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POSTGRADUATE PROGRAM

THESIS ON DETERMINANTS OF GROUND HANDLING SERVICE PERFORMANCE:EMPIRICAL EVIDENCE FROM ETHIOPIAN AIRLINES GROUP

BY: DerejeKuma (GSE/0646/14)

ADVISOR: YitbarekTakele (PhD)

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STATEMENT OF DECLARATION

I, DerejeKuma, have carried out independently the research entitled ***"Determinants of ground handling service performance: Empirical evidence from Ethiopian airlines group (EAG)"*** in partial fulfillment of the requirement for Master of Arts Degree in International Business with close advice and support of my advisor. This study is entirely my own work, and it has not been submitted to any other institution for a similar purpose or other academic award. In addition, all reference materials contained therein have been duly acknowledged.

Name of the student: **DerejeKumaAyana**

Signature: _____

Date:_____

Addis Ababa University

School of Graduate Studies

Statement of Certification

This is to certify that the study prepared by Dereje Kuma, entitled ***"Determinants of ground handling service performance: Empirical evidence from Ethiopian airlines group (EAG)"*** and submitted in partial fulfillment of the requirements for the Master of Arts Degree in International Business complies with the regulations of the program and meets the accepted standards with respect to originality and quality.

Signed by the Examining Committee,

Examiner I: Salamlak Mola (PhD) Signature: _____ Date: 16/09/2024

Examiner II: Zelalem Getasik Signature: _____ Date: 16/09/2024

Advisor: **Dr. Yitbarek Takele (PhD)** Signature: _____ Date: 13/09/2024

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DerejeKuma

ABSTRACT

This study has been conducted on Determinants of ground handling service performance with the special emphasis on Ethiopian airlines group (EAG). The major objective of the study was to assess the factors affecting ground handling service and the performance of ground handling service of EAG .Specifically, the study focused on assessing how Infrastructure and facility, supplier relationship, availability of *skilled manpower, Integration and communication, passenger, cargo and ramp handling service, Regulation and communication and safety and security affect the ground service performance of EAG. To realize these objectives, the researcher adopted a mixed research approach with descriptive research design. Both primary and secondary sources and types of data were utilized for the study. As primary data collection tools, self-administered survey questionnaires that were measured by Likert scale were used. Semi-structured interviews were also held with six interviewees of each unit representative. The questionnaires were sent for 118 respondents via outlook of which 91questionnaire were successfully received/collected. Moreover 384 questioners were distributed for premium passengers and 336 questioners were collected successfully. Document analysis was also done to collect secondary data. The collected primary data were presented in tables and analyzed using SPSS version 26. The findings of the study indicate thatall variables of the study which includesupplier relationship, integration and communication, infrastructure and facility, skilled manpower have positive and significant effects oncompetitiveness of EAG. But data obtained from the interview indicates that a critical issues both infrastructure and skilled manpower and negatively affecting the ground handling service performance of EAG where the infrastructure layout both inside airport and air side negatively affecting the passenger, cargo and ramp handling processes that in turn affects customer satisfaction and on time performance of ground handling service. The study concluded and recommended that since the airline existence, profitability and competitiveness are highly affected by punctuality of the ground handling service, Infrastructure and facility, skilled manpower, Supplier relationship, integration and communication, safety and security, all stakeholders of EAG need to provide special attentions in the long run by implementing special supplier relationship management practice tools, reevaluating the integration and communication tool, creating and bundling more better airport infrastructure and facilities, working more on skilled manpower and human capital management and advancing safety and security management using modern technology etc.*

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACRONYMS

ACI: Airports council international

ACU: Aircraft component

ASU: Aircraft system unit

ATAG: Air transport action group

ATS: Air transport system

CAA: Civil aviation authority

CIP; Commercially important person

DOC: Document

EAG; Ethiopian airline group

FAA: Federal aviation authority

GH: Ground handling

GHO: Ground handling operation

GOM: Ground operation manual

GPU: Ground power unit

GSE: Ground service equipment

IATA: International air transport association

ICAO: International civil aviation organization

NISS: National intelligence security services

OTP: On time performance

SAS: Special air services

SLA: Service level agreement

UN: United nation

US: United states of America

VCR: Vehicle rooting system

VIP: Very important person

WFP: World food program

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Ground handling services, which include a variety of tasks like passenger handling, baggage handling, and aircraft maintenance, are crucial to the smooth operation of airlines and airports. Customer satisfaction, operational efficiency, and the airline's overall competitiveness in the aviation sector are just a few of the aspects of operations that are greatly impacted by the quality of ground handling services (Fitouri-Trabelsi, 2015).

