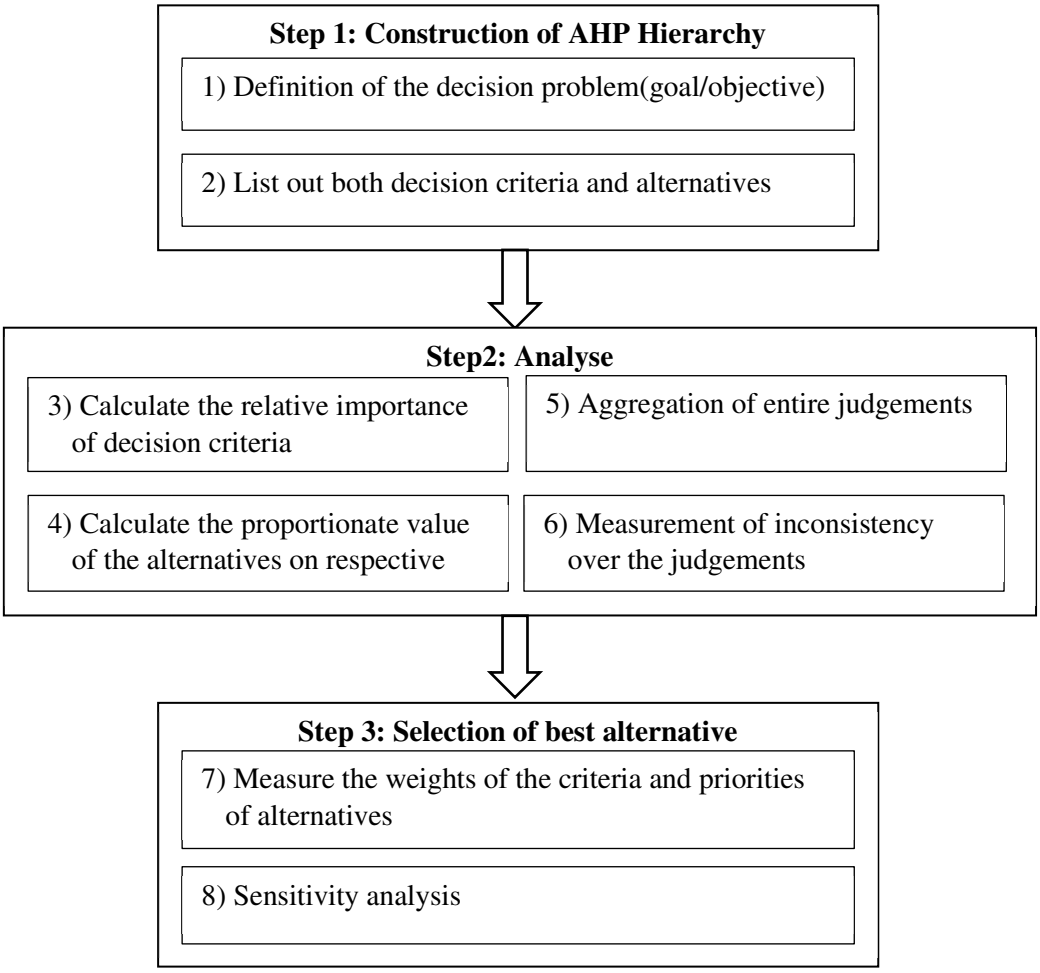
4.5.1 Analytic Hierarchy Process

AHP is a multiple-criteria decision-making procedure based on maths and psychology. It is a well-defined technique for organising and evaluating complicated decisions. This method was developed by Thomas L. Saaty to assess how several variables interact in difficult, unstructured situations (Yavuz, 2015). Basically, it involves three parts; the ultimate goal /objective, various criteria and possible alternatives contributes a logical framework to identify the best decision by evaluating both criteria and choices of alternatives.

Following are the important steps involved in the AHP:

Figure 4.4

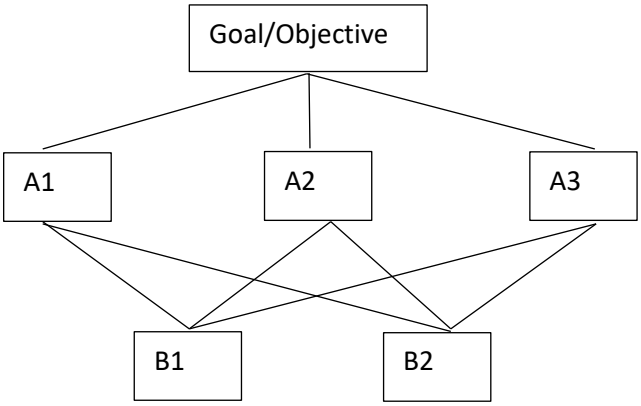
AHP Process



Constructing a structural hierarchy is the initial task, which involves a well-defined problem, selected criteria and alternatives. The problem structuring is demonstrated as follows.

Figure 4.5

Structure of AHP Technique



(A1=Criteria 1,A2=Criteria 2,A3=Criteria 3,B1=Alternative 1,B2=Alternative 2)

Table 4.3

Scale of Relative Importance (Saaty,1970)

Intensity of Importance	Definition
1	Equal Importance
3	Moderate Importance
5	Strong Importance
7	Very Strong Importance
9	Extremely Importance
2, 4, 6, 8	Intermediate Values (to compromise between the above values)

Source*: (Saaty,1970)*

This scale is developed by Thomas L. Saaty, which is exclusively meant for undertaking analytical hierarchy process. In this scale 1 represents equal degree of importance for both of the criteria. Whereas 3 represents moderate response is given to one criterion over the other one. Strict preference is on a criterion compared other criteria is rated as 5. finally, 7 & 9 represents highest degree of importance with highest confidence.

4.5.2 Measurement of consistency

In order to check the consistency of matrix the following steps need to be completed.

1) Construct the AW Matrix which is the product of comparison matrix (A) and priority matrix (W).

2) Calculate vector **λ** with the formula AW/W.

3) Find out **λmax** (can be calculated by using the average of ratios).

4) Calculate the consistency ratio using the following formula;

   Consistency index (CI)= **λmax-n/n-1**

5) Calculate the consistency ratio by using the following formula;

Consistency Ratio (CR)= Consistency index (CI)/Random Index

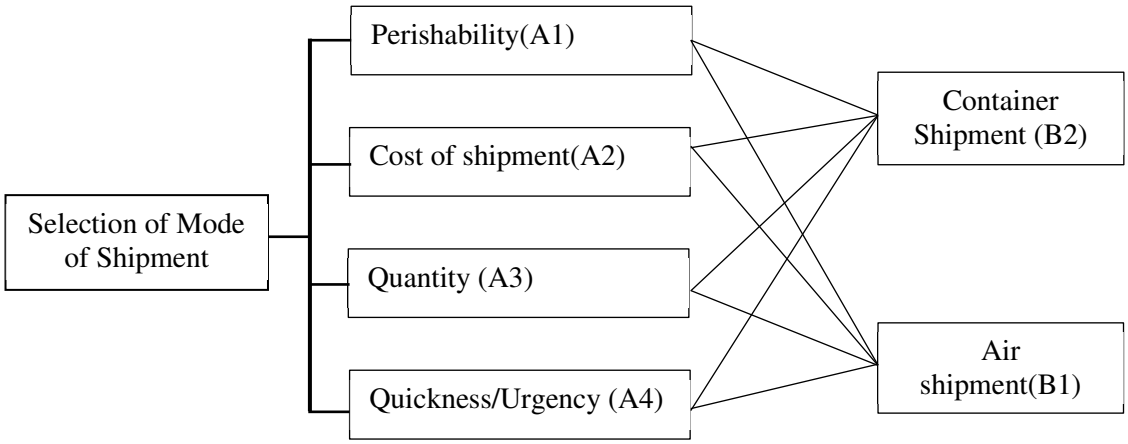
n	1	2	3	4	5	6	7	8	9	10	11	12	13
RI	0	0	.58	.90	1.12	.24	1.32	1.41	1.45	1.49	1.51	1.53	1.56

Table of Random Index (saaty,1970)

6) The comparison matrix is considered to be consistent if CR is < 0.10.

Figure 4.6

Hierarchical Structure



Structuring the problem of selection of the transportation mode is based on four criteria namely perishability, cost of shipment, quantity, and quickness. Since the AHP Technique is a mathematical decision model, only six experts in shipping with more than twenty years of experience and extensive knowledge were selected to fill out the questionnaire. As part of the first phase, respondents are asked to rank one criterion above the other on a scale range between 1-9, while in the second phase, each criteria's importance is compared with alternatives.

Next, the importance of attributes is assigned as presented in the next table, i.e. the comparison matrix:

Table 4.4

First level attributes comparison (decision criteria)

Comparison Matrix				
Criteria	A1	A2	A3	A4
A1	1.00	6.85	3.65	4.13
A2	0.15	1.00	0.30	0.18
A3	0.27	3.29	1.00	1.00
A4	0.24	5.58	1.00	1.00
SUM	1.66	16.72	5.95	6.31

Table 4.5

Matrix of alternative relative importance compared to A1 attribute (Perishability)

Relative importance matrix compared to perishability		
	B1	B2
B1	1.00	0.12
B2	8.16	1.00
SUM	9.16	1.12

Table 4.6

Matrix of alternative relative importance compared to A2 attribute (Cost)

Relative importance matrix compared to cost		
	B1	B2
B1	1.00	2.22
B2	0.45	1.00
SUM	1.45	3.22

Table 4.7

Matrix of alternative relative importance compared to A3 attribute (Quantity)

Relative importance matrix compared to quantity		
	B1	B2
B1	1.00	2.93
B2	0.34	1.00
SUM	1.34	3.93

Table 4.8

Matrix of alternative relative importance compared to A4 attribute (Urgency)

Relative importance matrix compared to Urgency		
	B1	B2
B1	1.00	0.12
B2	8.56	1.00
SUM	9.56	1.12

Following tables demonstrates normalised matrix of both decision criteria and alternatives.

Table 4.9

Normalised matrix of Decision criteria

	A1	A2	A3	A4	Weights	AW	λ	CI	CR
A1	0.60	0.41	0.61	0.65	0.57	2.433415	4.270756	0.046495	0.051662
A2	0.09	0.06	0.06	0.03	0.06	0.230527	3.909993		
A3	0.16	0.20	0.17	0.16	0.17	0.723361	4.206008		
A4	0.15	0.33	0.17	0.16	0.20	0.840306	4.171187		
						λ_{max}	4.139486		

$\lambda_{max=}$ 4.139486 CI= 0.046495 CR= 0.051662 <.10

Table 4.10

Normalised matrix of alternatives (compared with A1)

	B1	B2	Weights	aw	LAMDA	CI	CR
B1	0.11	0.11	0.11	0.22	2.00	0.00	0.00
B2	0.89	0.89	0.89	1.78	2.00		
				λ_{max}	2.00		

$\lambda_{max=}$ 2.00 CI= 0.00 CR= 0.00 <0.10

Table 4.11

Normalised matrix of alternatives (compared with A2)

	B1	B2	Weights	aw	LAMDA	CI	CR
B1	0.69	0.69	0.69	1.38	2.00	0.00	0.00
B2	0.31	0.31	0.31	0.62	2.00		
				λ_{max}	2.00		

$\lambda_{max=}$ 2.00 CI= 0.00 CR= 0.00 <0.10

Table 4.12

Normalised matrix of alternatives (compared with A3)

	B1	B2	Weights	aw	LAMDA	CI	CR
B1	0.75	0.75	0.75	1.49	2.00	0.00	0.00
B2	0.25	0.25	0.25	0.51	2.00		
				λ_{max}	2.00		

$\lambda_{max=}$ 2.00 CI= 0.00 CR= 0.00 <.010

Table 4.13

Normalised matrix of alternatives (compared with A4)

	B1	B2	weights	aw	LAMDA	CI	CR
B1	0.10	0.10	0.10	0.21	2.00	0.00	0.00
B2	0.90	0.90	0.90	1.79	2.00		
				λ_{max}	2.00		

$\lambda_{max=}$ 2.00 CI= 0.00 CR= 0.00 <.010

Table 4.14

Priority matrix

	A1	A2	A3	A4
B1	0.11	0.69	0.75	0.1
B2	0.89	0.31	0.25	0.9

Table 4.15

Overall criteria weight

Criteria	Weights
Perishability	0.57
Cost	0.06
Quantity	0.17
Urgency	0.20

Alternative weight= priority matrix*criteria weight

Table 4.16

Alternative weight

Container shipment	0.2516
Air Shipment	0.7484

4.5.3 Results and Interpretation.

Analytical Hierarchy Process technique has been used to identify optimal shipment mode for Agro perishable exporters. Using previous research and the researcher's survey, this study examined four important criteria namely perishability, cost, quantity, urgency to determine the most appropriate shipping mode (between container shipment and air shipment). The normalized matrix measurement of both criteria and alternatives reveals the consistency of items (above 0.10, table of random index). Perishability carries a heavier weight (0.57) when considering the overall weights of the decision criteria. Furthermore, the overall criteria weight is high to the second alternative (0.74). Therefore, the air shipment is considered as the most suitable transportation mode for agricultural products as it is highly time sensitive.

4.6 The role of Civil aviation and Air cargo logistics in agricultural product exports

The role of civil aviation in international agricultural product exports is discussed in this section. International trade and cargo movement rely heavily on civil aviation, serving as the backbone of the global supply chain especially the agricultural products such as fruits, vegetables etc. Since it is capable of quick transportation of goods, overcoming hindrances of geographical difficulties and time constraints, allows perishables and time-sensitives to transport fastly, ensuring freshness, quality, and prompt delivery. Through the civil aviation sector, different countries and continents are connected to each other and international trade is accelerated by integrating the global economy. Businesses can access new markets, also helps in stimulating the economy. *In this context a detailed investigation on contribution of civil aviation is necessary and this segment is divided into three portions as well. The overall air*

freight flow from India for agricultural products is compared in the first section using a state-by-state approach. Subsequently, the study Analysed the role of international airports in Kerala with regard to the shipment of agricultural products. Three international airports such as Calicut International Airport, Cochin International Airport, and Trivandrum International Airport have been taken into consideration, and also attempted to evaluate the cargo movement from Kerala to various region across the globe. In the last part, an export volume analysis has also conducted to determine the effect of covid pandemic in the air cargo traffic.

Table 4.17

Air cargo traffic from India: State wise comparison

State	2017-18		2018-19		2019-20		2020-21		2021-22	
	Qty	US$	Qty	US$	Qty	US$	Qty	US$	Qty	US$
Maharashtra	90273	167326595	88882	189932692	68178	153570291	35237	100651188	40650	131431506
Delhi	25290	146918707	22337	133111857	20529	116068439	12012	72324898	14868	95726729
Karnataka	33618	57196080	50007	72302950	51428	72374012	48638	76059872	53349	75952374
Kerala	77694	74125681	55811	54202646	71702	62862189	40315	41852515	52517	53392620
Tamil Nadu	17979	20520522	22793	26791337	21419	26831148	11874	19896737	15879	26639616
Telangana	20623	32170933	22041	32512520	24099	31921588	3026	24494226	4713	24601713
Gujarat	947	4280976	1168	5069065	1631	7052827	832	6864613	1158	11524130
West Bengal	6392	8213024	6651	8258975	5670	7246506	2415	6728614	2058	5064929
Uttar Pradesh	2837	12457343	2521	11422985	1910	9008473	650	2770325	1688	4833350
GOA	855	1420856	1176	1304855	613	727447	138	366154	592	1926546
Madhya Pradesh	46	558364	14	540813	37	976775	22	743754	2	102667
Rajasthan	974	1062522	835	632126	1087	783413	199	122028	6	4413
Andhra Pradesh	7	27698	9	23941	4	11683	0	0	0	0
Total	277534	526,279,301.00	274253	536,120,948.00	268311	489,439,408.00	155358	352,876,734.00	187516	431,268,307.00

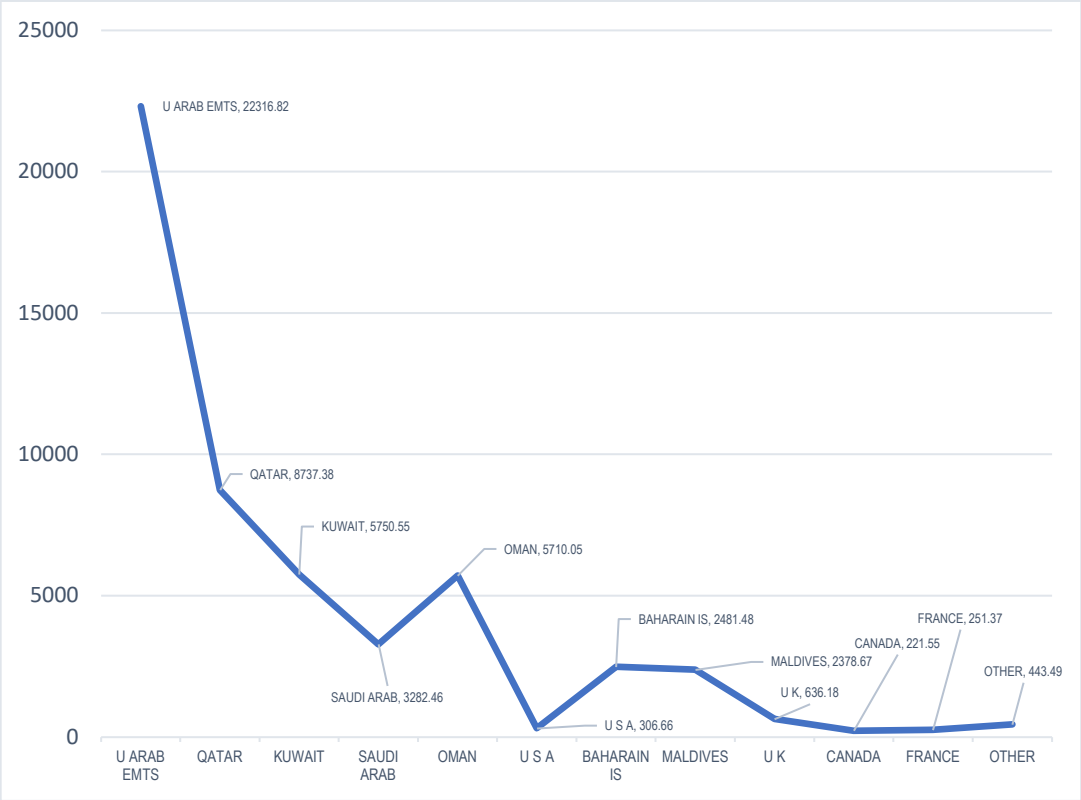
Source: DGCIS Report

The above table shows India's Air Cargo Traffic reports of agricultural commodities in the year 2017-2018 to 2021-2022. Maharashtra is the top state, exports 90273 MT during the year 2017-2018 to the countries such as UK, Netherlands, UAE, Canada, Kuwait Qatar, Germany, Singapore, France, Italy, Bahrain, Oman, Saudi Arabia as Air cargo. Among these countries the export from Maharashtra is high towards Oman (19517.53 MT, US$9626935.00). Second largest importing nation is UK (15598.37 MT, US$ 26590171.00). Besides that, a significant cargo traffic is noted towards other GCC Countries like Qatar, UAE, Saudi Arabia. However, a significant decline has found in the air cargo traffic from Maharashtra during the year (fall into 40650MT). Subsequently Kerala comes in the second position with respect air cargo movement of agricultural products exporting 77694 MT in the year 2017-2018. From the various international airports in Kerala, shipment undergone around 52517 MT (2021-2021) to the globe, prominently to the middle east countries like UAE (22316.82 MT, US$20450656.00), Qatar (8737.38 MT, US$ 8672428.00, Saudi Arabia (3282.46 MT, US$ 3850614.00), Bahrain (2481.48 MT, US$2519493.00). Meanwhile exports to UK are relatively smaller compared to Maharashtra's shipment, Kerala exported merely 636.18 MT to United Kingdom in the year 2021-2022.After Kerala, Karnataka comes third position with regard to air cargo movement (14868 MT worth us $95726729, 2021-2022). The top destinations of Karnataka ports are Oman UK, QATAR, Maldives, Singapore. Total cargo movement from Karnataka to Oman is 36608.36MT, 2426.9 MT to UK, 3988.05 MT to Qatar and 4259.93MT to Singapore. Similarly exports to Maldives as well as UAE is also significant, which is in quantity terms 2053.77MT and 2623.04 MT respectively. Furthermore, cargo movement details of Tamilnadu is also high, compared to other remaining states. In the year 2021-2022 the civil Aviation of Tamil Nadu shipped 15879 MT APEDA products worth US$26639616.The major destinations are Singapore (6599.15 MT, US$8111427.00), Kuwait (2200.41 MT, US$ 2397003.00), UAE (2790.27 MT, US$3052307.00). Similarly, Telangana's Air Cargo Traffic is 4713 MT in the year 2021-2022.While the shipment from west Bengal and Uttar Pradesh is 4713MT and 1688MT respectively. With regards to the air traffic volume of states like Jammu and

Kashmir and Assam is too lesser (not included in the table). Furthermore, least amount of volume of agricultural products is shipped from Madya Pradesh and Andra Pradesh.

Figure 4.7

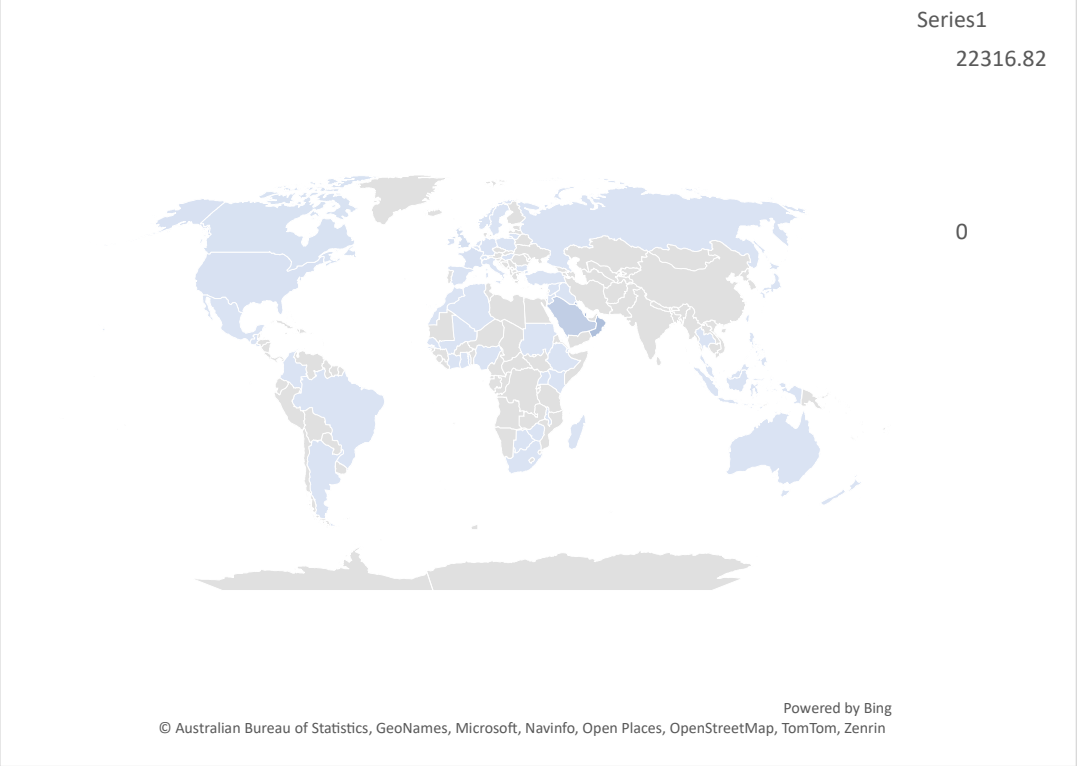
Air Cargo movement of agricultural products from Kerala



Source: DGCIS Report

Figure 4.8

Important destinations of air freight movement from Kerala



The GCC countries, including the UAE, Saudi Arabia, Qatar, Oman, Kuwait, and Bahrain, are found to be the major importers when looking at the air cargo traffic of international airports in Kerala. Approximately 22316 MT of agricultural products were flown by air to UAE in 2021–2022, is the biggest importer of agricultural commodities from the state. Kerala exports primarily to Kuwait, Qatar, and Oman after the UAE and shippers sent 5750.55 MT to Kuwait, 5710.05MT to Oman, and 8737.38 MT to Qatar. Meanwhile the total shipment of 3282.46 MT is to the direction of Saudi Arabia. Additionally, the Maldives imports approximately 2378.67MT from Kerala. Cargo traffic to the UK is approximately 636 MT, which is comparatively less when compared to GCC countries. Similar to that, just 306.66MT of goods was moved to the United States. The state shipped 251 metric tons (MT) of agricultural goods to France and 221 MT to Canada as air cargo.

Table 4.18

Air Cargo Traffic: Cochin International Airport

	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	CAGR
Country	Qty	Qty	Qty	Qty	Qty	Qty	%
West Asia-GCC	32509.99	53041.17	47876.67	41974.38	26908.01	32191.02	0%
South Asia	163.73	443.18	289.83	225.87	223.41	760.49	36%
North America	182.84	232.69	229.03	249.95	329.18	546.54	24%
Other European Countries	227.51	224.77	120.24	97.95	188.8	145.45	-9%
EU Countries	207.33	264.83	153.62	173.19	303.79	425.72	15%
Latin America	1.52	2.25	2.53	0.95	17.1	8.49	41%
ASEAN	432.96	132.01	331.21	267.72	250.78	109.18	-24%
NE Asia	5.18	5.69	13.44	121.19	3.28	9.59	13%
West Africa	204.86	20.01	10.77	7.72	4.55	12.54	-43%
Other West Asia	4.47	4.13	5	1.17	3.06	0.16	-49%
(EFTA)	3.9	14.15	2.8	19.86	24.29	19.32	38%
Other South African Countries	0.49	1.15	0.77	0.66	1.22	0	-100%
Other CIS Countries	1.27	1.3	1.68	1.22	1.76	1.9	8%
North Africa	1.74	11	0.18	0.08	6.62	1.82	1%
East Asia (Oceania)	21.87	12.25	10.22	8.83	12.9	21.22	-1%
Central Africa	10.28	1.74	2.7	2.69	2.7	4.5	-15%
(SACU)	1.59	8.67	2.1	3.25	0	3.94	20%
East Africa	0.15	0.35	17.56	3.39	8	7.94	121%

Source: Authors calculation based on secondary data

Agricultural products especially perishable items such as fruits, vegetables, cereal preparations, flowers, processed items, nuts and betel leaves are the major products moved through air mode of transportation. From Kerala majority of the freight movement is towards GCC Countries like UAE. Oman, Kuwait. Qatar, Saudi Arabia and, Bahrain. While analysing the compound annual growth rate to GCC, the freight movement remains constant from the year 2014-2015 to 2019-2020.Approximately 32000 MT of agricultural products are exported through cochin international airport to GCC countries in the year 2019-2020.Exports to Several other regions is insignificant from Kerala. While exports to South Asia in the year 2019-2020 is merely 760.49 MT. A regressive trend was visible in certain regions such as European countries, ASEAN, West Africa, other West Asia and other African countries. Freight movement to certain region like south Asia, European Union, EFTA, Latin America, SACU is progressive, however the export volume is too lesser.

Cochin International Airport stands out from other international airports because of its extensive international route network. This signifies that shippers looking to export goods to European, American, and African destinations prefer utilizing Cochin International Airport due to flight operations serving these regions.

Table 4.19

Freight Movement after Covid Outbreak: Cochin International Airport

Country	2020-21	2021-22	2022-23
West Asia- GCC	18786.3	23654.99	23617.33
South Asia	246.73	968.25	1629.97
North America	141.51	288.32	318.27
Other European Countries	154.03	231.08	757.21
EU Countries	326.89	267.45	352.63
Latin America	15.59	5.01	7.71
ASEAN	46.32	84.05	140.74
NE Asia	1.16	2.35	11.22
Southern African Customs Union (SACU)	0.22	3.55	3.4
West Africa	6.58	13.25	6.73

Country	2020-21	2021-22	2022-23
Other West Asia	0.68	1.66	9
European Free Trade Association (EFTA)	4.02	3.54	18.05
Other South African Countries	1.76	0.02	5.52
Other CIS Countries	0.6	2.2	1.01
North Africa	0.21	2.98	3.11
East Asia (Oceania)	0.53	0.44	1.74
Central Africa	0.98	2.61	1.1
East Africa	0.77	15.5	3.21

Source: DGCIS

Cochin International Airport experienced a significant reduction in total cargo volume bound for the GCC (Gulf Cooperation Council) region in the 2020-2021 period when compared to the previous year. This decrease can be attributed to the impact of the COVID-19 outbreak and subsequent limitations on flight operations. However, a slight recovery was observed in the 2021-2022 and 2022-2023 periods. Interestingly, the freight volume to the South Asian region saw a considerable increase in the year 2021-2022, despite facing some restrictions during the second wave of the COVID outbreak. In the year 2022-2023, the total freight volume to the same region reached 1629.97 metric tons. Moreover, the air cargo traffic continued to display a gradual upward trend in regions such as North America and other European countries, even though the cargo volume remained relatively low. It's worth noting that there was a slight decrease in air cargo traffic to the European Union in the year 2021-2022, coinciding with the peak of the virus spread.

Table 4.20

Air Cargo Traffic: Trivandrum International Airport

Country	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	CAGR%
	Qty	Qty	Qty	Qty	Qty	Qty	
West Asia-GCC	18222.14	19615.11	17430	16673.14	12793.24	14588.13	-4%
South Asia	1516.44	1398.76	1236.94	1211.24	1444.12	1273.46	-3%
Other European Countries	205.31	309.55	455.44	447.43	456.88	547.13	22%
North America	140.82	100.04	227.43	255.4	319.93	271.25	14%
EU Countries	203.92	219.37	298.3	185.34	182.1	208.93	0%
European Free Trade Association (EFTA)	88.04	81.46	131.55	120.57	116.32	96.7	2%
Central Africa	0.2	0.51	0	0.27	0	0.09	-15%
ASEAN	28	16.05	85.61	7.53	2.81	15.03	-12%
Other CIS Countries	2.51	1.75	3.86	2.9	1.6	0	-100%
Other South African Countries	0	0	0	0	0.5	0	0
NE Asia	0	0.01	0.02	0.31	0.09	7.01	0
Southern African Customs Union (SACU)	0.39	0	0.01	0	0	0	-100%
Latin America	10.33	8.93	7.49	0.63	1.19	0.79	-40%
East Africa	3.68	0	0.03	0.04	0.18	0.24	-42%
East Asia (Oceania)	2.42	0.9	0	0	0	0	-100%
West Africa	15.68	9.38	2.21	2.74	2.05	0.47	-50%
Other West Asia	3.6	0	0	1.82	0.02	0	-100%

Source: Author's Calculation based on Secondary Data

From Trivandrum international airport the shipment of agricultural products to GCC is showing a declining trend from the year 2014-2015 to 2019-2020, showing a -4% CAGR. Similarly, the same trend was also visible in the freight movement to south Asian region (-3%). While export trend over the years is also demonstrating an

increasing trend to other European countries and north America, However the countries contribution in terms of quantity of shipment is lesser. Despite the ASEAN region is one of the major importing regions of India in terms of agricultural exports, the shipment via air found lesser is also showing a negative trend. The freight movement towards the rest of the other region is comparatively lesser, and all showing a declining trend.

Table 4.21

Freight Movement after Covid Outbreak: Trivandrum International Airport

Country	2020-21	2021-22	2022-23
	Qty	Qty	Qty
West Asia- GCC	8880.49	8950.4	9450.11
South Asia	1847.53	1411.86	841.75
Other European Countries	419.98	417.25	214.97
North America	360.79	234.39	161.88
EU Countries	193.47	191.02	291.43
European Free Trade Association (EFTA)	78.57	66.71	56.96
Central Africa	0	0	0.07
ASEAN	0.56	0	2.15
Other CIS Countries	0	0	0
Other South African Countries	0	0	0
NE Asia	0	0	0
Southern African Customs Union (SACU)	0	0	0
Latin America	0.38	0	0
East Africa	0	0	0
East Asia (Oceania)	0.66	0	0
West Africa	0.92	6.44	0
Other West Asia	0	0	0

Source: DGCIS

When it comes to the latest information the freight movement towards the GCC relatively smaller compared to the air cargo traffic in the pre-covid era from Trivandrum international airport. The station's movement of the cargo to all the

sectors is showing a regressive trend. After covid outbreak the shipment via air to Central Africa, other CIS countries, Northeast Asia, East Africa and other West Asia is zero. Similarly, the air shipment towards ASEAN region is too less, and there was no shipment in the year 2021-2022. In short the freight movement to almost all the regions except GCC and South Asia from Trivandrum international airport is less.

Table 4.22

Air Cargo Traffic: Calicut International Airport

Country	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	CAGR
	Qty	Qty	Qty	Qty	Qty	Qty	%
West Asia-GCC	19886.86	11387.46	11672.89	15102.19	11687.13	20041.64	0%
EU Countries	67.39	108.77	287.13	383.91	324.67	169.97	20%
Other European Countries	28.11	77.45	83.55	104.7	156.21	194.39	47%
Other West Asia	0.01	0	0	0	6.96	4.01	232%
Unspecified	0	0.72	0	1.34	0	0	0
North America	0	0.73	0	22.97	23.65	6.7	0
European Free Trade Association (EFTA)	0	0.14	1.17	1.7	0	0	0
Latin America	0	1.22	0	1.1	0	0	0
South Asia	0.95	2.51	0.27	0	0	0	-100%
Other CIS Countries	0	1.2	0	0	0	0	0
NE Asia	0.47	0	0	1.77	0	0	-100%
ASEAN	0	0	0	0	0	0	0
North Africa	0	0	1.02	0	0	0	0
West Africa	0.77	0.4	0	0.77	0	0	-100%

Source: Author's Calculations

The air cargo movement from Calicut International airport is mostly towards GCC countries, its volume is more or less similar in every year during the period 2014-2015 and 2019-2020. Towards European sectors a notable increase in the export volume is

visible up to 2018-2019, however it has declined 170 MT from 325 MT in the year 2019-2020, hence the overall growth rate is 20%. The export volume towards all the region is actually too small. The freight movement to almost all the other regions is lesser or zero, is due to lack of aircraft operation from the station.

Table 4.23

Freight Movement after Covid Outbreak: Calicut International Airport

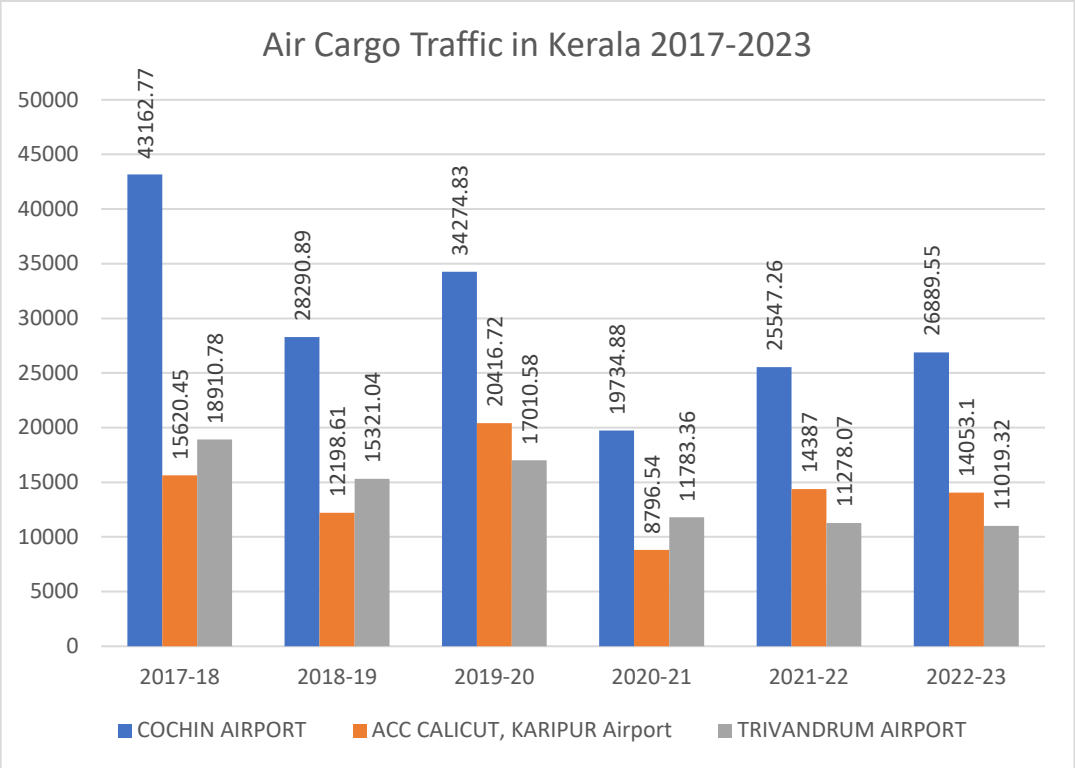
Country	2020-21	2021-22	2022-23
	Qty	Qty	Qty
West Asia- GCC	8791.68	14369.07	14034.41
EU Countries	0.33	2.27	11.28
Other European Countries	3.32	9.95	7.32
Other West Asia	0	0	0.1
Unspecified	0	0	0
North America	1.22	5.64	0
European Free Trade Association (EFTA)	0	0	0
Latin America	0	0	0
South Asia	0	0	0
Other CIS Countries	0	0	0
NE Asia	0	0	0
ASEAN	0	0.06	0
North Africa	0	0	0
West Africa	0	0	0

Source: DGCIs Report

When it comes to the freight movement after the covid outbreak a massive decline was found in the year 2020-2021, compared to the previous year, is due to lack of flight operation. But the volume has slightly improved in the year 2021-2022 (14370 MT), and similar trend was also shown in the year 2022 to 2023. A significant decline was found to the cargo movement in the case of other European countries as compared pre-covid era. In short, the air cargo traffic after covid outbreak from Calicut station is declining trend, and the volume is less or zero to all the regions other than GCC Countries.

Figure 4.9

Comparison of Air cargo Traffic: International Airports of Kerala



Source: DGCIs

The Figure 4.9 demonstrates Air Cargo movement of agricultural products from the selected International Airports of Kerala. The data shows that Cochin international airport is the International Airport having highest air cargo volume compared to other international airport. Cochin Airport handled 43162 MT in the year 2017-2018, while Calicut International Airport and Trivandrum International Airports handled 15620 MT and 18910MT respectively. In the year 2021-2022 Cochin International airport dealt 25547 MT, subsequently Trivandrum International Airport shipped 11278 MT. The graph shows a declining trend of air cargo traffic of agricultural products from 2017-2023. However, as a part of Covid outbreak the governments in home and host countries extended some measures and protocols in connection with prevention of virus spread. The protocols such as flight cancellation, non-operation of aircrafts to other countries have caused decreased air cargo movement from international airports in Kerala. Nevertheless, shippers made use of chartered flights and evacuation flights

as a means of shipment during the covid time which helps to survive the agricultural product export to some extent.

In short According to the information the given above, Karnataka had the most air freight traffic in 2021–2022, followed by Kerala and Maharashtra. The researcher could also comprehend that Kerala's biggest agricultural export markets are GCC nations including UAE, Qatar, Oman, Kuwait, and Bahrain. Fresh fruits and vegetables are among the things that are most frequently shipped to other markets. Evidently, Covid has encountered Kerala's air cargo movement, however shipment continued through chartered and evacuation flights amid covid era.

4.7 Conclusion

The study concludes by shedding light on the dynamic environment of agricultural exports from India and highlighting the fastest-growing commodities, which are wheat, animal, casings, casein, and millets. These findings suggest that India has great prospects in the global market. The importance of South Asia, the Gulf Cooperation Council (GCC), ASEAN, and West Africa as significant consumers of Indian agricultural products is highlighted by a regional analysis. Unfortunately, exports to other continents like Africa, Europe, and the United States remain relatively low.

Addressing the repercussions of the COVID-19 outbreak, the study reveals the resilience of the agricultural sector in the face of challenges. The industry's export performance held steady in spite of the pandemic. Furthermore, the study explores the role of civil aviation in facilitating agricultural exports. Maharashtra emerges as the top state, having the highest air freight shipments, closely followed by Kerala and Karnataka. Notably, the GCC countries, including Bahrain, Oman, Qatar, UAE, and Saudi Arabia, stand out as major destinations of air shipments from Kerala.

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Chapter 5

Challenges in the Air Cargo Logistics: A Shipper's Perspective

5.1 Introduction

The last chapter dealt with the trends of agricultural products export and role of civil aviation in freight movement based on the secondary data analysis. For a comprehensive understanding the researcher also conducted primary data analysis from the perception of shippers and logistics service providers in order to know the whether the air cargo logistics is properly working.

This chapter is divided into several sections. In the first section, the researcher presented the demographic profile of the shipping company. Thereafter, mean score analysis has also conducted to know the intensity of each problems in the industry. Similarly, various parametric tests were carried out to find out the difference in the perception of shippers with regards to shipment related issues. Finally using CART analysis researcher attempted to know effect of covid outbreak among the shippers with different demographic profile.

5.2 Demographic profile of the shippers

The Table 5.1 shows the demographic profile of the shippers taken for the study. The demographic profile includes nature of business, experience, strength of employees, experience, branches, mode of shipment, type of payment, availability of export promotion schemes.