Numerous academic investigations have underscored the significance of comprehending the factors that influence the performance of ground handling services. The significant contribution that ground handling services make to the seamless operation of air traffic and the aviation value chain is highlighted by Fitouri-Trabelsi (2015) and IATA (2017). These sources emphasize how important it is for airlines to have effective ground handling services in order to provide passengers and cargo with prompt, high-quality services.

Moreover, the study carried out by Anna T., Lukas T., and Alena N. (2015) emphasizes the participation of various entities in the delivery of ground handling services, such as airports, independent ground handling companies, and airlines. This demonstrates the intricacy of the ground handling sector and the range of market configurations that airlines can choose from to supply their services.

According to ATAG (2014), the aviation industry is a thriving sector that handles billions of passengers and millions of flights every year, significantly boosting the world economy. Ground handling services are essential to maintaining the smooth functioning and effective use of aviation infrastructure.

Both land-side and air-side operations are included in these operations. Check-in services, baggage screening and handling, passenger transportation, special needs assistance, cargo handling, aircraft maintenance, fueling, catering, cleaning, and maintenance are all considered

air-side tasks. Processing of passengers and luggage, departure gate services, and VIP support are all considered land-side activities (Guiding material GH Malaysia CAA, 2012).

The efficient delivery of ground handling services requires collaboration between multiple stakeholders. Effective resource management, proper staffing, and good communication with all stakeholders are necessary for optimal performance (Anna T., Lukas T., and Alena N., 2015).

The comprehensive range of passenger handling services includes pre-travel and in-flight operations designed to provide a smooth and seamless travel experience. In order to guarantee the comfort and satisfaction of passengers, these services include check-in procedures, baggage screening, help for passengers with limited mobility, lost and found services, baggage sorting, departure gate assistance, support for unaccompanied minors, and VIP services.

Ground handling includes ramp operations and cargo management in addition to passenger services. While ramp services include aircraft push-back, loading and unloading, fueling, catering, cleaning, and maintenance to ensure quick aircraft turnaround times, cargo services cover labeling, special cargo handling, and transportation.

Many factors affect how well ground handling services perform, such as how resources are allocated, how workers are scheduled, how stakeholders are coordinated, how rules and regulations are followed, and how best to use available resources. Enhancing these factors can result in lower wait times, more cost-effective services, and higher service quality.

Ethiopian Airlines recognizes that there is room for improvement in both customer satisfaction and on-time performance, even with compliance with regulatory minimum standards met. The competitiveness and future prospects of the airline can be affected by various factors, including but not limited to punctuality records, adherence to baggage handling protocols, costs incurred for lost baggage, boarding expenses resulting from irregular ground services, and overall irregularities in ground handling services (www.ethiopianairlines.com).

It is critical to pinpoint particular factors that are pertinent to Ethiopian Airlines in order to improve the performance of ground handling services. Thus, the goal of this study is to identify these variables in order to promote increases in customer satisfaction, cut costs, and preserve industry competitiveness.

1.2 Statement of the Problem

The provision of ground handling services is pivotal within the aviation sector, involving diverse tasks like baggage management, passenger aid, aircraft sanitation, and ramp operations. These services wield direct influence over an airline's efficiency, encompassing aspects like punctuality, customer contentment, and operational ineffectiveness. Airlines encounter the challenge of formulating robust ground handling strategies, navigating considerations such as in-house execution versus outsourcing and the impact of rapidly evolving technology (like the International Air Transport Association (IATA), the Federal Aviation Administration (FAA), or the International Civil Aviation Organization (ICAO)).

Ethiopian Airlines Group (EAG), akin to its counterparts, acknowledges the significance of ground handling and its ramifications across its operational spectrum. Presently, the airline confronts issues concerning its ground handling services, particularly pertaining to baggage delivery, flight punctuality, and customer grievances.

As per EAG's ground handling performance assessment in 2022/2023, its on-time performance stands at 84.02 percent, falling below the industry average of 85 percent considered as on time as per IATA, EAG target was 88 percent for the specific period. However, best OTP is 90 percent and above. This shortfall signifies EAG's inability to meet requisite benchmarks. Ground handling operations are susceptible to delays and disruptions owing to the intricate nature of services rendered and the operational environment. Operational exigencies at tactical, strategic, and operational force further augment the likelihood of disruptions.

Infrastructure itself significantly impacts ground handling performance, encompassing airport layout, air side and land side capacity, ramp configuration, baggage retrieval systems, and warehouse dimensions. Addressing these aspect is imperative for enhancing ground handling performance (IATA, 2017).

EAG grapples with baggage delivery performance as a key challenge. Efficient baggage management is critical for ensuring timely arrival of passengers' belongings at designated destinations. However, EAG encounters issues in this area, resulting in delays and customer grievances. Augmenting baggage delivery performance is pivotal for bolstering customer

satisfaction, curbing compensation expenses for lost or mishandled baggage, and upholding EAG's reputation.

Flight punctuality, gauged by on-time performance, stands as another pivotal factor influenced by ground handling operations. EAG's current on-time performance of 84.02 percent falls short of industry and international norms. Delays in ground handling activities, encompassing aircraft turnaround procedures, baggage and passenger management, and stakeholder coordination, can substantially disrupt flight schedules. Mitigating these delays and enhancing on-time performance is imperative for minimizing disruptions, ensuring dependable flight operations, and meeting customer expectations (IATA and ICAO regarding on-time performance and other key metrics)

Customer grievances related to ground handling services underscore the imperative for improvement. Dissatisfied customers may voice concerns regarding delays, baggage mishandling, or overall service quality. Addressing these grievances is pivotal for sustaining customer loyalty, fostering positive word-of-mouth, and bolstering EAG's overall credibility. (Customer satisfaction survey)

To enhance ground handling performance, both internal and external factors necessitate consideration. Internally, EAG must evaluate operational processes, communication channels, coordination mechanisms, and resource allocation concerning ground handling. This entails scrutinizing workflow efficiency, identifying bottlenecks, and implementing measures to streamline operations. Investment in suitable technology, equipment, and infrastructure can further contribute to performance enhancement (Operational efficiency studies) .

Externally, EAG must assess the influence of airport operational protocols, security measures, and safety regulations on ground handling activities. Collaboration with airport authorities, immigration regulatory bodies, and other stakeholders is indispensable for addressing external factors that may impede ground handling performance. By comprehending and addressing both internal and external factors, EAG can foster an environment conducive to efficient ground handling operations (regulatory documents).

While previous research has delved into ground handling services, most studies have centered on developed nations and specific facets of the ground handling process. Some studies have

advocated optimization strategies like deploying new communication and tracking devices or analyzing delay repercussions on aircraft turnaround performance (Academic journals)

However, there exists a need for a comprehensive study that encompasses both internal and external factors influencing ground handling performance, particularly concerning on-time performance and its corollaries such as compensation expenses, customer satisfaction, and overall credibility.

Hence, this study aims to scrutinize the principal issues impacting the efficacy of ground handling operations, both internal and external, with specific emphasis on on-time performance and associated consequences. The objective is to refine and optimize Ethiopian Airlines' ground handling services, ultimately bolstering EAG's overall performance. By addressing these factors, the study endeavors to mitigate delays, trim costs, enhance customer satisfaction, and augment the overall efficiency and efficacy of ground handling operations at EAG.

1.3 Research Questions

The study is going to address the following research questions.

- What are the key determinants influencing ground handling service performance at Ethiopian Airlines Group?
- How do various factors, including skilled manpower/staff training, equipment quality, technology adoption, and regulatory compliance, contribute to the performance of ground handling services at Ethiopian Airlines Group?
- What is the relative importance and interplay of different determinants in shaping ground handling service performance, as observed within Ethiopian Airlines Group?