Table 5.1

Demographic Profile of the Shippers

SL No	Categorical variables		Number of respondents	Percent
1	Type of the business	Sole proprietorship	33	78.6
		Partnership	9	21.4
		Total	**42**	**100**
2	Educational Qualification	SSLC	2	4.8
		Plus Two	3	7.1
		Graduation	35	83.3
		Post-Graduation	2	4.8
		Total	**42**	**100.0**
3	Year of experience	0 to 5	6	14.3
		6 to 11	8	19
		12 to 17	12	28.6
		Above 18	16	38.1
		Total	**42**	**100**
4	Number of Employees	Below 5	7	16.7
		6 to 11	18	42.9
		12 to 17	8	19.0
		Above 18	9	21.4
		Total	**42**	**100.0**
5	Nature of building	Hired	34	81.0
		Owned	8	19.0
		Total	**42**	**100.0**
6	Type of Shipment	Air only	26	61.9
		Air and container	16	38.1
		Total	**42**	**100.0**
7	Type of Payment	Credit	21	50.0
		Advance	5	11.9
		Both	16	38.1
		Total	42	100.0
8	Export Promotion schemes	Yes	27	64.3
		No	15	35.7
		Total	**42**	**100**
9	No of Branches	Yes	12	28.5
		No	30	71.42
		Total	42	100

Source: Field Survey

The table 5.1 demonstrates the overall view of the frequency distribution of the sample taken for the study. It provides the characteristics of the samples (shippers). The demographic profile includes type of business, educational qualification, number of employees, nature of building, type of shipment, type of payment, availability of export promotion scheme. According to the analysis of the details of shippers it has been noted that majority of the shippers are from the category of single ownership (79%), while with respect to educational qualification most of the shipping company owners are graduated, least number of respondents has found with below graduation. At the same time while comparing the number of employees, majority of the firms consist of employees in a range between 6 to 11 (42%). Similarly, most of the firms have hired building, only 19% have owned building and only 38% of the shippers relying on both air cargo and container shipment. Likewise, merely 12% of respondents receive advance payment for their trade, the rest of are either on credit or both credit and advance payment. Furthermore, the export promotion schemes beneficiaries are dominated, approximately 64% shippers are availing export promotion schemes such as APEDA and RODTEP, nevertheless, 37% of respondents report that these measures are no longer available after a covid outbreak.

5.3 Frequency of exports to various destinations from Kerala by air

Apart from the demographic profile of the shippers, it is important to know the major importing nations towards which the shippers in Kerala has been exporting via air.

Therefore, the researcher contacted cargo managers and prominent exporters, and also based on secondary data, the researcher found that the majority of Kerala shippers export goods to gulf countries, including Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, United Arab Emirates. The study also considered the countries such as USA, UK, Netherland, Maldives, Canada, France, Ireland, Germany, Singapore, Switzerland, Turkey, as 'other' countries since smaller export volumes. The following table demonstrates the frequency of shipment by the respondents, and degree of frequency is measured using five-point Likert scale which includes 'Never', 'Rarely', 'Sometimes', 'Often', 'Always'

Table 5.2

Frequency of shipment towards major importing nations

Ratings	Bahrain	Kuwait	Oman	Qatar	KSA	UAE	Other
Never	23 (54.8%)	24 (57.1%)	24 (57.21%)	19 (45.2%)	19 (45.2%)	13 (31%)	37 (88%)
Rarely	4 (9.5%)	2 (4.8%)	0 (0%)	1 (2.4%)	2 (4.8%)	1 (2.4%)	1 (2.4%)
Sometimes	0 (0%)	2 (4.8%)	1 (2.4%)	0 (0%)	1 (2.4%)	2 (4.8%)	2 (4.8%)
Often	1 (2.4%)	4 (9.5%)	2 (4.8%)	4 (9.5%)	2 (4.8%)	1 (2.4%)	2 (4.8%)
Always	14 (33.33%)	10 (23.8%)	15 (35.7%)	18 (42.9%)	18 (42.9%)	25 (59.5)	0 (0%)
Total	42	42	42	42	42	42	42

Source: Field Survey

5.4 Usage of various bodies for the identification of buyers.

The researcher is also curious about how different international bodies and databases prevailed in home country and host country are used by shippers for identifying buyers in the overseas market. There are number of institutions and events exist, including export promotion councils, trade fairs, Indian embassies abroad, foreign embassies in India, and trade promotion offices. Ultimately, these institutions are meant for the promotion of India's exports. For shippers to find their buyers, it is essential to know how often they use these items. Table 5.3 is illustrating the ratings of the shippers over the importance of international bodies, events, and databases for the selection of importers in the overseas market.

Table 5.3

Importance of various International/National Bodies for identification of buyers

Sl No	National and International bodies	Scale	Frequency	Percent
1	Export Promotion Council	Not at all important	14	33.3
		Slightly Important	16	38.1
		Moderately Important	11	26.2
		Fairly Important	1	2.4
		Extremely Important	0	0
		Total	42	100
2	Trade fairs	Not at all important	20	47.6
		Slightly Important	11	26.2
		Moderately Important	8	19
		Fairly Important	1	2.4
		Extremely Important	2	4.8
		Total	42	100
3	Indian Embassies abroad	Not at all important	16	38.1
		Slightly Important	14	33.3
		Moderately Important	12	28.6
		Fairly Important	0	0
		Extremely Important	0	0
		Total	42	100.0
4	Foreign Embassies in India	Not at all important	16	38.1
		Slightly Important	14	33.3
		Moderately Important	9	21.4
		Fairly Important	1	2.4
		Extremely Important	2	4.8
		Total	42	100
5	Trade promotion office	Not at all important	20	47.6
		Slightly Important	10	23.8
		Moderately Important	6	14.3
		Fairly Important	4	9.5
		Extremely Important	2	4.8
		Total	42	100

Sl No	National and International bodies	Scale	Frequency	Percent
6	International Chambers	Not at all important	13	31.0
		Slightly Important	12	28.6
		Moderately Important	14	33.3
		Fairly Important	1	2.4
		Extremely Important	2	4.8
		Total	42	100
7	B2B Portals	Not at all important	21	50.0
		Slightly Important	13	31.0
		Moderately Important	8	19.0
		Fairly Important	0	0
		Extremely Important	0	0
		Total	42	100.0
8	Shipment data	Not at all important	11	26.2
		Slightly Important	20	47.6
		Moderately Important	10	23.8
		Fairly Important	1	2.4
		Extremely Important	0	0
		Total	42	100
9	Buying Agent	Not at all important	11	26.2
		Slightly Important	16	38.1
		Moderately Important	13	31.0
		Fairly Important	2	4.8
		Extremely Important	0	0
		Total	42	100
10	Commission Agent	Not at all important	18	42.9
		Slightly Important	10	23.8
		Moderately Important	11	26.2
		Fairly Important	2	4.8
		Extremely Important	1	2.4
		Total	42	100.0
11	Friends and relatives/ own buyers	Not at all important	0	0
		Slightly Important	0	0
		Moderately Important	5	11.9
		Fairly Important	10	23.8
		Extremely Important	27	64.28
		Total	42	100

Source: Field survey

This study examined the usage of various institutional bodies, events, databases, and intermediaries by the shippers to identify buyers in international markets. Even though the government has brought all these bodies to promote exporting, majority of shippers do not prioritize these institutions and agencies as a means of identifying buyers and only a small number of respondents rely on them. Shippers instead deals with friends, relatives, and their on-tied buyers (supermarkets and hypermarkets) as this ensures that creditworthiness of importers. Concerning the significance of various bodies and institutions, as per the responses of shippers the promotion council is not at all significant. The majority of respondents (48%) do not rely on trade fairs to find customers. Only 28% of respondents assessed Indian embassies as being somewhat useful for buyer identification. Briefly, when considering the importance of foreign embassies in India and Indian embassies abroad, trade promotion offices, international chambers, B2B portals, trade fairs, shipment data, and trade promotion offices, respondents use these organizations very little for identifying buyers. A discussion with shippers has revealed that dealing with an unknown importer is much riskier and would also creates more credibility issues.

5.5 Frequency of dependency of international airports

The purpose of this section is to determine how frequently shippers use Kerala's international airports. In addition to choosing international airports in Kerala, the researcher also included international airports outside Kerala because pre-testing revealed that shippers were not just using international airports within Kerala for shipments but were also doing shipment through other station outside Kerala.

Table 5.4

Frequency of dependency of International Airports

Sl No	International airports	scale	Frequency	Percent
1	Calicut International Airport	Never	8	19.0
		Rarely	3	7.1
		Sometimes	2	4.8
		Often	6	14.3
		Always	23	54.8
		Total	42	100
2	Cochin International Airport	Never	10	23.8
		Rarely	3	7.1
		Sometimes	4	9.5
		Often	5	11.9
		Always	20	47.6
		Total	42	100.0
3	Trivandrum International Airport	Never	19	45.2
		Rarely	5	11.9
		Sometimes	2	4.8
		Often	11	11.9
		Always	19	45.2
		Total	42	100
4	Kannur International Airport	Never	19	45.2
		Rarely	5	11.9
		Sometimes	2	4.8
		Often	11	11.9
		Always	19	45.2
		Total	42	100
5	Other International Airports	Never	25	59.5
		Rarely	2	4.8
		Sometimes	3	7.1
		Often	2	4.8
		Always	10	23.8
		Total	42	100.0

Source: Field Survey

The study examined the frequency of dependency of international airports in Kerala by the shippers, the study considered Calicut international airport, Cochin international airports, Trivandrum international airports and other international airports outside Kerala. Shippers choose the different stations in accordance with overseas sectoral availability, space availability, and convenience of cargo movement and transportation. In this analysis what the researcher could understand is shippers do rely the airports interchangeably by considering the above-mentioned factors. Besides international airports in Kerala shippers are also relying other international airports in Tamilnadu, Karnataka, Hyderabad, Mumbai based on the sectoral availability. Approximately 24% respondents rated "always" to depend the airports outside Kerala.

5.6 Problems faced by shippers in air cargo logistics

An investigation of cargo logistics issues faced by the shippers is the first objective of the study in the primary data analysis. Therefore in this research the researcher attempted to know various air cargo logistics related issues in infrastructure, cargo operations, packaging, customs clearance, and spill over based on the literature review (Vasantha, 2019). The study has removed the variable namely Hazardous and Dangerous goods from the measurement scale as the scope of the study is curtailed to time sensitive agricultural products. Furthermore, for analysing the various problems in the air cargo logistics the researcher has used certain statistical tools and techniques like mean score analysis, Bivariate analysis (Independent T test) and multivariate analysis (Anova).

Table 5.5

Descriptive statistics of infrastructural related issues

Infrastructure related issues	Mean	Standard deviation
Airport is not capable of handling future demand cargo	3.52	1.34
Cargo Congestion in the airports	4.26	0.79
Equipment's are not utilized properly	3.45	0.94
Not adoptable to new technology style	2.94	0.65

Source: Author's calculation using field survey

The above table 5.5 describes mean score and standard deviation of the problem related with infrastructure of international airports in Kerala, experienced by shippers. Infrastructural related issues comprise of 'incapability of Airports in handling future demand cargo', 'cargo congestion in the station', 'improper utilization of Equipment's', 'Adaptability of new technology'. Out of all these items 'Cargo Congestion in the airports' (Mean=4.26) is the significant problem which is faced by exporters. Subsequently 'Airport is not capable of handling future demand cargo' comes second top challenge of which the mean value is 3.52, is followed by 'equipment are not properly used'(Mean=3.45). Furthermore, shippers also responded with the fact 'Not adoptable to new technology style', the mean value of which is 2.94.

Table 5.6

Descriptive statistics of cargo operations related issues

Cargo operations related problems	Mean	Standard deviation
Lack of skilled manpower	3.14	0.78
Inadequate use of technology	2.92	1.02
Lack of dedicated terminal space and facilities for airlines	3.23	0.82
Delay in custom procedure and documentation	2.77	0.63
Lack of efficiency level of ground handling agents within airports	2.83	0.88

Source: Author's calculation using field survey

Table 5.6 shows the results of the shipper's perception towards the challenges in air cargo operations. The data presents the item mean score and standard deviation. Based on the mean score value 'Lack of dedicated terminal space and facilities for airline' (3.23) is the major issue experienced by the respondents, followed by 'lack of skilled manpower' (3.14), 'Inadequate use of technology' (2.92), 'Lack of efficiency level of Ground handling Agent' (2.83). While analysing 'Delay in documentation and Custom procedure', it is found as least affected (2.77).

Table 5.7

Descriptive statistics of Packaging related issues

Packaging related issues	Mean	Standard deviation
Improper packaging of cargo leads to damage	2.78	0.78
Pilferage	2.91	0.91
Carelessness of employees leads to damage	4.69	0.47
Improper handling leads to damage	3.73	1.12

Source: Author's calculation using field survey

Table 5.7 shows the mean score and standard deviation of packaging related issues, the prime issue faced by the respondents is 'employee carelessness' (Mean Value = 4.69), Meanwhile 'improper handling leads to damage' is the second severe problem in the air cargo traffic (Mean value=3.73), furthermore, while taking into account other factors like 'pilferage' and 'improper packaging', the mean value of cargo damage is relatively lower than that of other variables in the same dimension (2.91and 2.7 respectively)

Table 5.8

Descriptive statistics of Customs related issues

Customs related issues	Mean	SD
24*7 services are not available	1.88	0.77
Clearing process are sometimes delayed	2.09	1.20
Documentation is not completely digitalized	1.69	0.71
Proper officers are not available at all time	2.00	0.79
Single window system is not effective	1.72	0.67

Source: Author's calculation using field survey

Table 5.8 shows the mean score and standard deviation for the problem experienced by the respondents in air cargo customs procedure and documentation. In the overall perspective, the problems connected with Customs clearance procedure is insignificant and found mean value less than 3. Among all the items in this factor 'clearing process are sometimes delayed' has the highest mean score (2.09), followed

by ‘proper officers are not available at all time’ (2.00). Similarly, the mean score of ‘24*7 services are not available’ takes third concern , carrying 1.88 as mean score. In addition to that the respondents mostly are on opinion that almost all documentation and clearance are digitalized and following single window scheme. In short shippers do not face severe problems connected with customs clearance and documentation as the mean value of all the items are below 3.

Table 5.9

Descriptive statistics of Truck lay and spill over issues

Spill over	Mean	Standard deviation
Cargo gets delayed due to increase in cargo	3.05	0.69
By loading spill over cargo exact cargo to load in airline gets damaged	3.23	1.00
Lack of parking space	3.04	0.98
System procedural delay	2.92	0.92

Source: Author’s calculation using field survey

As shown in the table,5.9 based on the mean score ‘By loading spill over cargo exact cargo to load in airline gets damaged’ (3.23) is the top difficulty that is felt by the shippers, followed by ‘cargo gets delayed due to increased cargo’ (3.05), ‘Lack of Parking Space’ (3.04), ‘System Procedural delay’ (2.92). It is evident that each and every variable indicates that Truck lay bays and spill over cargo are a significant concern.

5.7 Parametric Tests for identification of differences in the perception of shippers

Some parametric techniques were used to know the difference in the perception of shippers regarding the logistics related issues based on the demographic characteristics.

5.7.1 Comparison of perception of cargo logistics related problems based on type of business

To know the difference in the level of perception regarding the problems of air cargo logistics, independent sample t test is used. The Table shows mean values of each logistics related problems with respect to the type of business. Hypothesis for this test is as given below.

Hypothesis:

H0: There is no significant difference in the opinion of shippers regarding the problems of cargo logistics in accordance with the type of business.

H1: There is a significant difference in the opinion of shippers regarding the problems of cargo logistics in accordance with the type of business.

Table 5.10

Cargo related problems and type of business (Independent T test)

Cargo related problems	Type of Business				T Value	P value	Significance
	Single ownership		Partnership				
	Mean	Standard Deviation	Mean	Standard Deviation			
Infrastructure	3.27	.556	3.42	.321	.760	.443	Insignificant
Air Cargo operation	2.72	.417	2.73	.443	.030	.970	Insignificant
Packaging	3.20	1.87	2.67	.333	.895	.376	Insignificant
Customs Clearance	1.94	.410	1.82	.332	.826	.414	Insignificant
Spill over	2.64	1.27	2.30	.658	.764	.484	Insignificant

Source: Author's Calculation

The table 5.5 shows that the results of independent t test, which is a parametric test in the bivariate analysis. Which is primarily used to measure or compare two groups of means. In order to find out the homogeneity of variances among the selected group Levene's Test for equality variance has undertaken. As the significance value of the Levene's Test for Equality of Variances is 0.066 (above 0.05) the equal variance is

assumed and P value also shown 0.443 which is above the threshold value (0.05) at 5% level of significance. Therefore, the first hypothesis with regarded to infrastructural problems has failed to reject and which means there is an insignificant relationship exist. Similarly, with respect to air cargo operation Levine's test for equality of variance is also shown as above 0.05 (0.979) where equal variance is assumed and the P value is above 0.05 (0.977), therefore the researcher is failed to reject the null hypothesis, that means there is no significant difference in the perception of shippers regarding cargo operation problems with respect to type of business. Moreover, while analysing the P value of Packaging related problems, customs clearance and documentation related problems and spill over it is shown 0.376, 0.414, 0.484 respectively, all denotes an insignificant difference and all the null hypothesis is failed to reject as the P Value is above 0.05. In short, the shipper's opinion regarding the cargo logistics problems do not vary according to the type of business.

5.7.2 Comparison of perception of problems based on availability of export promotion schemes

It is important to know if there is any difference in the perception of shippers regarding cargo related issues based on availability of export promotion schemes, Therefore the researcher again conducted Independent T test, in which Problems are taken as dependent variable and Availability export promotion schemes are taken as independent variable. Availability of export promotion scheme is a categorical variable and the respondents are advised to mark either "yes" or "No". Hypothesis for Independent T test is given as follows.

Hypothesis

H0: There is no significant difference in the opinion of shippers regarding the problems of cargo logistics in accordance with the availability of export promotion schemes.

H1: There is a significant difference in the opinion of shippers regarding the problems of cargo logistics in accordance with the availability of export promotion schemes.

Table 5.11

Cargo related problems and availability of export promotion schemes (Independent T test)

Cargo related problems	Benefits of export promotion scheme				T Value	P value	Significance
	Availed		Not Availed				
	Mean	Standard Deviation	Mean	Standard Deviation			
Infrastructure	3.3333	.57379	3.2533	.40332	.477	.636	Insignificant
Air Cargo operation	2.7481	.45266	2.6933	.36148	.402	.601	Insignificant
Packaging	3.2500	2.04986	2.7833	.53341	.429	.394	Insignificant
Customs Clearance	1.8963	.44157	1.9600	.30426	.061	.623	Insignificant
Spill over	2.6111	1.38559	2.5000	.64780	.302	.772	Insignificant

Source: Author's Calculation

The independent T test has undertaken to know the difference in the perception of logistics related problems among the beneficiaries and non-beneficiaries. As per the Levin's test the significance value is 0.081 which is above 0.05 therefore equal variance is assumed, and the first null hypothesis is failed to reject as the P value is above 0.05. Similarly in the case of infrastructure related problems also assumed equal variance (sig value = 0.207) and found insignificant relation as the P value exceeds threshold value. Therefore, the second hypothesis is also failed to reject. In addition to that the rest of three factors of problems shows the same trend, where all the P values are above 0.05, as a result, null hypothesis is failed to reject in all the remaining cases also. That means the opinion regarding cargo logistics problems do not differ according to the export promotion schemes availability (All taken at 5% level of significance).

5.7.3 Comparison of perception of problems based on modes of payment.

In this segment the researcher attempted to know is there any differences in the perception of shippers regarding cargo related problems based on payment modes.

For that the researcher has undertaken ANOVA test and hypothesis are as given below.

Hypothesis

H0: There is no significant difference in the opinion of shippers regarding cargo logistics problems based on their mode of payment.

H1: There is a significant difference in the opinion of shippers regarding cargo logistics problems based on their mode of payment.

Table 5.12

Cargo related problems and mode of payment (ANOVA test)

Cargo related Problems	Mode of Payment			F value	P Value	Significance
	Credit	Advance	Both			
Infrastructure	3.2381 (.46312)	3.4000 (.37417)	3.3625 (.15622)	0.350	0.707	Insignificant
Air Cargo operation	2.8000 (.37947)	2.4800 (.41473)	2.7200 (.46170	1.211	0.309	Insignificant
Packaging	2.8214 (.43404)	2.8000 (.54196)	3.5150 (.66314)	0.853	0.434	Insignificant
Customs Clearance	1.9048 (.36671)	1.8800 (.33466)	1.9500 (.46476)	0.083	0.920	Insignificant
Spill over	2.4881 (.81193)	2.5500 (.20917)	2.6875 (1.16777)	0.128	0.881	Insignificant
Over all problems	2.6504 (.26716)	2.6220 (.15156)	2.8456 (.65803)	0.978	0.385	Insignificant

Source: Author's Calculation
Note: The value within the bracket is standard deviation

Here the researcher wants to know is there any differences in the perception of shippers with regards to logistics problems based on mode of payment. Therefore, Anova Test is employed which is normally used to compare more than two groups. In this context, mode of payment is taken as independent variable which is categorical variable and various logistics related problems are taken as dependent variables. Mode of payment comprises of three categories such as Credit Payment, Advance Payment,

and Both. On the other hand, with regards to the problems connected with infrastructure, cargo operations, packaging, customs clearance, spill over have been considered.

From the table 5.12 the result indicates that there is no significant difference in the opinion of shippers with regards to cargo related issues, Since the P value of all the factors are greater than 0.05. Hence the null hypothesis is failed to reject in all the cases at a 5% level of significance. In short, this analysis demonstrates no significant changes in the opinion of problems among shippers with different category of payment modes. Furthermore, since all the tests are found insignificant, the test of post hoc analysis is also not required in order to compare between the categorical group.

5.7.4 Comparison of perception of logistics problem based on experience of shippers

It is important to check whether any changes in the perception of logistics related problems in accordance with the years of experience. Here the researcher has used one-way Anova. And following are the important hypothesis.

Hypothesis

H0: There is no significant difference in the opinion of shippers regarding cargo logistics problems based on their experience.

H1: There is a significant difference in the opinion of shippers regarding cargo logistics problems based on their experience.

Table 5.13

Cargo related problems and experience of shippers (One-way Anova)

Cargo related Problems	Shipping Experience				F value	P Value	Significance
	0 to 5	6 to 11	12 to17	Above 18			
Infrastructure	3.4667 (.39328)	3.2500 (.39328)	3.3167 (.38573)	3.2625 (.66018)	0.251	0.860	Insignificant
Air Cargo operation	2.8333 (.51251)	2.7250 (.36936)	2.7000 (.38612)	2.7125 (.46170)	0.142	0.934	Insignificant
Packaging	2.4167 (.46547)	2.7250 (.36936)	2.8958 (.38612)	3.5938 (2.62182)	0.908	0.446	Insignificant
Customs Clearance	1.7000 (.37417)	1.9500 (.27775)	1.8333 (.39848)	2.0500 (.42895)	1.451	0.243	Insignificant
Spill over	1.9167 (.62583)	3.0938 (.62583)	2.9167 (1.88092)	2.2969 (.51816)	1.930	0.141	Insignificant
Over all problems	2.4667 (2.7232)	2.7725 (.29163)	2.7325 (.38305)	2.7831 (.61472)	0.754	0.527	Insignificant

Source: Author's Calculation
Note: The value within the bracket is standard deviation

The researcher is again attempted to check if there is any difference among the shippers with varied years of experience and perception of logistics problems. Here the experience has taken as the independent variable which is categorical and having four groups such as up to 5 years,6 to 11 years,12 to 17 years and above 18 years. As per the Anova results ,the relationship between the independent variable (experience) and dependent variable (problems) is found to be insignificant as the P value of all of the problems are above 0.05.Therefore all the null hypothesis are failed to reject, confirming that there is no significant difference among the shippers perspectives towards problems according to years of experience .In this case also the researcher has not conducted post hoc Analysis, as it found to insignificant difference between the categories.

5.8 Effect of covid outbreak: Shippers Perspective

In the first objective, the study assessed the impact of the COVID outbreak on Indian agricultural export and airfreight movement, concluding that it did not significantly

affect agricultural export. However, the research now aims to shift its focus towards examining the varying degrees of outbreak intensity among individual shippers. This change in perspective will help to gain a deeper understanding of how COVID has affected shippers in their shipping businesses.

The CART method is employed to determine the extent to which different groups of shippers were impacted by the COVID outbreak in terms of exports. It helps to identify the categories of shippers that were most affected and those that were least affected by the pandemic. The effect of COVID is taken as dependent variable, while the independent variables are the type of shipment, export promotion scheme, experience, educational background, mode of payment, number of branches, and type. The tree consists of 17 nodes and 9 terminal nodes.

Figure 5.1

Decision tree framework

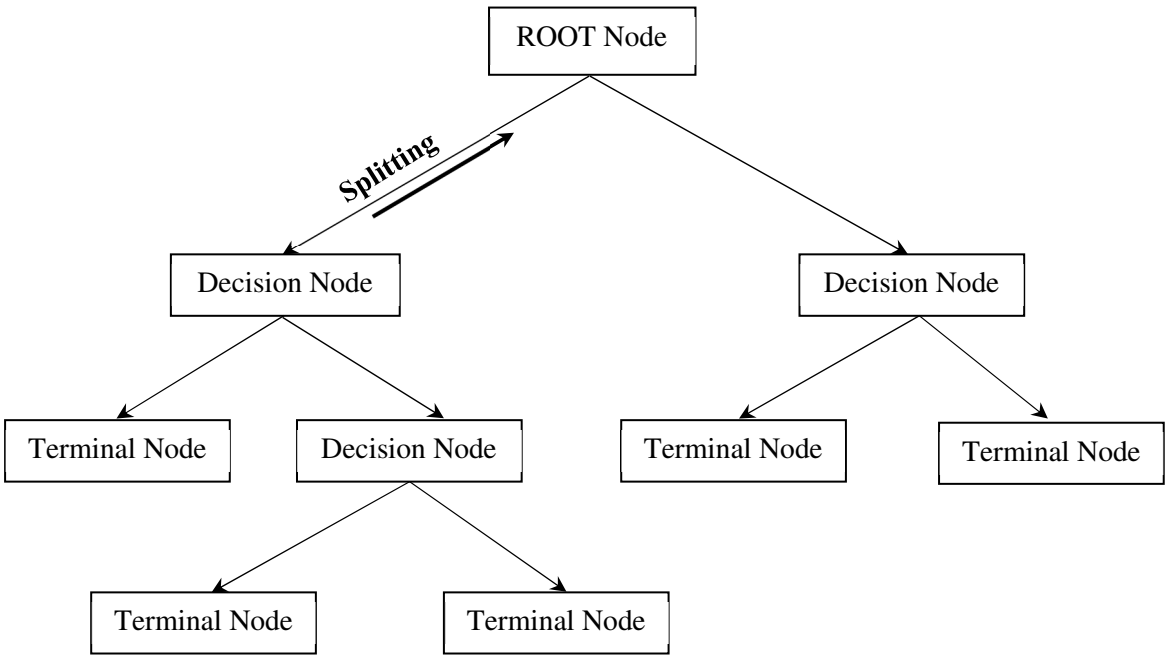


Table 5.14

Characteristics of variables used in CART Analysis

Variable Name	Given Values	Code	structure		Type of variable	
			fi	%	MS	IDV/DV
Covid Impact	low	1	27	64.3	Interval Scale	DV
	Moderate	2	9	21.4		
	High	3	6	14.3		
Type of Business	Sole proprietorship	1	33	78.6	Nominal	IDV
	Partnership	2	9	21.4		
No of Branches	No	1	30	71.4	Nominal	IDV
	Yes	2	12	28.6		
Educational Qualification	SSLC	1	2	4.8	Ordinal	IDV
	Plus Two	2	3	7.1		
	Graduation	3	35	83.3		
	Post-Graduation	4	2	4.8		
Years of Experience	0 to 5	1	6	14.3	Ordinal	IDV
	6 to 11	2	8	19		
	12 to 17	3	12	28.6		
	Above 18	4	16	38.1		
Type of shipment	Air Only	1	26	61.9	Nominal	IDV
	Both Air & Container	2	16	38.1		
Type of payment	Credit	1	21	50	Nominal	IDV
	Advance	2	5	11.9		
	Both	3	16	38.1		
Export promotion scheme	Yes	1	27	64.3	Nominal	IDV
	No	2	15	35.7		

Source: Field Survey

Note: MS=measurement scale; IDV=Independent Variable=Dependent Variable

Table 5.15

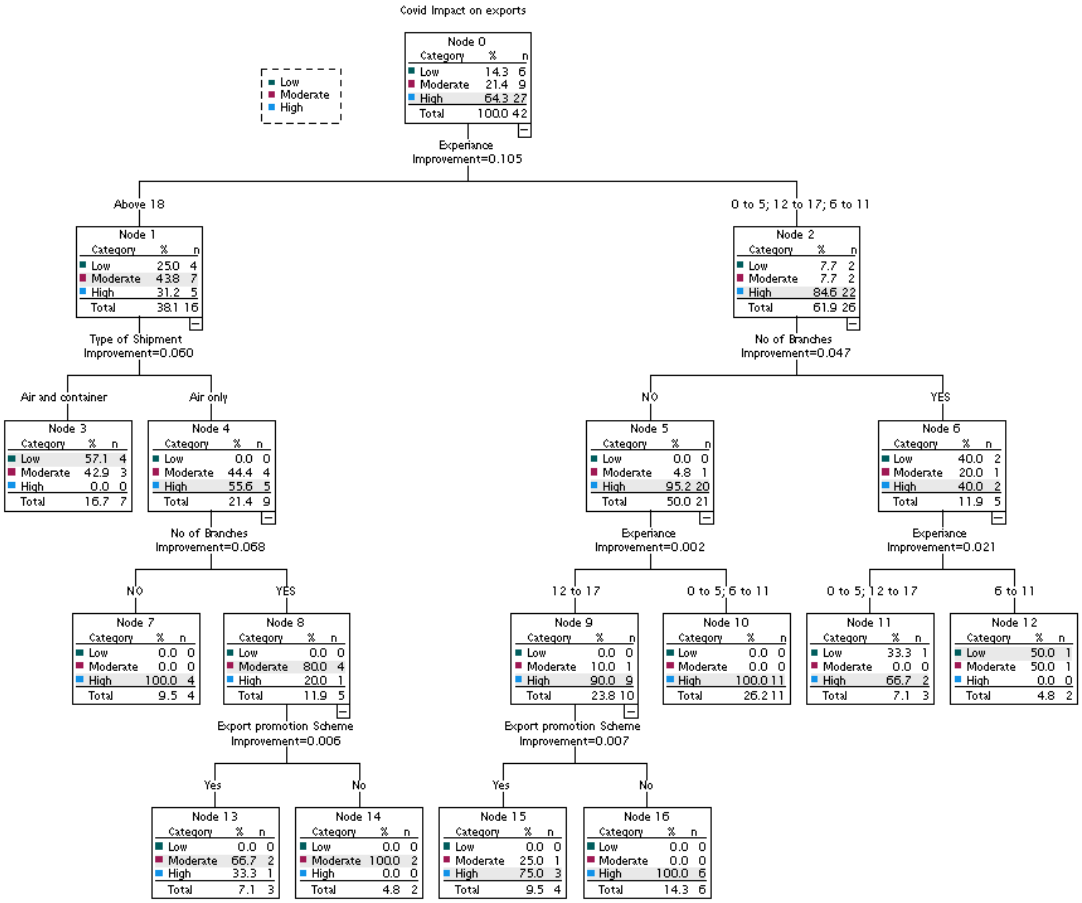
Model Summery

Specifications	Growing Method	CRT
	Dependent Variable	Covid Impact on exports
	Independent Variables	Type of Shipment, Export promotion Scheme, Experience, Educational Qualification, Type of Payment, No of Branches, type
	Validation	None
	Maximum Tree Depth	5
	Minimum Cases in Parent Node	5
	Minimum Cases in Child Node	2
Results	Independent Variables Included	Experience, No of Branches, Type of Payment, Type of Shipment, Export promotion Scheme, type, Educational Qualification
	Number of Nodes	17
	Number of Terminal Nodes	9
	Depth	4

Source: Author's calculation based on the primary data

Figure 5.2

Classification and Regression Tree



Source: Source Data

The parent node summarizes the overall information about the covid effect among various shippers. 'Experience' is identified as the most critical variable. The first left branch of the tree (*experience above 18 years*) comprises of 16 shippers, the tree demonstrates that the shippers having the experience above 18 years have *moderate* effect of covid 19,at the same time node 2 is dominated by *high* covid impact (shippers below 18 years of experience) .The left branch is subsequently split on the basis of type of shipment, which shows 'lesser impact' for those shippers simultaneously depending both container and air. Later, decision node (air only) further splits on the basis of '*number of branches'*, which comprises of *high* impact is dominated significantly in Node7. Hence in Node 8 (those having branches) *moderate*

impact subjugate. Then the node 8 further split based on the export promotion scheme. Meanwhile in the right branch of the tree consists of 26 shippers. Node 2 splits based on the number of branches. Node 5 and node 6 are subsequently splits based on the experience of shippers. Node 9, Node 10, Node 11, Node 12 (experiences less than 18 years) all denotes significant impact due to covid 19. Finally, this branch also ended up the tree with export promotion scheme.

Table 5.16

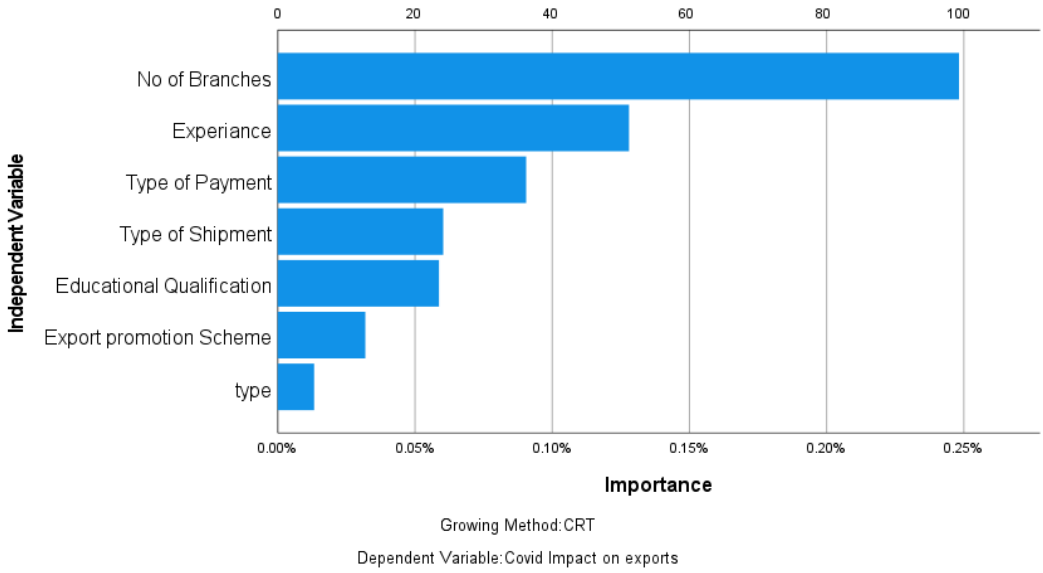
Importance Matrix of Independent Variable

Independent Variable Importance		
Independent Variable	Importance	Normalized Importance
No of Branches	.248	100.0%
Experience	.128	51.6%
Type of Payment	.091	36.5%
Type of Shipment	.060	24.3%
Educational Qualification	.059	23.7%
Export promotion Scheme	.032	12.9%
Type	.013	5.3%

Source: Author's Calculations

Figure 5.3

Normalised importance



The figure 5.3 explains the importance of independent variable. The importance of an independent variable in a decision tree refers to the degree to which the tree's predicted values change with changes in the selected independent variable. As per the importance chart, both 'number of branches' and 'experience' shows substantial effects on the target variable, "COVID effect," with impact percentages of 100% and 51.6%, respectively. Hence, 'the type of shipment' emerges as the least influential independent variable, as its normalized importance is shown as 5.3.

Table 5.17

Risk

Estimate	Std.Error
.167	.058

Source: Author's Calculation based on primary data

Table 5.18

Classification matrix

Observed	Predicted			
	Low	Moderate	High	Percent Correct
Low	5	0	1	83.3%
Moderate	4	4	1	44.4%
High	0	1	26	96.3%
Overall Percentage	21.4%	11.9%	66.7%	83.3%

Source: Author's Calculation based on primary data

5.8.1 Results and interpretation

The risk table indicates the likelihood of misclassifying a shipper, In this model 16.7 % risk is shown, which means approximately a 17% probability for the misclassification of respondents. In simpler terms, this means that out of 100 instances, around 17 are expected to be misclassified, which denotes that 83% of respondents are accurately categorized in the correct group. Then table 4 showing the classification matrix also known as confusion matrix. The matrix shows the three categories of dependent variable (low, Moderate, High), while considering the *low*

impact the model is correct to the extent of 83.3%, and for *moderate* and *high* the model prediction is correct to the extent of 44.4% and 96.6% respectively. it can be stated that the overall accuracy of the model is 83.3%.

5.9 Conclusion

One of the global markets with the quickest growth is the air cargo market in India, which has several prospects for business owners. In addition to playing a large role in the aviation industry, India is also undergoing substantial policy changes under its current administration, including the privatization of airports and the attraction of foreign investment in the nation's airport infrastructure. Infrastructure, cargo handling and packing, and customs clearance are only a few of the issues that have been addressed with regard to International Airports in Kerala. This study seeks to pinpoint those issues and offer pertinent solutions.

The results of shipper's perception towards challenges of cargo logistics indicates, 'carelessness of employees leads to damage of goods', 'lack of dedicated terminal space and facilities for airlines', 'cargo congestion in the stations' are found to be the major issues faced by the shippers. Apart from this, 'Increase in passenger baggage, cargo gets delayed' also contributing as a biggest challenge to shippers, similarly they are also struggled with 'offloading issues without prior notice'.

After identifying the key issues faced by the shippers in the air cargo logistics, the researcher further attempted to do some parametric tests in order to know is there any differences in their perception on the logistics problems based on their demographic profile. The results indicate that all the respondents selected for the study are facing the problem as same irrespective of their demographic character. According to the survey, problem prevailed in air cargo logistics is considered as the common one for all the shippers in the industry.

The study also analysed the relationship of shipper's characteristics and covid effect by taking 42 responses, extracted a set of predictors which are found to be statistically significant, in the hierarchical structure it has shown that *year of experiences* has the strongest interaction with the target variable (covid impact). However, it is extremely

important to have a continuous observation by taking large number of responses to ensure the stability of the presented model. Besides increasing the number of observations, increasing the number of input variable also helps to improve the model performance.

Chapter 6

Shipper's Decision Making Process: Criteria Influencing LSPs Selection and Effect of LSQ on Export Performance, Satisfaction and Loyalty

Objective: To investigate the criteria chosen by shippers to select LSPs and the influence of logistics service quality on export performance, customer satisfaction and loyalty.

6.1 Introduction

This chapter also covers several aspects, the first part of this chapter seeks the key factors influencing shippers in selecting third party logistics providers. In the next phase the researcher tried to understand how the logistics service quality affect export performance, satisfaction and loyalty. Finally, the last segment of this chapter dealt with some parametric tests to know the perception of shippers regarding export performance based on their demographic profile.

6.2 Factors influencing logistics service quality

The purpose of this segment is to sort the key attributes of third-party logistics services and to examine how these attributes influence shipper's selection of third-party logistics service providers (3PLs). Having knowledge and understanding of these attributes can greatly assist 3PLs in developing marketing strategies for attracting and retaining customers. There are numerous studies held previously, showing different criteria for the selection of third party logistics providers, hence this study has used a validated LSQ scale proposed by Banomyong & Supatn (2011).The scale comprises of 24 freight logistics service factors under the dimensions of reliability, assurance, tangibility, empathy, responsiveness, and cost. To determine which freight logistics service attributes are important to 3PL selection and to examine how these attributes affect 3PL selection, a survey was conducted. This section of the questionnaire was added by using a 5-point Likert scale anchoring at 1 (lowest) to 5 (highest) to rate the shippers' responses. Questionnaire requests the participants to rate the importance of

the factors using a five-point Likert type scale from 1 = Very unimportant; 2 = Unimportant; 3 = Neutral; 4 = Important to 5 = Very important. Subsequently to ensure that all proposed service attributes were consistent statistical analysis namely Cronbach alpha has used.

6.2.1 Data Analysis

Table 6.1

Descriptive statistics of the factor 'Reliability'

Reliability	Mean	SD
Accuracy of Documents	3.85	1.15
Short transit time	3.35	1.24
Consistency of the service	3.30	1.11

Source: authors calculation based on field survey

Table 6.1 shows the descriptive statistics of reliability. Actually, reliability refers to, the ability of a service provider to exercise the promised service in a great accurate manner. While analysing these items, the mean value is high in the case of accuracy of documents (3.87) followed by short transit time (Mean value=3.35).

Table 6.2

Descriptive statistics of the factor 'Assurance'

Assurance		
Firm's reputation	3.76	.890
Track and trace service offering	3.85	.951
No damaged goods while in transit	3.80	.905
Staff's knowledge and expertise	3.73	.905
Offering of one-stop service	3.90	.905
High standard service	3.78	.976

Source: authors calculation based on field survey

Literally, Assurance refers to the expertise and courtesy of service providers as well as their capacity to inspire confidence and trust. As per the descriptive statistics 'offering of one stop service' is the highest concern of the shippers (Mean

value=3.90).The second highest concern of the shippers is 'offering of track and trace option', the mean value of which is 3.85.Then it is followed by 'No damaged goods while in transit'(Mean value=3.8095) and 'high standard service' (Mean value= 3.78).In short the offering of one stop service is one the biggest demand of shippers with respect to logistics activities.

Table 6.3

Descriptive statistics of the factor 'Tangibility'

Tangibility	Mean	Std. Deviation
Location of the 3PL	3.52	1.19
Modern equipment	3.59	1.25
EDI and e-commerce service offering	3.50	1.15
Owned CFS (Container freight station)	3.57	1.23

Source: authors calculation based on field survey

'Tangible components' refers to the tools and resources used to make the service a reality. In other words, tangibility refers to the existence of Machines and equipment, personnel, and communication channels. In the factor tangibility the importance level is highest with respect to 'modern equipment 'is holding highest mean value 3.51, followed by owned CFS.

Table 6.4

Descriptive statistics of the factor 'Responsiveness'

Responsiveness	Mean	SD
Fast responses to customers' requests	3.78	1.00
World-wide service offering	3.66	1.00
Offering of updated freight rates	3.76	0.97
Good care of the customers	3.80	0.89
Owned overseas network	3.83	0.90
Consolidation offering	3.80	0.94
Variety of services	3.73	0.96
Express delivery service offering	3.72	0.92
Responsiveness of the service	3.65	1.00
Staff willingness to provide Service	3.80	0.94

Source: authors calculation based on field survey

Responsiveness refers to the willingness of the service providers to offer quick and accurate service to their customers. In this measurement scale responsiveness comprises of ten factors, out of these factors 'owned overseas network' is the highest demand of the shippers (Mean value=3.83), Subsequently shipper's second prominent priority is towards 'staff willingness to provide service' and 'good care to customers' (mean value= 3.80) which is followed by 'consolidation offering'(Mean value=3.80). Apart from these factors the shippers are also demanding the 'fast responses to their requests' (Mean value=.3.78) and 'offering of updated freight rates' (Mean value=3.76).