1.4 General Objectives

The general objective of the study is to asses' major factors determining EAL ground handling operation / service performances.

1.4.1. Specific Objectives

Based on the major objective of the study the specific objectives are intended to:

- To identify the key determinants that significantly influence ground handling service performance within Ethiopian Airlines Group, using empirical evidence.
- To examine the specific contributions of various factors, such as skilled manpower/ staff training, equipment quality, technology adoption, and regulatory compliance, to the performance of ground handling services at Ethiopian Airlines Group.
- To assess the relative importance and interplay among different determinants in shaping ground handling service performance, based on observations within Ethiopian Airlines Group.

1.5 Significance of the Research

By offering the required inputs and well-formulated and organized information for decision-making, this study aims to shed light on ground handling services that have significant implications on Ethiopian Airlines' group efforts to maintain and improve on time performance and customer satisfaction while avoiding those major challenges that have been identified. Additionally, the study will help the airline get ahead of the game by structuring ground handling services as a fundamental tool to meet customer demand on the ground to decrease costs. Furthermore, the research will function as a foundation for Ethiopian Airlines to secure backing from other foreign governments that are also considering the reciprocal advantages of bilateral agreements.

On the other hand, anyone who might be interested in this field of study is likely to use the study's findings as references for additional research. Moreover, by balancing the sensitivity of various ground handling service attributes to satisfy client needs, it is probably going to make an academic contribution to future research. The results of this study will also probably help policy makers. They will probably use it when examining and creating policies, which frequently serve as recommendations for the strategy they constantly take into account to guarantee ground handling services.

1.6 Scope of the Study

The factors determining Ethiopian Airlines' ground handling operations performance at Addis Abeba Airports will be the main topic of this study. The study will concentrate on both internal factors related to suppliers, Passengers, handling, cargo handling, ramp handling, infrastructure, integration and communication issues, skilled manpower issues, Air traffic control ,and external factors such as, weather condition and regulatory body, regulatory compliance factors. In order to better understand the factors influencing its performance and growth through ground handling services as a single business unit and its network expansion in tandem with ground handling services in light of its new vision for 2035,

1.7 Limitation of the Study

There will be a number of difficulties in carrying out this research. In essence, the operating ground handling staff crew may respond slowly to the study because of their busy schedules and the nature of their jobs. Furthermore, obstacles pertaining to the accessibility and availability of desired data may arise as a research setback. One of the restrictions to be dealt with while conducting the research will also be the small amount of relevant prior research on the particular topic in the context of developing nations.

1.8 Organization of the Paper

The study is organized into five chapters. **Chapter one** addressed the introductory part of the study as presented above. **Chapter two** contains theoretical and empirical literature reviews as well as the conceptual framework of the study. **Chapter three** is about research methodology and design of the study. It explains the research design and approach adopted, tools used for data collection, sampling methods, and methods of data analysis. **Chapter four** of the paper contains presentation and discussion of research findings. Conclusion and recommendations of the study are presented in the last **chapter.**

CHAPTER TWO

LITRETAURE REVIEW

2.1. Introduction

The current body of research on ground handling services is covered in this section. One of the most important services offered to airport patrons is ground handling. The performance of ground handling services from an optimization perspective has been discussed by Nugroho et al. (2012), Bite (2010), Gomez &Scholz (2009), and Pestana et al. (2010). It includes ramp management, passenger handling, baggage handling, mail handling, freight handling, and aircraft services. It also includes surface transportation, catering services, fuel and oil handling, aircraft maintenance, flight operations, crew administration, and ground administration. These services were traditionally provided by airlines or airport operators, and monopolies characterized the supply of these services at airports throughout the European Union. Initially, Nugroho et al. (2012) attempted to improve the On Time Performance (OTP) by concentrating on three distinct GHO tasks: baggage handling, passenger handling, and aircraft cleaning and attempted to raise the rate of On Time Performance (OTP). The researchers offered equipment and physical infrastructure recommendations, such as increasing the number of desks and information boards at airports to expedite procedures. It has been claimed that the findings of the proposed model enhance the efficiency of ground handling operations; however, no experiments have been conducted to substantiate these assertions (Nugroho et al. 2012).