Table 6.5

Descriptive statistics of the factor 'Empathy'

Empathy	Mean	SD
Keep customers' information confidentially	3.62	0.90
Care for customers' needs and interests	3.57	1.19
Customer Relationship Management (CRM)	3.61	1.10

Source: authors calculation based on field survey

Empathy refers to customised attention and caring given by service providers to customers. In this segment 'keeping shipper's information confidential' has the highest prominence given by the shippers having highest mean score 3.62, followed by Customer Relationship Management (Mean value=3.61). Furthermore 'care for the customer's needs and interest' has also given significant priority by the shippers (Mean value=3.57).

Table 6.6

Descriptive statistics of the factor 'Cost'

Cost	Mean	SD
Reasonable price	4.58	0.59
Ease of Payment	4.57	0.50
Appropriate credit term	4.61	0.49
Discount offering	4.64	0.48

Source: authors calculation based on field survey

Among all the other factors the shippers provide highest priority to 'discount offering'. The mean value of which is 4.64. The next best priority of the shippers in the cost element is 'appropriate credit term' which has the mean value of 4.61. A relative importance had given to the 'reasonable price' as per the results showing the mean value of 4.58, followed by 'Ease of payment' (Mean score=4.57).

Table 6.7

Overall ratings of importance of factors

Factors	Mean	Std. Deviation
Reliability	3.31	1.10
Assurance	3.77	0.86
Tangibility	3.54	1.17
Empathy	3.60	1.10
Responsiveness	3.81	0.89
Cost	4.57	0.44

Source: authors calculation based on field survey

While observing the overall importance rating of the shippers on each dimension 'cost' has the highest mean value, which means the biggest concern of the shippers while selecting the freight forwarder is 'Cost'. Similarly, Responsiveness has the second highest significance given by the shippers, having the mean score of 3.81, followed by Assurance (Mean value=,3.77) Empathy (Mean value=3.60), Tangibility (Mean value= 3.54) and Reliability (Mean value=3.31).

This study further discusses the relationship between logistics service performances and export performance of shippers. In addition, the researcher is also attempted to find the relationship between logistics service performances and loyalty, with the mediation effect of satisfaction. Therefore, the researcher has constructed two models to know how the factors of Logistics Service Quality contribute or predict the outcome variable export performance and loyalty. Both models have strong foundation in the previous literature which has mentioned in the chapter named 'Theoretical formulation'. For testing the conceptual model, the study has used PLS-Structural Equation Model.

6.3 Influence of Logistics service quality on export performance

- Partial Least Square Structural Equation Modelling

The usage and application of structural equation modelling (SEM) in academics has changed the way in which social and behavioural scientists examine the relationships between theoretical constructs. This methodology involves representing abstract concepts as constructs and linking them via a structural model to investigate their interrelationships. SEM is especially useful because it permits for the incorporation of random measurement errors, enabling empirical validation of postulated theories through statistical testing.

SEM can be evaluated using two primary methods: covariance-based and variance-based. Covariance-based estimators seek to minimize the difference between the factual and model-generated variance-covariance matrices of the observable indicators to derive the model parameter estimates. In contrast, variance-based estimators create linear combinations of the indicators as proxies for the theoretical constructs, and then estimate the model parameters. One generally used variance-based estimator is partial least squares path modelling (PLS).

The adaptability of SEM has made it a useful research tool across a wide variety of fields, including economics, marketing, education, and psychology. SEM can be utilised to investigate complex relationships between unobservable variables and to test hypotheses in different contexts.

A theoretical model is built to examine the relationships between these variables. The model consists of four independent variables: Customer focus, Order fulfilment, Timeliness, and Information Quality, along with one dependent variable: Performance. The Customer focus (CFQ) is measured using four items. The Order fulfilment (OFQ) is measured with three items, the variable Timeliness (Tim) is assessed using three items, while Information Quality (IQ) is measured using three items. All of these variables are considered independent variables in the model. Performance is the dependent variable and is influenced by the independent variables. It is measured using four items. the export performance is measured in subjective

manner and the scale consist of four variables namely Achievement of company's export goals and objectives, relative export growth and sales performance, market share in the target market and perception of export profitability compared to major competitors.

By examining the relationships between the independent variables (Customer focus, Order fulfilment, Timeliness, and Information Quality) and the dependent variable (Performance), this theoretical model aims to gain understandings into how these factors contribute to or predict performance outcomes. The model is used to test hypotheses and examine the significance and strength of the relationships between the variables, by providing a framework for understanding and explaining the underlying mechanisms of performance of logistics services. The proposed model is represented below.

Figure 6.1

Proposed model 1

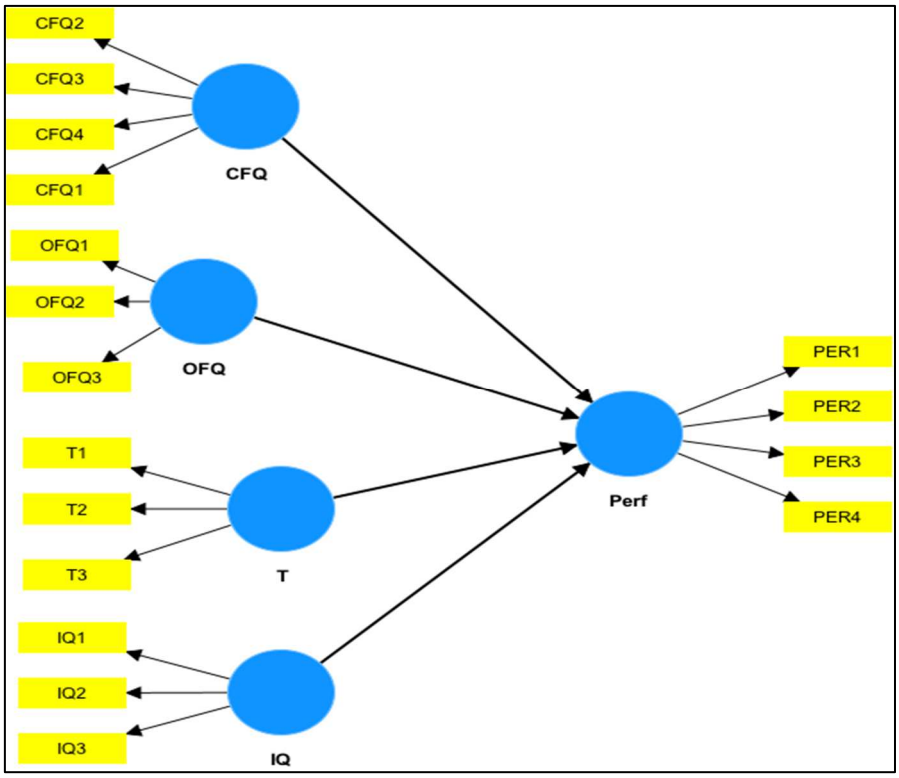


Table 6.8

Outer loadings of the model 1

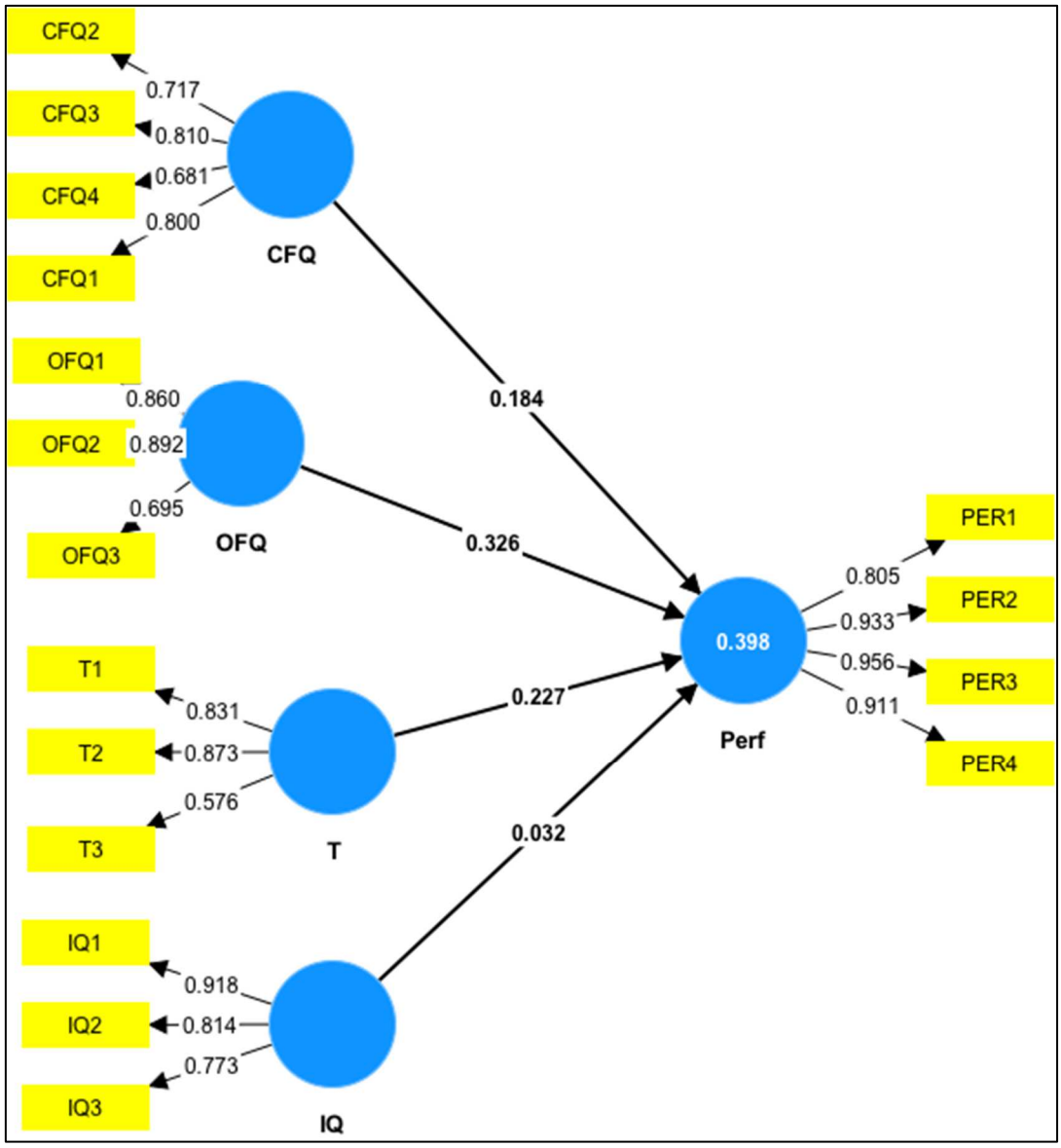
	CFQ	IQ	OFQ	Perf	Tim
CFQ1	0.800				
CFQ2	0.717				
CFQ3	0.810				
CFQ4	0.681				
IQ1		0.918			
IQ2		0.814			
IQ3		0.773			
OFQ1			0.860		
OFQ2			0.892		
OFQ3			0.695		
PER1				0.805	
PER2				0.933	
PER3				0.956	
PER4				0.911	
Tim1					0.831
Tim2					0.873
Tim3					0.576

Note: Customer focus (CFQ), Order fulfilment (OFQ),, Timeliness (Tim), Information quality (IQ), Performance (Perf)

The outer loadings of the constructs in the study is presented in the above table. According to criteria of partial least square structural equation model, only those loadings above 0.5 is to be retained for further analysis. The Customer focus (CFQ) is measured using four items. The Order fulfilment (OFQ) is measured with three items, the variable Timeliness (Tim) is assessed using three items, while Information quality (IQ) is measured using three items. All items had loadings above 0.5 and were retained for further analysis. This can be seen in the above table and the below output of the model form partial least square, structural equation method.

Figure 6.2

Measurement model 1



6.3.1 Reliability and Validity

Table 6.9

Table Representing Reliability and Validity

	Cronbach's alpha	Composite reliability	Average variance extracted (AVE)
CFQ	0.746	0.840	0.569
IQ	0.819	0.875	0.701
OFQ	0.759	0.859	0.673
Perf	0.923	0.946	0.816
Tim	0.701	0.811	0.595

Note: Customer focus (CFQ), Order fulfilment (OFQ),, Timeliness (Tim), Information quality (IQ), Performance (Perf)

The Cronbach alpha value of the constructs being studied is between 0.74 and 0.92, which is nearly equal to or greater than the benchmark proposed by Nunnally (1978) of 0.7. To make sure the internal consistency is maintained, the composite reliability value is also taken into consideration and it is found to be between 0.81 and 0.94, which is much higher than the threshold of 0.70. Thus, it can be concluded that there are no issues concerning internal consistency.

The convergent validity of the constructs was determined by examining the outer loading scores and AVE. Variables with low external loadings that impacted the AVE and composite reliability were eliminated. The AVE value for the constructs was between 0.56 to 0.81, which is above the 0.5 threshold proposed by Hair et al. (2014). Consequently, there are no issues with the convergent validity, and it can be concluded that the constructs are converging properly at the measurement.

6.3.2 Discriminant validity

Table 6.10

Representing discriminant validity

Fornell-Larcker criterion

	CFQ	IQ	OFQ	Perf	Tim
CFQ	0.754				
IQ	0.215	0.837			
OFQ	0.638	0.315	0.820		
Perf	0.496	0.274	0.572	0.903	
Tim	0.431	0.436	0.524	0.491	0.771

Note: Customer focus (CFQ), Order fulfilment (OFQ), Timeliness (Tim), Information quality (IQ), Performance (Perf)

The table above illustrates the square root of AVE and the correlation between each variable. As proposed by Hair et al. (2014), discriminant validity was examined from two perspectives. Firstly, by looking at the outer loadings, it is evident that the items are assigned to the proper construct, thus confirming the absence of discriminant validity issues. The second approach is by comparing the square root of AVE with the constructs as recommended by Fornell & Larcker (1981). The square root of AVE highlighted in bold along the diagonal is greater than the correlation values for the corresponding latent variables. All the square root of AVE values are greater than the correlation values. Based on this, we can conclude that there are no discriminant validity issues.

Table 6.11

Heterotrait-monotrait ratio (HTMT) - Matrix

	CFQ	IQ	OFQ	Perf	Tim
IQ	0.214	-			
OFQ	0.789	0.368	-		
Perf	0.593	0.260	0.662	-	
Tim	0.594	0.603	0.729	0.624	-

Note: Customer focus (CFQ), Order fulfilment (OFQ),, Timeliness (Tim), Information quality (IQ), Performance (Perf)

The Heterotrait-Monotrait ratio (HTMT) is an additional tool that evaluates Discriminant Validity by analysing correlations. This evaluation is derived from Campbell and Fiske's (1959) Multitrait-Multimethod (MTMM) matrix, where the Heterotrait-Monotrait ratio of the correlations is examined. HTMT is one of the various measures that determine discriminant validity and encompasses a range of correlations that are greater than 0.10 and less than 0.90. The HTMT results table confirms this correlation range among the constructs, furnishing a secondary approach providing Discriminant Validity.

6.3.3 Model quality metrics

In PLS-SEM analysis, to assess the quality of a model, various statistics can be used, such as R square and F square. R square is a measure of how much variance in the dependent variables can be explained by the variance in the independent variables. A higher value indicates a better model fit. F square is a measure of effect size, which shows the effect of removing an independent variable on the outcome variables and its effect on R square.

R-square values

Table 6.12

Table representing R-square values

	R-square	R-square adjusted
Perf	0.398	0.394

The coefficient of determination (R square) evaluates the extent to which the independent variable accounts for the variance in the dependent variable. The above table underlines the R Square value. R square defines the explanatory power of the independent variable on the dependent variable. From the above table we can see that the independent variable has an effect on dependent variable to an extent of 39.4%. i.e., it has explanatory power of 39%. We can say that there are other variables other than these variables that is influencing performance.

Table 6.13

F square value

	CFQ	IQ	OFQ	Perf	Tim
CFQ				0.032	
IQ				0.001	
OFQ				0.090	
Tim				0.054	

Note: Customer focus (CFQ), Order fulfilment (OFQ),, Timeliness (Tim), Information quality (IQ), Performance (Perf)

Cohen (1988) recommended using the F square to indicate the effect size of the path relationship. An effect size is considered small when the F square is lesser than 0.02, medium if it is more than 0.15, and large when it is greater than or equal to 0.35. We can see that all the independent variable has low effect size on the dependent variable.

Bootstrapping results

This statistical analysis of the proposed model is demonstrated by the tables and diagram presented. The inference was established by the t and p values that were stated. The hypothesized connections between the variables in the study were examined and interpretations were made based on the t and p values. This is discussed further below.

Table 6.14

Table representing Boot strapping estimates

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
CFQ -> Perf	0.184	0.185	0.045	4.045	0.000***
IQ -> Perf	0.032	0.035	0.040	0.808	0.419^{NS}
OFQ -> Perf	0.326	0.326	0.044	7.466	0.000***
Tim -> Perf	0.227	0.227	0.045	5.030	0.000***

****p<0.01, Significant, NS- Not Significant.*
Customer focus (CFQ), Order fulfilment (OFQ), Timeliness (Tim), Information quality (IQ), Performance (Perf)

1. H0: There is no significant influence of Customer focus on performance

   H1: There is a significant influence of Customer focus on performance

Study hypothesis was proposed to understand the significant influence of customer focus on performance. The t-value of 4.045 shows that the relationship between customer focus on performance is statistically significant at 1 % level of significance. The p-value of 0.00 further supports the rejection of the null hypothesis as it is less than 0.01. Hence, null hypothesis (H0) is rejected, and the alternative hypothesis (H1) is accepted. Therefore, it can be concluded that customer focus has a significant influence on performance.

2. H0: There is no significant influence of Order fulfilment on performance

   H1: There is a significant influence of Order fulfilment on performance

Next hypothesis was proposed to understand the significant influence of order fulfilment on performance. The t-value of 7.466 shows that the relationship between customer focus on performance is statistically significant at 1 % level of significance. The p-value of 0.00 further supports the rejection of the null hypothesis as the p value is less than 0.01. Hence, null hypothesis (H0) is rejected, and the alternative hypothesis (H1) is accepted. Therefore, it can be concluded that order fulfilment has a significant influence on performance.

3. H0: There is no significant influence of Timeliness on performance

   H1: There is a significant influence of Timeliness on performance

Study hypothesis was proposed to understand the significant influence of timeliness on performance. The t-value of 5.03 shows that the relationship between timeliness on performance is statistically significant at 1 % level of significance. The p-value of 0.00 further supports the rejection of the null hypothesis as it is less than 0.01. Hence, null hypothesis (H0) is rejected, and the alternative hypothesis (H1) is accepted. Therefore, it can be concluded that timeliness has a significant influence on performance.

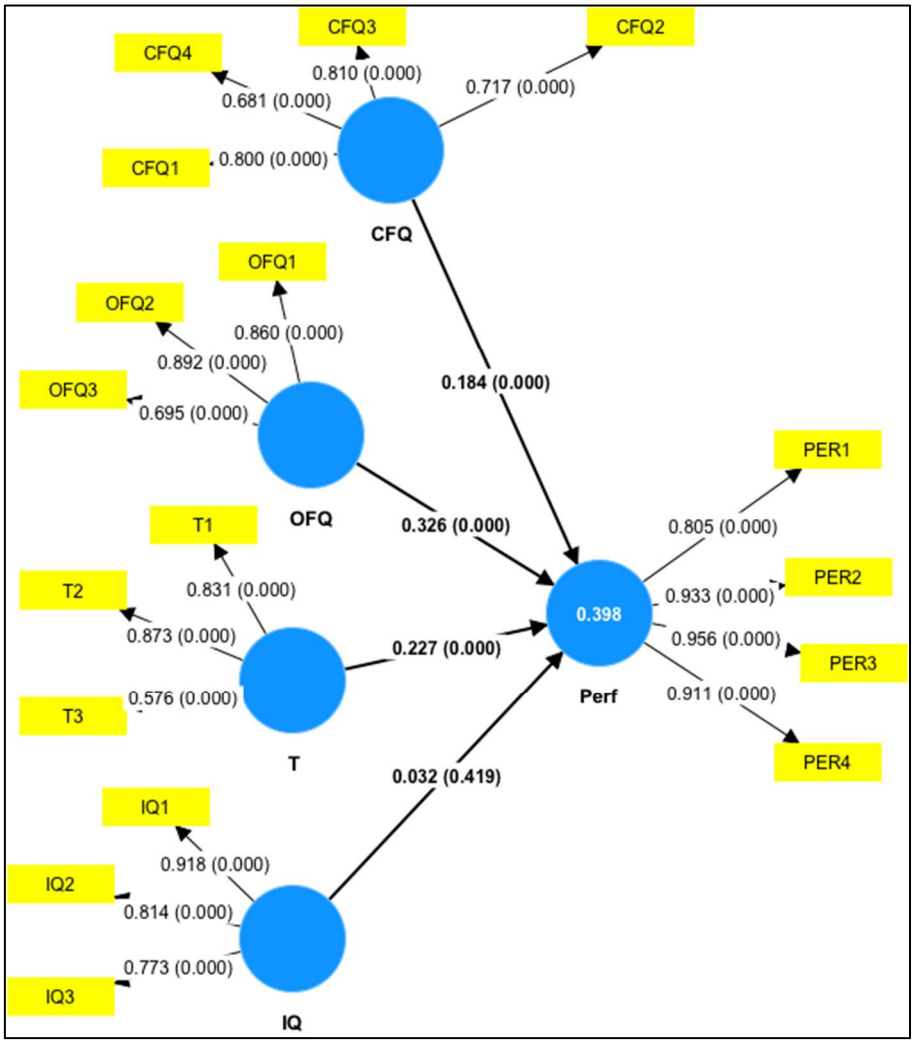
4. H0: There is no significant influence of Information quality on performance

   H1: There is a significant influence of Information quality on performance

Study hypothesis was proposed to understand the significant influence of information quality on performance. The t-value of 0.419 shows that the relationship between information quality on performance is statistically insignificant at the 5% level of significance. The p-value of 0.419 further supports the acceptance of the null hypothesis as it is greater than 0.05. Hence, null hypothesis (H0) is accepted, and the alternative hypothesis (H1) is rejected. Therefore, it can be concluded that information quality do not have a significant influence on performance.

Figure 6.3

Bootstrapping results of model 1



6.4 Logistics Service Quality – Satisfaction – Loyalty Paradigm

A theoretical model is built to examine the relationships between the variables in the below table. The model consists of one independent variable logistics service quality (LSQ) which had the dimensions namely Customer focus (4 items), Order fulfilment (5 items), Timeliness (4 items), and Information Quality (3 items). Satisfaction is a mediating variable which is measured with the help of 2 items and outcome variable is loyalty which is measured with 2 items.

By examining the relationships between the independent variable logistics service quality and outcome variable loyalty, with the mediating role of satisfaction, this theoretical model aims to gain understandings into how these factors contribute to or predict the outcome variable loyalty. The model is used to test hypotheses and examine the significance and strength of the relationships between the variables, by providing a framework for understanding and explaining the underlying mechanisms of loyalty of logistics service customer. The proposed model is represented below.

Table 6.15

Various constructs and items used in the study of Model 2

Constructs	Dimensions	Type of variable in study
Logistics Service Quality (LSQ)	Customer focus (CFQ)	**Independent**
	Order Fulfilment (OFQ)	
	Timeliness (Tim)	
	Information Quality (IQ)	
Satisfaction (SAT)		**Mediating**
Loyalty (Loy)		**Outcome**

Figure 6.4

Proposed model 2

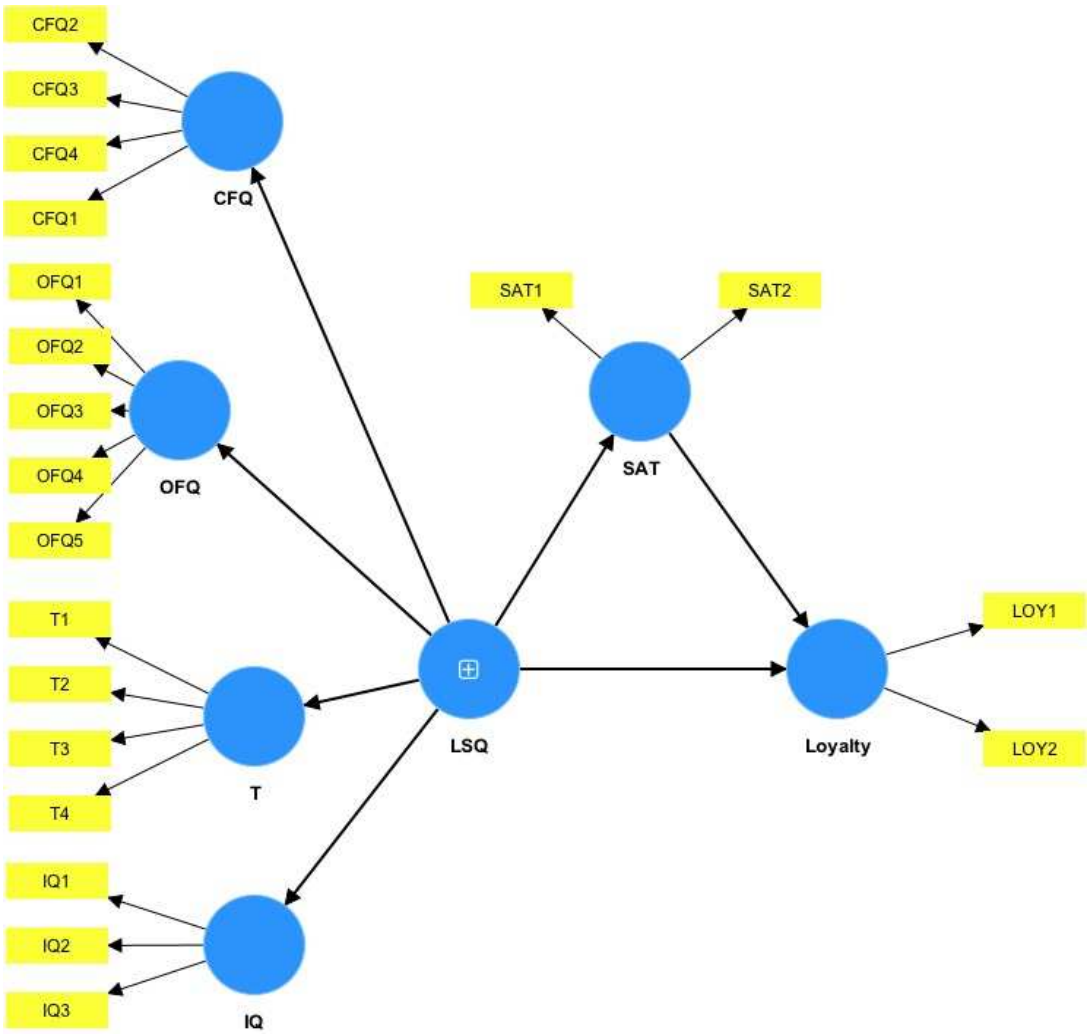


Table 6.16

Outer loadings of the model 2

	CFQ	IQ	OFQ	RET	SAT	Tim
CFQ1	0.785					
CFQ2	0.731					
CFQ3	0.809					
CFQ4	0.685					
IQ1		0.854				
IQ2		0.858				
IQ3		0.851				
OFQ1			0.791			
OFQ2			0.854			
OFQ3			0.727			
OFQ4			0.513			
OFQ5			0.444			
LOY1				0.930		
LOY2				0.920		
SAT1					0.936	
SAT2					0.935	
Tim1						0.720
Tim2						0.709
Tim3						0.759
Tim4						0.727

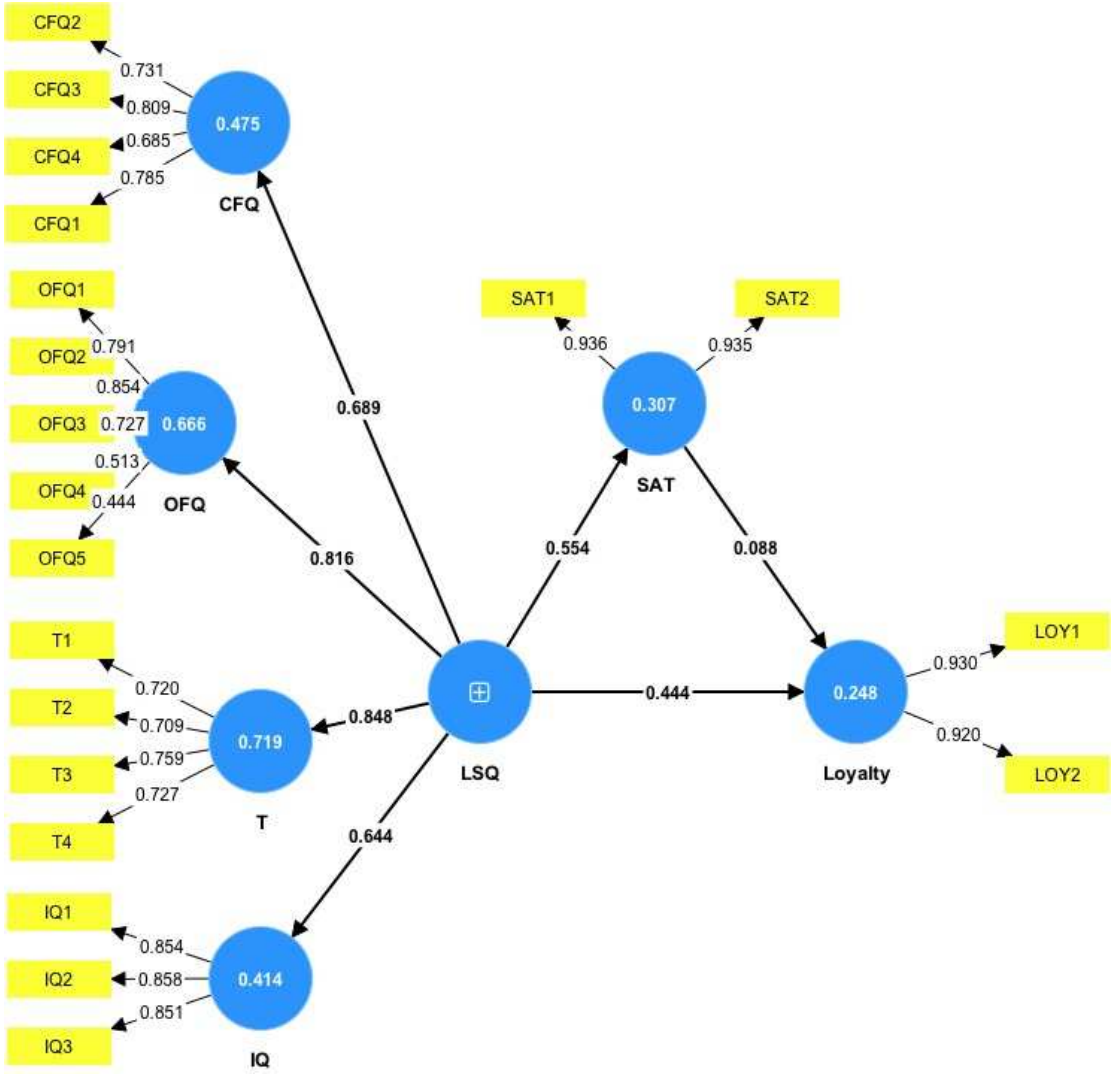
Customer focus (CFQ), Order fulfilment (OFQ),Timeliness (Tim), Information quality (IQ),

The outer loadings of the constructs in the study is presented in the above table. According to criteria of partial least square structural equation model, only those loadings above 0.5 is to be considered for further analysis. Logistics service quality with dimensions Customer focus (CFQ) is measured using four items, the Order fulfilment (OFQ) is measured with five items, the variable Timeliness (Tim) is assessed using four items, while Information quality (IQ) is measured using three items. All items had loadings above 0.5 except OFQ5 which had 0.44 was removed and tested again. Since there was no drastic change in the output, the item was retained

for further analysis. This can be seen in the above table and the below output of the model form partial least square, structural equation method.

Figure 6.5

Outer loadings of the measurement model 2



6.4.1 Reliability and Validity

Table 6.17

Table representing Reliability and Validity

	Cronbach's alpha	Composite reliability	Average variance extracted (AVE)
CFQ	0.746	0.840	0.569
IQ	0.819	0.875	0.701
OFQ	0.701	0.859	0.673
LOY	0.832	0.922	0.856
SAT	0.858	0.934	0.876
Tim	0.701	0.811	0.595

Customer focus (CFQ), Order fulfilment (OFQ), Timeliness (Tim), Information quality (IQ),

The Cronbach alpha value of the constructs being studied is between 0.70 and 0.85 which is good and the composite reliability value is also taken into consideration and it is found to be between 0.80 and 0.93, which is much higher than the threshold of 0.70. Thus, it can be concluded that there are no issues concerning internal consistency. The AVE value for the constructs was between 0.50 to 0.87, which is above the 0.5 threshold proposed by Hair et al. (2014). Consequently, there are no issues with the convergent validity, and it can be concluded that the constructs are converging properly at the measurement.

6.4.2 Discriminant validity

Table 6.18

Table representing discriminant validity

Fornell-Larcker criterion

	CFQ	IQ	OFQ	LOY	SAT	Tim
CFQ	**0.754**					
IQ	0.183	**0.837**				
OFQ	0.592	0.302	**0.684**			
LOY	0.408	0.229	0.429	**0.925**		
SAT	0.265	0.647	0.277	0.334	**0.936**	
Tim	0.397	0.604	0.537	0.414	0.578	**0.729**

Customer focus (CFQ), Order fulfilment (OFQ),Timeliness (Tim), Information quality (IQ),

The square root of AVE highlighted in bold along the diagonal is greater than the correlation values for the corresponding latent variables. All the square root of AVE values are greater than the correlation values. Based on this, we can conclude that there are no discriminant validity issues.

Table 6.19

Heterotrait-monotrait ratio (HTMT)

	CFQ	IQ	OFQ	LOY	SAT	Tim
CFQ	-					
IQ	0.214	-				
OFQ	0.767	0.376	-			
LOY	0.514	0.247	0.515	-		
SAT	0.330	0.766	0.338	0.394	-	
Tim	0.544	0.766	0.756	0.538	0.741	-

Customer focus (CFQ), Order fulfilment (OFQ),Timeliness (Tim), Information quality (IQ), Satisfaction (SAT), Loyalty (LOY)

HTMT determine discriminant validity and encompasses a range of correlations that are greater than 0.10 and less than 0.90. The HTMT results table confirms this correlation range among the constructs, furnishing a secondary approach providing Discriminant Validity.

Model quality metrics

6.4.3 R-square values

Table 6.20

Table representing R-square values

	R-square	R-square adjusted
LOY	0.248	0.245
SAT	0.307	0.306

Satisfaction (SAT), Loyalty (LOY)

From the above table we can see that the independent variables has an effect on dependent variable loyalty to an extent of 24.5.%. i.e., it has explanatory power of 24%. We can say that there are other variables other than these variables that is influencing Loyalty. The logistics service quality has an effect on the satisfaction to an extent of 30.7%.

6.4.4 F-square values

Table 6.21

Table representing F-square values

	CFQ	IQ	LSQ	OFQ	LOY	SAT	Tim
CFQ							
IQ							
LSQ	0.906	0.707		1.991	0.181	0.443	2.560
OFQ							
LOY							
SAT					0.007		
Tim							

Customer focus (CFQ), Order fulfilment (OFQ),Timeliness (Tim), Information quality (IQ), Logistics Service Quality(LSQ), Satisfaction (SAT), Loyalty (LOY)

An effect size is considered small when the F square is greater than 0.02, medium if it is more than 0.15, and large when it is greater than or equal to 0.35. We can see that logistics service quality has an influence on loyalty which is greater than 0.15 and hence medium effect. We can see that it has high effect on the outcome variable loyalty because it has F square value of 0.443 which is higher than threshold value of 0.35.

Bootstrapping results

This statistical analysis of the proposed model is demonstrated by the tables and diagram presented. The inference was established by the t and p values that were stated. The hypothesized connections between the variables in the study were

examined and interpretations were made based on the t and p values. This is discussed further below.

Table 6.22

Table representing Boot strapping Estimates

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
LSQ -> LOY	0.444	0.444	0.048	9.188	0.000***
LSQ -> SAT	0.554	0.555	0.037	14.970	0.000***
SAT -> LOY	0.088	0.088	0.049	1.803	0.071^{NS}

****p<0.01, Significant, NS- Not Significant.*
Logistics Service Quality(LSQ), Satisfaction (SAT), Loyalty (LOY)

1. H0: There is no significant influence of Logistics service quality on satisfaction

   H1: There is a significant influence of Logistics service quality on satisfaction

Study hypothesis was proposed to understand the significant influence of Logistics service quality on satisfaction. The t-value of 14.97 shows that the relationship between Logistics service quality on satisfaction is statistically significant at 1 % level of significance. The p-value of 0.00 further supports the rejection of the null hypothesis because it is less than 0.01. Hence, null hypothesis (H0) is rejected, and the alternative hypothesis (H1) is accepted. Therefore, it can be concluded that logistics service quality has a significant influence on satisfaction.

2. H0: There is no significant influence of Logistics service quality on loyalty

   H1: There is significant influence of Logistics service quality on loyalty

Study hypothesis was proposed to understand the significant influence of Logistics service quality on customer loyalty. The t-value of 9.188 shows that the relationship between Logistics service quality on satisfaction is statistically significant at 1 % level of significance. The p-value of 0.00 further supports the rejection of the null hypothesis because it is less than 0.01. Hence, null hypothesis (H0) is rejected, and

the alternative hypothesis (H1) is accepted. Therefore, it can be concluded that logistics service quality has a significant influence on loyalty.

3. H0: There is no significant influence of satisfaction on customer loyalty.

   H1: There is significant influence of satisfaction on customer loyalty.

Study hypothesis was proposed to understand the significant influence of satisfaction on retention. The t-value of 1.803 shows that the relationship between information quality on performance is statistically significant at 1 % level of significance. The p-value of 0.071 further supports the acceptance of the null hypothesis as it is greater than 0.05. Hence, null hypothesis (H0) is accepted, and the alternative hypothesis (H1) is rejected. Therefore, it can be concluded that satisfaction do not have a significant influence on loyalty.

Table 6.23

Mediation effect of satisfaction

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
LSQ -> SAT -> LOY	0.049	0.049	0.028	1.764	0.078^{NS}

NS- Not Significant.
Logistics Service Quality(LSQ), Satisfaction (SAT), Loyalty(Loy)

4. H0: Satisfaction do not mediate the relationship between logistics service quality and loyalty.

   H1: Satisfaction mediate the relationship between logistics service quality and loyalty.

Study hypothesis was proposed to understand the significant mediating role of satisfaction between logistics service quality and loyalty. The t-value of 1.764 shows that the mediating relationship between logistics service quality and loyalty is statistically insignificant. The p-value of 0.078 further supports the acceptance of the null hypothesis as it is higher than 0.05. Hence, null hypothesis (H0) is accepted. Therefore, it can be concluded that satisfaction do not mediate the relationship

between logistics service quality and loyalty. Hence irrespective of the satisfaction, the logistics service quality directly influences loyalty. However, logistics service quality has a direct influence on satisfaction.

In nutshell, in the relationship of LSQ and shipper's export Performance, the study found that the factors such as Customer focus quality, Order fulfilment quality, Timelines have a significant relationship in the export performance. In the LSQ Satisfaction Loyalty Paradigm it can be said that the relationship between loyalty and the quality of the logistics service is not mediated by satisfaction. Thus, regardless of customer satisfaction, the LSQ has a direct impact on loyalty. Quality of the logistics service, however, directly affects satisfaction. studies proven that the in the B2B concept satisfaction do not always mediate the service quality and loyalty, Sales-Vivó et al.(2020) conducted a triadic study in the furniture industry, shown the same result.

6.5 An evaluation on changes in the perception of export performance

In this section, the researcher tried to know the changes in the perception of shippers regarding export performance in different periods. Here the researcher measured export performance on the three contexts like pre-covid era, covid era, and post-covid era using the same export performance measurement scale. Furthermore, some parametric tests such as t test, anova conducted for knowing whether there is any difference in the opinion based on the category of shippers.

6.5.1 Comparison of perception of export performance based on type of business

In order to test whether there is any difference in the perception of export performance amid these three periods, the researcher has undertaken independent T test, in which type of business is taken as grouping variable and export performance is taken as test variable. In this context the study has formulated hypothesis as given below.

Hypotheses

H0: There is no significant difference in the perception of shippers regarding export performance in the pre-covid period in accordance with type of business.

H1: There is a significant difference in the perception of shippers regarding export performance in the pre- covid period in accordance with type of business.

H0: There is no significant difference in the perception of shippers regarding export performance in the covid period in accordance with type of business.

H1: There is a significant difference in the perception of shippers regarding export performance in the covid period in accordance with type of business.

H0: There is no significant difference in the perception of shippers regarding export performance in the post- covid period in accordance with type of business.

H1: There is a significant difference in the perception of shippers regarding export performance in the post- covid period in accordance with type of business.

Table 6.24

Comparison of export performance and type of business (Independent T test)

Export performance	Type of Business				T Value	P value	Significance
	Single ownership		Partnership				
	Mean	Standard Deviation	Mean	Standard Deviation			
Pre-Covid	3.8500	0.72399	4.0000	0.81394	0.572	0.571	Insignificant
Covid	2.2097	1.14582	2.8182	1.64731	1.132	0.277	Insignificant
Post-Covid	2.8387	0.43083	2.7955	0.77313	0.229	0.820	Insignificant

Source: authors calculation based on field survey

As per the descriptive statistics, the mean score of export performance in the pre-covid era is shown as 3.85 ,which means most of the exporters are on opinion of excellent and good performance. Furthermore, as per the test result it has been found that, an insignificant difference in the perception based on type of business (pre covid era), that means the null hypothesis is failed to reject as the P value is 0.571. Similarly, during the covid pandemic the export performance has fallen down and the means score of the perception of shippers (single ownership) is 2.20, while of partnership firm's mean score is 2.81. In this case also the null hypothesis is failed to reject as the

P value is found as insignificant (0.27). Likewise, an insignificant difference also explicit in the case of post-covid era, the null hypothesis again failed to reject as the P value is not below 0.05.