Today's aviation industry is characterized by a highly dynamic and volatile business environment (Doganis, 2001, 2002). On the one hand it holds high growth potential (Air Transport Association, 2006; Bernabai, 2001), but on the other hand competition is intensifying (Garvens, 2005) and margins are decreasing (Francis et al., 2005). Changes in the aviation business affect all members along the value chain (SAS, 2005). Competitive pressures not only occur on the ‘‘air side’’ of the value chain but are especially increasing on the ‘‘ground side’’. In this context ground handling logistics are one of the biggest challenges and a main factor that determines sustainable success (Gonnord and Lawson, 2000; Wyld et al., 2005).

2.2. Theoretical Review

2.2.1. Historical review of Ground Handling Services

When an aircraft arrives at or departs from an airport, ground handling services are required. The opening of the ground handling market was considered beneficial in order to accommodate the increasing number of passengers and guarantee that the air transport infrastructure could be utilized effectively. As a result, in order to ensure healthy competition and boost market efficiency, the directive on access to the ground handling market at community of airports was enacted with the intention of progressively opening this market until 2001.

It is common knowledge that ground handling services, if improperly managed and not closely monitored, can pose a significant threat to profitability. For instance, according to IATA estimates, safety improvements and decreased damage to vehicles, aircraft, and ground support equipment could save about $4 billion annually.

Additionally, the industry anticipates a rise in jobs related to ground operations, however, most ground handlers have a staff turnover rate of between 30 and 50 percent. It's possible that both elements are stressing the industry more and more. Additionally, if there are any irregularities that put the business at risk, operational activities will also have an impact on the airlines and ground handlers. For instance, if ramp handling causes a flight delay for a specific number of minutes, the ground handler will deduct from the basic ground handling in accordance with the SLA (service level agreement); Actually, the customer's claim for compensation for the delay will also have an impact on the airline. Thus, in theory, there are numerous difficulties influencing ground handling services, which is comparable to or parallels Ethiopian Airlines' situation. In addition to this, there are other theories related to the subject under study, such as real-time scheduling theory, theory of performance, system management theory, transaction cost theory, resource theory of management, and human capital theory of HRM. These theories can be referred to in connection with the factors affecting performance of ground handling specifically includes passenger handling, cargo handling, ramp handling, and special services handling.

2.2.2 Theories and Categories of Ground Handling Services

Ground handling services basically categorized in to four.

Passenger Handling: It includes arrival services, weight and balance, boarding, lounge access, and supervision. (GH Malaysia CAA, 2012).

Cargo Handling: This service handles cargo documentation, pallet building and dismantling, containers for hazardous materials, and valuables, perishables, and animals (Guiding material GH Malaysia CAA, 2012).

Ramp handling, Included are loading and unloading, cargo/baggage transportation, cabin cleaning, pushback, water and toilet service, and de-icing (Guiding material GH Malaysia CAA,2012) .

Special Services and includes transportation services (crew & passengers), snow removal, fueling, line maintenance, baggage container management, and wheelchair services (Guiding material GH Malaysia CAA, 2012).

2.2.3 Passenger Handling Services

Numerous services are included, the most important ones being check-in, lounge, arrival, boarding, load control (weight and balance), and supervision. It includes helping arriving, departing transfer or transit passengers in any way possible, such as verifying travel documents and tickets, registering bags, and lugging them to the sorting area (IATA, 2018)**.** The body of research on marketing services has identified the importance of customer satisfaction and service quality in fostering customer loyalty (Taylor and Baker, 1994).

By their very nature, the airline industry and the services sector are highly diverse and comprise a wide range of operations (Silvestor et al., 192). According to Levitt (1981), service quality is widely acknowledged as a successful marketing strategy that businesses can use to achieve service differentiation and customer satisfaction.

According to Levitt (1982), service is a "deed act of performance." According to Norman, providing 1984 service is a social act that happens in close proximity between a client and a company representative. According to Booms and Pitter (1981), the primary characteristics of

services are intangibility, inseparability, variability, and perish ability. These characteristics have an impact on services.