In overall sense while analysing the export performance of the shippers amid these three periods, the performance was relatively better before covid outbreak (Mean score 3.85 and 4.00), Hence covid unexpectedly hit the shipping industry and causes a decline in the export performance and the mean score shifted to 2.20 (single ownership), 2.81 (Partnership firms).The reason for this massive decline is caused by international restrictions such as entry ban, Passenger flight cancellation, increased protocols etc. However, there is no significant change been noticed in the perception of export performance in the post covid era, and the difference in the perception of export performance with respect to the type of business is not significant, (P value is 0.82) the researcher is again failed to reject the null hypothesis.

6.5.2 Comparison of perception of export performance based on experience

Test of Anova is used for comparing the changes in the perception of shippers regarding export performance in accordance with experience of shippers during different periods. The hypothesis are as given below.

Hypothesis

H0: There is no significant difference in the perception of shippers regarding export performance in different periods based on years of experience.

H1: There is a significant difference in the perception of shippers regarding export performance in different periods based on years of experience.

Table 6.25

Comparison of export performance and experience (One-way Anova)

Export Performance	Shipping Experience				F value	P Value	Significance
	0 to 5	6 to 11	12 to17	Above 18			
Pre covid	a 3.1500 (.65192)	a 3.6542 (.66485)	a 3.7045 (.78117)	b 4.5000 (.25944)	8.413	.000**	HS
Covid	a 1.5500 (.32596)	ab 2.0625 (.98929)	ab 2.0455 (1.04772)	b 3.1786 (1.58244)	3.428	.027*	S
Post Covid	2.6500 (.54772)	2.9375 (.47822)	2.8409 (.30151)	2.7857 (.71291)	.371	.774	NS

Source: authors calculation based on field survey

Note: 1. Values within the bracket refers to SD
2. **denotes significant at 1% level
3. *denotes Significant at 5% level
4. Different Alphabet among experience denotes significant at 5% level using Dunken Multiple Range Test (DMRT)

All** with DMRT

Since P value is below 0.01. The null hypothesis is rejected at 1 % with regard to perception of export performance during the pre covid period. That means there is a significant difference in the perceptions of shippers with varied years of experience. Based on the Duncan Multiple Range Test (DMRT), shippers with experience of 0 to 5,6 to 11 and 12 to 17 not having the difference each other with respect to perception of export performance, Although the opinion of these three category is different from the opinion of shippers above 18 at 5% level of significance.

*Star

Since P value is below 0.05 the null hypothesis is rejected at 5 % with regard to perception of export performance during the covid period. That means there is a significant difference in the perception of shippers with varied years of experience. Based on the Duncan Multiple Range Test (DMRT), the opinion of shippers having experience up to 5 years is differ from the opinion of shippers above 18. However, the

perception of shippers with the experience of 6 to 11 and above 18 is differ from each other categories of age group at 5 % level of significance.

No star with no DMRT

There is no significant difference among the shippers with varied years of experience with respect to export performance in the post covid era as the P value is greater than .05. Hence the null hypothesis is failed to reject at 5% level, that means the opinion of export performance in accordance with different experience is found as insignificant differences.

6.5.3 Comparison of difference in the perception of export performance amid various periods

The researcher wants to investigate on the fact whether there any difference in the perception of exporters regarding their export performance as an impact of covid outbreak in the country. In order to measure the export performance, the variable such as achievement of the company's export goals and objectives, relative export sales and growth performance, market share in target markets and perception of export profitability with respect to major competitors has used. The study has considered three periods such as pre-covid, during the covid, and post covid export performance. Therefore, for analysing the impact of covid on export performance Paired T Test has been performed, may help the researcher to identify the differences of export performance before and after covid outbreak by comparing its means.

Hypotheses

H0: There is no significant difference in the perception of shippers regarding export performance during covid period and pre covid period.

H0: There is a significant difference in the perception of shippers regarding export performance during covid period and pre covid period.

H0: There is no significant difference in the perception of shippers regarding export performance during covid era and post covid era.

H1: There is a significant difference in the perception of shippers regarding export performance during covid era and post covid era.

Table 6.26

Comparison of export performance before and after covid outbreak (Paired T test)

Test		Mean	Std Deviation	T Value	Df	Sig	Reject/Fail to Reject	Remarks
Paired T test	Pre-Covid	4.21	0.37	12.55	41	0.000**	Reject	Highly Significant
	Covid Era	2.11	1.01					
	Covid Era	2.11	1.01	-.334	41	0.740	Failed to Reject	Insignificant
	Post Covid	2.13	0.37					

Source: Survey Data
Note:**denotes significance at 1%

The table demonstrates the results of paired T test. As per the analysis it has found that there is a statistically significant difference in the perception of export performance during pre-covid and covid period. That means alternative hypothesis is failed to reject. While considering the mean value of export performances on the pre-covid time (pre covid-Mean = 4.21, SD =.37) is higher compared to the perception of export performance in the covid period (Mean = 2.11, SD=. 1.01). Similarly, while comparing the export performances during covid era and post covid, mean of post covid export performance shows almost similar result (Mean=2.13 SD=.37), in this case also the null hypothesis is failed to reject as the significant value (0.740), which exceeds the threshold (0.05). That means the difference between the export performance of shippers amid covid time and post covid time is statistically insignificant. In light of the survey researcher's findings, the high freight charges imposed by airlines during the covid period continue to be imposed by airlines in the post-pandemic, explaining why the export performance has not changed significantly. In addition to the covid outbreak, exporters are facing a major challenge, as the government has withdrawn the GST exemption on air cargo movements, which is about 18%, which is not affordable to shippers in Kerala.

6.6 Conclusion

The goal of this chapter is identifying attributes and concept of logistics service quality. In this segment the researcher attempts to know the key attributes considered by the shippers for choosing third party logistics providers and the variables such as Reliability, Assurance, Tangibility, Empathy, Responsiveness and Cost have taken in to consideration. The results reveal that 'Cost', 'Responsiveness' and 'Assurance' are the most crucial factors in the selection of freight forwarders while outsourcing the logistics activities. Among all the factors shippers prioritise 'Cost' as the prominent attribute in which discount offerings and giving appropriate credit term have the highest importance ratings. Besides the cost, the study also reveals 'offering of one stop service', 'offering of track and trace option', 'owned overseas network', 'staff willingness to provide service' 'good care to customers, 'consolidation offering', 'keep customer information confidential' 'CRM', 'Accuracy of documents', 'modern Equipment' and 'owned CFS' as the significant logistics selection attributes.

'Cost' with regards to shipment directly affect the pricing of the commodities, shippers find hard to survive in the overseas market whenever they impose price which is relatively higher than the competitors. Therefore, an affordable shipment pricing is a major demand of the shippers. Similarly, 'Accuracy of documents' has a vital significance for shippers because the documents produced by the service provider are used as official evidence for the export and shippers view that 'accuracy of documents' as one of the most crucial service attributes. Any mistakes or inaccuracies in the documentation leads non-payment which causes incurring huge losses. Moreover, there is a strong influence of 'customer care' and 'CRM' on 3PL selection. The results suggest that choosing a service provider is largely depended by customer satisfaction and the quality of the relationship between shippers and service providers. Therefore, the 3PL Providers should think about making relationship marketing a fundamental component of its strategic marketing plan.

These findings are well supported by Mothilal et al., (2012) emphasizes relationship with clients and customer relationship management is treated as the key success factor. However (Phuong Vu et al., 2020) found delivery time and shipment condition

of the products are the highest demand of the shippers. Similarly (Uvet, 2020) found out that Timeliness and Order Condition, are leading two dimensions which makes LSQs competitive.

From the researcher's point, any company who wants to create a competitive advantage in business should give importance to satisfy customer's desires. Therefore, logistics companies cannot build any long-term relationship without understanding the fundamental factors behind the customers' behavioural intentions. One of the business implications of this research, logistics service providers can easily target what areas to concentrate for the purpose of the improve their LSQ. Additionally, by getting feedback from their customers, firms can easily enhance their service quality and can build a long-term relationship with their customers by meeting their expectations.

In short companies for its competitive advantage should be aware of customers (shippers) needs and wants. Freight forwarders won't be able keep a long-term relationship with shippers without knowing the fundamental factors behind the shipper's behavioural intensions. Therefore, the researcher believes that this research has some business implication as it ensures the key areas to concentrate to improve the efficiency of LSQ. In addition, the logistics firms can also make their service performance better and build a long-term bond with their clients by meeting their expectations.

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Chapter 7

Airline Service Quality in Cargo Operations

7.1 Introduction

In this chapter, the researcher attempts to explore the service quality of airlines with respect to cargo movement from Kerala. This study's goal is to pinpoint the major flaws and respondents' levels of satisfaction with the airlines in terms of handling of cargo. The researcher has selected third party logistics providers to measure the service performance of airline using a structured questionnaire. For this, 102 3PL providers were used by the researcher in the course of this investigation. In this chapter, the researcher firstly attempts to know demographic characteristics, then four service attributes of airlines namely tangibility, transportation ability, convenience, and personnel service were used to assess satisfaction of respondents with airline services with regards to air freight traffic.

7.2 Demographic Profile of the respondents

Table 7.1

Demographic Profile of the respondents

SL	Nature	Category	Frequency	Percent
1	Location	Kerala	62	60.7
		Other	40	39.2
		Total	102	100
2	Experience	0 to 5	6	5.9
		6 to 11	31	30.4
		12 to 17	51	50.0
		Above 18	14	13.7
		Total	102	100

Source: Field Survey

In the given table it is evident that majority of the respondents taken by the researcher is from Kerala (61%) anyhow 39% of the respondents are from outside Kerala such as Maharashtra, Karnataka, Tamilnadu, Hariyana. When it comes to the experience of the third party logistics providers, most of the respondents are belongs to the category of 12 to 17 (50.5%) and 30% of the respondents are having the experience on range between 6 to 11. Out of 102 sample size only 14 respondents belongs to the category of experience above 18.

7.3 Airline Service performance with regards to cargo handling

Table 7.2

Descriptive statistics of the Airline service attribute 'Tangibility'

Tangibility	Mean	SD
Adequate shipping spaces	1.97	0.68
Adequate shipping Routes	2.00	0.71
Adequate shipping flights	2.03	0.68
Adequate service branches	2.93	0.78

Source: Author's Calculation based on the field survey

Tangibility refers to the physical facilities offered by the airlines. Regarding tangibility elements all the items such as 'availability of shipping space', 'shipping routes', 'shipping flights' and 'adequate service branches' are showing mean value below 3, that means their satisfaction level is lesser. Lack of adequate shipping space is the biggest trouble faced by shippers and logistics service providers (Mean value=1.97). Next biggest concern of the respondents is lack of adequate shipping routes (Mean value=2.0098), that means the respondents are not at all satisfied with the present shipping routes, and they recommend more flight operations to various regions. While analysing the mean value, Adequate shipping flights is another bigger concern of the respondents, and mean value showing 2.03, which means most of the respondents are not satisfied with the 'Adequacy of shipping flights'.

Table 7.3

Descriptive statistics of the Airline service attribute 'Transportation ability'

Transportation ability	Mean	SD
Punctual cargo delivery	3.06	1.23
Perfect cargo delivery	3.00	0.77
Accurate cargo delivery	3.08	1.43
Compensation for service misses	1.98	0.70

Source: Author's Calculation based on the field survey

Transportation ability dimension discusses about the punctuality, perfection and accuracy of cargo delivery. The mean value of all the items shows the intensity of satisfaction regarding service of cargo delivery. All the mean value shows above 3, except the fourth item. The respondents are satisfied with punctuality of cargo delivery, perfection and accuracy of cargo delivery and the mean value is 3.06, 3.00, 3.08 respectively. However, in the fourth item in the dimension of 'transportation ability' the respondents are highly dissatisfied with respect to 'compensation of service misses', of which the mean value is 1.98.

Table 7.4

Descriptive statistics of the Airline service attribute 'Convenience'

Convenience	Mean	SD
1. Information system support	3.83	0.71
2. Flexible payment ways	4.07	0.90
3. Convenient inquiry service	3.98	0.80
4. Flexible booking time	4.05	0.81

Source: Author's Calculation based on the field survey

Convenience dimension comprises of information system, flexible payment method, convenient inquiry, and flexibility of booking time. Respondents responses towards this dimension is positive and satisfactory. The mean value of the 'flexibility of payment ways' is 4.07 is highest mean value in this factor and which is followed by flexible booking time (Mean value=4.05). The rest of two items namely 'information

system support' and 'Enquiry convenience' also having a mean value above 3, which says the respondents are satisfied.

Table 7.5

Descriptive statistics of the Airline service attribute 'Personal service'

Personal service	Mean	SD
1. Professional capability	3.37	0.97
2. Response for complaint	2.64	1.18
3. Unified service window	3.20	1.19

Source: Author's Calculation based on the field survey

In the personal service attributes the responses towards 'professional capability' and 'unified service window' is satisfactory, the mean value is 3.37 and 3.20 respectively. Although the mean value of 'response for complaints' is 2.64, which is below 3 ,that means most of the respondents dissatisfied with the factor 'response of airlines towards complaints'.

7.4 Parametric test to know the differences in the perception

7.4.1 Independent sample T test

The researcher has undertaken the independent T test to find out whether there is any difference in the perception of LSPs regarding service performance of airline based on different categories. The hypothesis is as given below.

H0: There is no significant difference in the opinion of LSPs regarding airline service quality based on the state.

H1: There is a significant difference in the opinion of LSPs regarding airline service quality based on the state.

Table 7.6

Comparison of perception regarding service quality of airlines (Independent t test)

Airline Service Performance	Category				T Value	P value	Significance
	Kerala		Other				
	Mean	Standard Deviation	Mean	Standard Deviation			
Tangibility	8.5778	2.61542	7.5965	2.37441	1.982	.060	Insignificant
Transport Ability	16.8444	1.39733	16.4737	1.73314	1.166	.246	Insignificant
Convenience	15.7333	3.12177	16.1228	2.92813	.648	.519	Insignificant
Personnel Service	10.4444	2.80061	10.8070	3.17039	.603	.548	Insignificant

Source: Author's Calculation based on the field survey

The above table shows, the analysis of Independent T test, the mean and standard deviation of each category is also shown in the table. As per the Leven's Test for equality of variance the results of 'Tangibility' shown 0.515 which is above 0.05, therefore equal variance is assumed and P Value is 0.060 which is above 0.05. As the P value is above the threshold the null hypothesis is failed to reject, that means there is no significant difference in the perception airline service quality among the LSPs from Kerala and other states. Similarly, the significance value of Levene's test of equality of variance of the variable named 'transportation ability' is 0.062 is also above 0.05, therefore equal variance is assumed, and found an insignificant relationship between the two categories, as a result the second hypothesis regarding transport ability also failed to reject. The third dimension is 'Convenience', the P value again shown insignificant (0.519) as it is above 0.05, Then researcher again failed to reject the null hypothesis. Thus, it is evident that there is no significant difference in the perception of airline services among the respondents from Kerala and respondents outside Kerala. The null hypothesis with regards to 'personnel service' is also failed to reject as the P value is above 0.05. In short there is no changes in the opinion of LSPS regarding service performance of airlines with regard to cargo handling from Kerala.

7.4.2 One-way Anova

Test of Anova for comparing the changes in the perception of LSPs with regards to Airline service quality in accordance with experience of shippers.

Hypothesis

H0: There is no significant difference in the perception of LSPs with regards to Airline service quality based on experience.

H1: Alternate hypothesis: There is a significant difference in the perception of LSPs with regards to Airline service quality based on experience.

Table 7.7

Anova test on service attributes of Airlines based on the experience

Service Attributes of airlines	Experience of the Respondents				F value	P Value	Significance
	0 to 5	6 to 11	12 to 17	Above 18			
Tangibility	6.6667 (2.06559)	8.8387 (2.20751)	7.8235 (2.62073)	7.5714 (2.68082)	1.975	.123	Insignificant
Transport Ability	17.5000 (1.22474)	16.5484 (1.70956)	16.7843 (1.59140)	15.9286 (1.32806)	1.715	.169	Insignificant
Convenience	16.8333 (2.71416)	15.7097 (3.13256)	16.0196 (3.01656)	15.8571 (3.03460)	.247	.864	Insignificant
Personnel Service	7.3333 (3.26599)	10.3548 (2.78745)	10.2143 (2.83314)	10.6471 (3.14223)	3.809	.012*	significant

Source: Authors calculation based on field survey
Note: Values within the bracket refers to SD

The researcher has undertaken Anova test for identifying difference among respondents in the perception of service performance of airline with respect to years of experiences. In this, Experience has taken as grouping variable (independent variable),and service attributes of Airlines has taken as test variable (dependent variable).The P value of 'Tangibility' is 0.123 which is greater than 0.05, therefore the null hypothesis failed to reject and the results reveal that there is an insignificant difference in the perception with regards to experience. The P value of the second attribute (Transport Ability) is 0.169, which is greater than the threshold (0.05), the

null hypothesis in this case also failed to reject. Regarding the 'convenience' attribute the results again shown as insignificant and the null hypothesis failed to reject as the P value is above .05 (0.864).

Furthermore, a significant result found in the case of the factor 'Personnel service' as its P value shows 0.01, indicates there is significant difference in the opinion with respect to airline service quality among different respondents. The study also deployed DMRT test of Post hoc analysis and found out that, the perception of the 3PLs having the experience above 16,11 to 15 and 6 to 10 are more less similar. However the perception varies among the respondents below 5 years of experience.

7.5 Conclusion

The assessment of airline service quality pertaining to cargo movement has been explored through the perception of third-party logistics service providers. Specifically, in the dimension of 'tangibility,' it is observed that these providers express dissatisfaction with prevailing airline services, particularly in aspects such as adequate shipping spaces, routes, flights, and service branches. However, there is a positive perception regarding the punctuality and accuracy of flight operations. Contrastingly, there is a notable disagreement among respondents regarding airline's failure to ensure compensation for service misses. Additionally, a significant majority of shippers are dissatisfied with the airlines' responsiveness to complaints.

In summary, the study highlights the tangible shortcomings perceived by third-party logistics providers in current airline services for cargo movement. While some operational aspects receive favourable feedback, concerns around compensation for service misses and complaint resolution indicate areas for improvement to enhance overall satisfaction in the logistics industry.

Chapter 8

Findings and Conclusion

8.1 Findings on trends and prospectus of agricultural product exports from India

- Several agricultural and food products, including Non-Basmati rice, Dairy products, Milled products, and Betel Leaves & Nuts, are currently witnessing significant growth trends. Among agricultural commodities, Millets lead the way with an impressive 39% compound annual growth rate (CAGR), while other cereals and animal casings show CAGRs of 37% and 31%, respectively. Notably, wheat and casein products have also exhibited remarkable growth over the past decade, with a 26% CAGR. Wheat exports experienced a substantial surge in 2020-2021 compared to the previous year (2019-2020), with a remarkable 247% growth in 2021-2022. Additionally, there has been a notable increase in the export of walnuts, these trends indicate promising opportunities in the mentioned agricultural and food product sectors, making them attractive for potential investments or business endeavours due to their growing market demand.

- The most of India's agricultural exports are towards South Asian nations (32% of total exports in the year 2021-2022) followed by West Africa (16%), ASEAN (14%), GCC (10%). The country exports 32% of its total exports to South Asia, 16% to West Africa and 14% to ASEAN nations. Bangladesh is the largest importing nation with respect to agricultural products from India. Nepal as the member of SAFTA is the second largest importing nation relying Indian agricultural market, country exported 3371058.57 MT, in value terms it is 1100361321 US$. The third largest importing nation is Vietnam which is also an ASEAN member. Countries such as UAE, Sri Lanka, Indonesia and

Malaysia are some of the major export markets for Indian agricultural products.

- The study reveals trade trends during the 2019-2020 and 2020-2021 periods. In 2019-2020, exports to various regions, such as South Asia, ASEAN, GCC, and West Africa, decreased. However, trade remained stable in certain regions like North America, Northeast Asia, North Africa, the European Union, Other European Countries, and Other CIS countries. In 2020-2021, there was a significant increase in exports, especially to South Asian regions, ASEAN, GCC, West Africa, Northeast Asia, and West Africa. India set a new record by exporting 4,683,658,825 MT to the South Asian region in 2021-2022. Import of Indian agricultural products in ASEAN saw substantial growth, while trade with GCC remained constant. Furthermore, West Africa, North East Asia, and East Africa showed similar trade patterns.

- In the year 2019-2020 as any other sectors of the economy, covid inception shrunk Indian agricultural exports also. Which supports the findings of (Ahn & Steinbach, 2022),the author concluded that adverse trade effect of 35.9% was identified within the agriculture and food sector. But a massive growth found in the year 2020-2021, 2021-2022.

- Shippers choose the mode of shipment in accordance with the perishability of the items, that means perishability has the highest priority as far as an agricultural product exporting firm. Therefore, Air mode of transportation is recommended as it is the fastest mode of transportation to maintain the freshness of commodities. However outbreaks tend to have a more significant impact on airfreight and land freight, while ocean freight, is not statistically significantly affected (Xu et al., 2021).

8.2 Findings on role of civil aviation in agricultural exports

- In India Karnataka has the most aviation freight traffic, shipped 40650MT to UK, Netherlands, UAE, Canada, Kuwait, Qatar, Germany, Singapore, France, Italy, Bahrain, Oman, Saudi Arabia in the year 2021-2022. Meanwhile Kerala

is the second largest state with regards to aviation freight traffic, mostly the shipment is towards GCC countries such as Oman, Qatar, UAE, KSA, Bahrain, Kuwait. An insignificant export volume found (636.18 MT) to United Kingdom in the same period. The civil Aviation of Tamil Nadu shipped 15879 MT APEDA products in the year 2021-2022. The major destinations are Singapore, Kuwait, UAE. The majority of air cargo traffic from Kerala is directed towards the UAE, followed by Qatar, Kuwait, Oman, Saudi Arabia, and Bahrain. Cargo travel to the Maldives, the UK, and Canada is significantly fewer due to the restricted number of aircraft operations.

- Fresh fruits and vegetables are the major products exported to various nations from Kerala via aircraft. However, the shipment of products like flower, diary products, processed vegetables are comparatively lesser. The exports of flowers from Kerala disrupted due to covid outbreak,

- The air cargo traffic from Cochin International Airport, the primary destination is the GCC countries. Between 2014 and 2020, the Compound Annual Growth Rate (CAGR) for shipments to South Asia, Latin America, and North America stood at 36%, 41%, and 24%, respectively. Although the station maintains flight operations to European countries, African countries, and America, this allows exporters to access these markets. However, it's worth noting that the export volume to these regions remains relatively low.

- Cochin International Airport witnessed a significant drop in cargo volume bound for the GCC region due to COVID-19-related flight restrictions. However, there was a slight recovery in the 2021-2022 and 2022-2023 periods. Surprisingly, freight volume to the South Asian region increased notably in 2021-2022, despite facing COVID-19 restrictions. In 2022-2023, the total freight volume to the same region reached 1629.97 metric tons. Air cargo traffic displayed a gradual upward trend in regions like North America and other European countries, though the volume remained relatively low. Notably, there was a slight decrease in air cargo traffic to the European Union in 2021-2022 during the peak of the virus spread.

- In Trivandrum station, the majority of freight is directed towards GCC countries, but there has been a declining trend with a -4% Compound Annual Growth Rate (CAGR). Freight movement to nearly all other regions has also shown decreasing growth rates, except for other European countries and North America. Overall, cargo movement from the station is regressing. Following the COVID-19 outbreak, there were no air shipments to Central Africa, other CIS countries, Northeast Asia, East Africa, and other West Asia. Additionally, air shipments to the ASEAN region have been significantly reduced, with no shipments reported in the year 2021-2022. In summary, freight movement from Trivandrum International Airport to all regions, except for GCC and South Asia, has decreased.

- Air cargo traffic from Calicut International Airport is predominantly directed towards GCC countries, and the volume has remained relatively consistent from 2014-2015 to 2019-2020. There was a noticeable increase in export volume to European sectors up until the year 2018-2019. The reason for minimal or zero freight movement to most other regions is the lack of aircraft operations from the station. After COVID-19, air cargo from Calicut is decreasing, and there's very little or no volume of export to regions other than GCC countries.

8.3 Findings based on demographic profile of the shippers

- Majority of the shippers in Kerala are carrying their business as single ownership (78.6%), and 21.4% shippers are partnership firms.

- The majority of shippers (83.3%) are graduates, while only 4.8% are postgraduates.

- Most of the shippers are belongs to the category of experience above 18% (38.1%), approximately 29% of the respondents are in the category of experience between 12-17.

- 42% of the shipping firms have employees on a range between 6 to 11, While 21.4% of shipping firms have number of employees above 18.

- Most of the shippers in Kerala do air shipment only (61.9%), The rest of respondents are carrying not only air shipment but also container shipment.
- Most of the shippers are receiving their payments on credit basis (50%), while only 12% respondents are getting their payment in advance.
- Only 64% of the respondents are availing export promotion schemes like RODTEP, APEDA, the rest of respondents are on opinion that no such schemes are presently prevailed.
- Shippers mostly do not rely on export promotion council, trade fairs, Indian embassies abroad, foreign embassies India, trade promotion office, B2B Portals, Shipment data, Buying and commission agent as a means for identification of international buyers.
- The shippers are mostly relying own buyers, friends and relatives to find their markets, as it found to be safe and do not have any credibility issues.
- Shippers use different international airports within Kerala Interchangeably for their operation based on the sectoral availability, space availability, and price charges.
- 24% of the respondents relying other international airports outside Kerala, such as Mumbai, Mangalore, Hyderabad, Bengaluru, Chennai considering aircraft operation and space availability, and price differences.

8.4 Findings on problems faced by shippers in the air cargo logistics

- 'Cargo Congestion', 'Incapability of handling future demand cargo', and 'improper utilisation equipment' are the most serious problems (Mean value of 4.26,3.52,3.45 respectively) Perceived by shippers in Kerala among the infrastructure related issues.
- Majority of the shippers opined that 'Lack of dedicated terminal space' and lack of skilled manpower are important challenges faced by shippers with respect to cargo operation related issues.

- ‘Careless of employees leads to damage’ is another serious issue faced by the shippers with regards to packaging related issues (Mean value is 4.69), followed by ‘improper handling leads to damage’ (Mean value is 3.73).

- The opinion of shippers regarding customs clearance and documentation is positive, and that means the respondents are satisfied with the present customs clearance and documentation (mean value of all the items is below 2).

- Regarding the ‘Truck lay bay and spill over’, shippers mostly are on the same opinion that ‘By loading spill over cargo exact cargo to load in airline gets damaged’. But ‘Shortage of proper customs officers at customs’, ‘Carelessness of manpower’, ‘increase in the passenger baggage’ causes delay cargo movement are the major issues found in the air cargo logistics in Tamilnadu (Vasantha, 2019).

- The results of parametric tests (Independent T test, Anova) shows that shipper’s perception regarding the problems in air cargo logistics is more or less similar. That means their opinion do not vary according to their demographic characteristics like ownership, Availability of export promotion scheme, modes of payment and experience.

8.5 Findings on shipper’s selection criteria on 3PLS providers

- The study has found out that ‘Short transit time ‘and ‘accuracy of time’ are the biggest concern of the shippers while choosing the third-party logistics service providers (mean value is 3.85 and 3.35 respectively) in the factor reliability.

- In assurance dimension the respondents rated the importance more on ‘offering of one stop service’, track and trace service offering, and ‘no damaged goods while in transit’ as the key attributes while choosing the 3PLS providers.

- Owned overseas network, staff willingness to provide services, good care to customers and consolidation offering are highest priorities of shippers regarding the responsiveness factor.

- In the factor empathy shippers focus more on 'customer relationship management' and 'care for customer needs and interests'.

- Cost is the prime factor considered by the shippers, 'appropriate credit term' and the 'discount offerings' are the key attractions of shippers in the selection of 3PLS in Kerala. Which supports the work of (Wilding & Juriado, 2004),argues that Selection and renewal of 3PLs were highly influenced by service quality and cost.

8.6 Findings on Export performance and the intensity of covid outbreak among shippers

- According to the descriptive statistics, the average export performance score in the period before the COVID-19 pandemic is reported as 3.85. This indicates that a majority of exporters perceive their performance as either excellent or good. Additionally, the test results suggest that there is no significant difference in the perception of export performance among different type of shippers.

- However, the export performance amid covid era is significantly varies according to the demographic profile of the shippers (experience level).

- Exporters with a high profile, such as those with extensive experience, multiple branches, and diversified transportation methods, have demonstrated a lower vulnerability to the impact of the COVID-19 outbreak. These market leaders could afford increased freight charges imposed by the airline and gained high profit margin through largescale businesses. whereas the exporters with poor financial capability struggled to survive in their export business, some of them switched their operation permanently.

- Exporters with limited financial resources faced significant difficulties in sustaining their export businesses, and some of them made the decision to permanently switch to different operations. This finding is also supported (Daley et al., 2022) and proven that intensity of virus outbreak varies in

accordance with demographic profile of the business, small enterprises were seemingly susceptible to the vulnerabilities.

- The structural equation model indicates that logistics service quality has a significant impacts on satisfaction and loyalty. It's important to note that while logistics service quality directly affects both satisfaction and loyalty, satisfaction does not act as a mediator in the relationship between logistics service quality and loyalty.

- While the relationship between Logistics Service Quality (LSQ) and export performance is noteworthy, it's important to highlight that factors such as customer focus, order fulfilment, and timeliness also play significant roles in influencing performance. LSQ contributes to export performance by explaining 39.4% of its variance, indicating a substantial explanatory power. However, this suggests that there are additional variables beyond these factors that have an impact on performance. The study supports the findings of Gotzamani et al., (2010) demonstrated a strong correlation between financial performance and the level of service quality in logistics.

8.7 Findings on service quality of airlines

- The major issue experienced by shippers and logistics service providers is lack of availability of shipping space, as indicated by a mean value of 1.97. Following closely, the respondents express dissatisfaction with the current shipping routes, as evidenced by a mean value of 2.00. This suggests that respondents are not satisfied with the existing routes and recommend an increase in flight operations to various regions. Apart from that Adequate shipping flights is another significant concern of the shippers (shown with a mean value of 2.03)

- With regards to the 'convenience' the shippers are highly satisfied with all the facts such as Information system support, flexible payment ways, convenient inquiry service, Flexible booking time. The rating for 'response to complaints' is 2.64, indicating that the parties are dissatisfied. This suggests that the

majority of respondents express dissatisfaction with the way airlines handle complaints. However the biggest concern in Taiwan logistics providers is perfect cargo delivery information system support and Adequate shipping spaces (Huang et al., 2016). Meanwhile, the third party logistics service providers are happy with factors like professional service quality and a unified service window provided by airlines.

- The respondent's opinion regarding the service quality of airlines is similar, Except 'Personnel service 'that means opinion do not vary according to their demographic profile.

8.8 Conclusion

Civil aviation and air cargo logistics play vital roles in the interconnected world. Civil aviation not only offers prompt comfortable passenger travel, but also promotes cross border trade and cultural exchange. Air cargo logistics serve as a crucial element for international trade, ensuring unparalleled speed in transporting time-sensitive and high-value goods.

This study highlights the critical importance of assessment of the service performance of air cargo logistics sector through the perception of stake holders, Particularly shippers and third-party logistics providers (3PLs). The investigation intended to determine the degree to which these services meet the needs and expectation of their clients. The findings demonstrate the efficient functioning of the customs department in Kerala, nevertheless study also highlights several challenges like cargo congestion and employee's carelessness, non-availability of space, inadequate shipping routes, excessive freight charges, cargo offloading problem, lack wider body aircraft etc.

Despite the resilience of agricultural product exports in India during the virus outbreak, a primary data analysis reveals that smaller exporters encountered significant challenges. This was primarily due to the substantial rates imposed by airlines. Hence Exporters with high profiles relied on evacuations and charter flights for large-scale shipments and gained more profit.

As a result of the research analysis and findings, the study emphasises the necessity of pro-active measures to improve infrastructural facilities, optimize shipping routes, and streamline the operation procedures in air cargo logistics sector. Apart from that, the study advocates need for a collaborative effort among the parties including government, airlines and logistics service providers to mitigate the difficulties of cargo congestion and cargo offloading. A strong recommendation is extended highlighting the importance of specifically designed support systems for smaller exporters during times of crisis, by considering their susceptibility to fluctuations in the economy. The study's conclusions also provide a basis for strategic interventions and policy modifications in the air cargo industry, under given global uncertainties.

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Chapter 9

Recommendations and Further Scope

9.1 Recommendations

- In order to tackle the shortage of international routes from Kerala, the study suggests fostering partnerships with foreign airlines. Encouraging code-sharing agreements or joint ventures on international routes would significantly contribute to addressing this issue and also enhance global connectivity from the region.

- Addressing the challenge of limited space, study recommends to ensure sufficient space for cargo, through dedicated freighter services, so that the industry can accommodate larger shipments and enhance overall logistics efficiency.

- To reduce the burden of high airline charges, it is recommended to extend initiatives such as providing incentives or subsidies to airlines operating cargo-only flights. This strategic approach intends to make freight services more affordable for both airlines and shippers. By incentivizing cargo-specific operations, the industry can potentially reduce overall charges, helps to make more competitive and affordable environment for businesses engaged in international trade.

- Better infrastructure to accommodate wider body aircraft is also recommended, as it found to be essential for optimizing air transportation capabilities. Investments should be directed towards upgrading airport facilities, runways, and taxiways to meet the specifications of wider body aircraft.

- Enhance communication and coordination between airlines, airport authorities, and cargo handlers to minimize the offloading of cargo due to passenger baggage concerns.

- It is essential to make investments in more X-ray machines and equipment in order to reduce the backlog at customs. This will speed up cargo inspections, improving productivity and cutting down on clearing procedure delay.

- India ought to provide special support to small exporters, drawing inspiration from the Australian government's initiative, the Package Assisting Small Exporters (PASE). This program is designed to help small exporters overcome challenges such as virus outbreaks and other uncontrollable international issues.

9.2 Further scope

- The study can be extended to incorporate parameters like export value and trade balance, may ensure an in-depth understanding of export trends and prospects. Examining these extra variables would provide a thorough understanding of the economic ramifications, assisting stakeholders and policymakers in developing focused plans for trade optimisation and sustainable growth.

- Explore the adoption of novel technologies such as lean six sigma, AI in air cargo logistics to enhance efficiency, traceability, and transparency, which enables to address industry gaps in technological adoption.

- Examine the obstacles caused by various international regulations on air freight movement and explore potential opportunities for standardization or harmonization to streamline processes and reduce complication.

- Evaluate the long-term effect of global events, such as pandemics or trade disputes, natural disaster, geo-political issues, on agricultural exports. Examine the risk reduction strategies and adaptive measures for agricultural supply chains.

- Examine the adaptable strategies taken by shippers in the air cargo reaction to the post-COVID-19 environment. Examine re-organisation of supply chain, demand dynamics, and explore the modifications in operational procedures undertaken to align with the emerging concept of the 'new normal.'
- Investigating technological advancements, sustainability practices, regulatory frameworks and the impact of global events, in the field of maritime logistics.

Appendices

Appendix I

QUESTIONNAIRE FOR SHIPPERS

Section I

Demographic Profile

Location	:	……	
Ownership	:	☐ Single owner	☐ Partnership
Educational Qualification	:	☐ SSLC	☐ Plus Two
		☐ UG	☐ PG
Year of Experience	:	☐ Below 5	☐ 6 to 11
		☐ 12 to 17	☐ Above 18
Number of Employees	:	☐ Below 5	☐ 6 to 11
		☐ 12 to 17	☐ Above 18
Nature of building	:	☐ Hired	☐ Owned
Type of Shipment	:	☐ Air Only	☐ Air & Container
Type of Payment	:	☐ Credit	☐ Advance
		☐ Both	
Export Promotion schemes	:	☐ Yes	☐ No
Number of Branches	:	☐ Yes	☐ No

Section II

1. Kindly Rate the frequency of exports to the following mentioned countries.

(5 –Always, 4 – Very Often, 3 – Sometimes, 2 – Rarely, 1 –Never)

Destinations	**1**	**2**	**3**	**4**	**5**
Bahrain					
Kuwait					
Oman					
Qatar					
KSA					
UAE					
Other					

2. Kindly Rate the importance of various bodies and institutions for the identification of buyers in the overseas market (5-- Highly Aware,4-Aware,3-Neutral,2-Not Aware.1- Highly not Aware)

Bodies/Institutions	**1**	**2**	**3**	**4**	**5**
Export Promotion Council					
Trade fairs					
Indian Embassies abroad					
Foreign Embassies in India					
Trade promotion office					
International Chambers					
B2B Portals					
Shipment data					
Buying Agent					
Commission Agent					
Friends and relatives/ own buyers					

3. Kindly rate the frequency of shipments through different International Airports

International Airports	**1**	**2**	**3**	**4**	**5**
Calicut International Airport					
Cochin International Airport					
Trivandrum International Airport					
Kannur International Airport					
Other					

Section III

4. Kindly rate the problems faced by the shippers in the air cargo logistics (5 - Strongly Agree, 4- Agree, 3- Neutral, 2- Disagree,1 – Strongly Disagree)

Problems in Air Cargo Logistics	**1**	**2**	**3**	**4**	**5**
Infrastructure related issues					
Airport is incapable to deal future demand cargo					
Cargo Congestion in the airports					
Equipment's are not utilized properly					
Not adoptable to new technology style					
Cargo operations related problems					
Lack of skilled manpower					
Inadequate use of technology					
Lack of dedicated terminal space and facilities for airlines					
Delay in custom procedure and documentation					
Lack of efficiency level of ground handling agents within airports					
Packaging related Problems					
Improper packaging of cargo leads to damage					

Pilferage					
Carelessness of employees leads to damage					
Improper handling leads to damage					
Customs related Problems					
24*7 services are not available					
Clearing process are sometimes delayed					
Documentation is not completely digitalized					
Proper officers are not available at all time					
Single window system is not effective					
Truck lay bay and spillover related problems					
Cargo gets delayed due to increase in cargo					
By loading spill over cargo exact cargo to load in airline gets damaged					
Lack of parking space					
System procedural delay					

5. Kindly rate your opinion on the following factors regarding the selection of Third-Party Logistics service providers. (5: Highly Important, 4: Important, 3: Neutral,2:least Important ,1:Not Important)

Selection Criteria	**1**	**2**	**3**	**4**	**5**
Reliability					
Accuracy of documents					
Short transit time					
Consistency of the service					
Assurance					
Firms reputation					
Track and trace service offering					
No damaged goods while in transit					
Staff's knowledge and expertise					
Offering of one stop service					

High standard service					
Tangibility					
Location of 3PL					
Modern Equipment's					
EDI&E-Commerce Service Offering					
Owned CFS					
Empathy					
Keep customers' information confidentially					
Care for customers' needs and interests					
Customer Relationship Management (CRM)					
Responsiveness					
Fast responses to customers' requests					
World-wide service offering					
Offering of updated freight rates					
Good care of the customers					
Owned overseas network					
Consolidation offering					
Variety of services					
Express delivery service offering					
Staff Willingness to provide Service					
Responsiveness of the service					
Cost					
Reasonable price					
Ease of payment					
Appropriate credit term					
Discount offering					

6. Kindly rate your perception regarding the service quality of 3rd party logistics services in Kerala. Please rate the following elements using Likert scale (5: Highly Satisfied, 4: Satisfied, 3:Neutral,2:Dissatisfeid ,1:Highly Dissatisfied)

Factors	**1**	**2**	**3**	**4**	**5**
Response to meet customer needs					
Expertise and knowledge to meet customer wants					
Competence of staffs					
Handling of customers' claim, complaints and returns					
Order accuracy (meeting customers' requirements)					
Order condition (free of damage, fault or loss)					
Order discrepancy handling					
Service performance consistency					
Delivery without loss or damage					
Total order cycle time					
Order placement convenience					
Transportation time					
Back-order time					
IT and EDI application in customer service					
Introduction of IT innovation in customer service					
Order information availability					
We are delighted with overall service relationship					
We wish more of our suppliers like this					
Consider this supplier your first choice to buy these services					
If all other attributes are similar (price, product, quality)we will buy always to this supplier by their logistics service					

Section IV

7. Kindly rate the effect of covid outbreak in shipping operation:

High	Moderate	Low

8. Kindly rate your opinion regarding the export performance amid different periods. Please rate the following elements using Likert scale (5:Excellent, 4: Good,3:Average,2:Poor,1:Very Poor)

Performance Indicators	Pre-Covid era					Covid era					Post-Covid era				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Achievement of the company's export goals and objectives															
Relative export sales and growth performance															
Market share in target markets															
Perception of export profitability with respect to major competitors															

Suggestion :

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THANK YOU

Appendix II

QUESTIONNAIRE FOR THIRD PARTY LOGISTICS PROVIDERS

SECTION I

Location : ……..

State : Kerala/Other

Experience : ☐ Below 5 ☐ 6 to 11

☐ 12 to 17 ☐ Above 18

SECTION II

Variables	1	2	3	4	5
Tangibility					
1.Adequate shipping spaces					
2.Adequate shipping Routes					
3.Adequate shipping flights					
4.Adequate service branches					
Transportation Capability					
1.Puctual cargo delivery					
2.Perfect cargo delivery					
3.Accurate cargo delivery					
4.Compensation for service misses					
Convenience					
1.Information system support					
2.Flexible payment ways					
3.Convenient inquiry service					
4.Flexible booking time					
Personnel service					
1.Professional capability					
2.Response for complaint					
3.Unified service window					

Kindly mark your satisfaction level of following service factors of Airlines with respect to cargo movement (1: Highly Dissatisfied, 2: Dissatisfied, 3: Neutral,4:Satisfeid ,5:Highly Satisfied)

Appendix III

QUESTIONNAIRE FOR AHP ANALYSIS

Kindly rate the relative importance of following criteria using nine point scale (1:Equal Importance, 3:Moderate Importance, 5:Strong Importance, 7:Very Strong Importance,9:Extremely Important)

Comparison among Criteria

Criterion 1	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**Criterion 2**
Perishability																		Cost
Perishability																		Quantity
Perishability																		Urgency
Cost																		Quantity
Cost																		Urgency
Quantity																		Urgency

Comparison among Alternatives on the basis of criterion 1: "Perishability"

Alternative 1	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**Alternative 2**
Container shipment																		**Air Shipment**

Comparison among Alternatives on the basis of criterion 2: "Cost"

Alternative 1	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**Alternative 2**
Container shipment																		**Air Shipment**

Comparison among Alternatives on the basis of criterion 3: "Quantity"

Alternative 1	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**Alternative 2**
Container shipment																		**Air Shipment**

Comparison among Alternatives on the basis of criterion 4: "Urgency"

Alternative 1	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**Alternative 2**
Container shipment																		**Air Shipment**