Producing or offering services that satisfy requirements or standards is what is meant by "quality of service" (Schroeder, 1989).

Access, aesthetics, attentiveness, availability, care, cleanliness, comfort, commitment, communication, competency, courtesy, flexibility, friendliness, functionality integrity, responsiveness, and security are some of the factors that affect the quality of services (Robert, 1999).

Customer satisfaction It is the only objective of every organization, the source of all organizational difficulties, the focal point of every mission statement, and the ultimate objective of all strategies (Mohamme, 2000).It is an assessment made after making a choice regarding a particular transaction (Bastos and Gallego, 2008).

2.2.3.1 Check-in Services

A personalized service provided at airport check-in desks or through a mobile device, kiosk check-in services, also known as self-check-in, include checking your luggage through to your destination and providing your boarding pass (Guiding material GH Malaysia CAA,2012) .

2.2.3.2 Lounge Services

Passengers may enter lounges in certain circumstances. Most lounges are found in the travel, lodging, and entertainment industries. This facility is run by numerous airports. For a fee, airport lounges provide certain travelers with amenities not available in the terminal itself, like cozier seating, calmer surroundings, and frequently quicker access to customer support (Guiding material GH Malaysia CAA, 2012).

2.2.3.3 Arrival Services

Customer relationship officers provide a service to all arriving passengers from flights, guiding them to the Passport Control and Baggage Claim area or the transit exit for connecting passengers, where airport agents or customer service officers can assist (Guiding material GH Malaysia CAA, 2012).

2.2.3.4 Passenger Boarding/De Boarding Services

It involves transferring customers, or passengers, to the services and out of the services to the passengers' final destination. Depending on where the aircraft is parked, there are two ways to observe passenger DE boarding and boarding. When an aircraft is parked on a remote stand, passengers board the aircraft using the passenger stairs and are transported by shuttle buses to either the terminal building or the front of the aircraft. However, there are still two options if the aircraft is parked in front of the terminal building: using the Air Bridge or the passenger stairs to board or disembark. Due to the increased expense, the majority of low-cost airlines steer clear of using air bridges. They favor air bridges over passenger stairs (Guiding material GH Malaysia CAA, 2012).

2.2.3.5 Central Load Control Services

It includes: issuing the documentation for the full range of services; calculating the weight and balance of the airline flights worldwide (Guiding material GH Malaysia CAA, 2012).

2.2.3.6 Ground Administration and Supervision Services

According to (Guiding material GH Malaysia CAA, 2012) Comprising:

a) Representation and liaison services with local authorities or any other entity disbursements on behalf of the airport user and provision of office space for its representatives;

b) Load control, messaging and telecommunications;

c) Handling, storage and administration of unit load devices;

d) Any other supervision services before, during or after the flight; and

e) Any other administrative service requested by the airport user.

2.2.4 Cargo Handling Services

In order to move cargo from origins to destinations, a shipper, a forwarder, a road transporter (or trucker), an airline (or carrier), and a consignee are involved in the air cargo transport services (Derigs et al., 2013). The shipper requires the commodity to be delivered at the required service

level and at a reasonable cost to any location in the world. The "middle man" between the shipper and the airlines is the forwarder. Ground transportation is supplied by the road transporter both prior to and following air transport. The airline assigns and oversees capacity in addition to receiving, storing, transferring, tracking, loading, and unloading cargo. The shipments are received by the consignee (Kasilingam, 2003).

This service supply chain involves two different airline types: combination passenger and cargo airlines and integrated express carriers. Combination airlines are able to operate dedicated freight aircraft and transport mail, express packages, and air freight in the belly space of passenger aircraft (Li et al., 2012). A few combination airlines might also operate "combi" aircraft, which can have its cargo capacity changed by adding or removing passenger seats. Integrated express carriers (like FedEx, UPS, and DHL) and non-integrated freight carriers make up all-cargo carriers. In addition to selling excess capacity to freight forwarders, integrated express carriers primarily sell capacity to shippers directly (direct channel market) (indirect channel market). Airlines and integrated express carriers may participate in the indirect channel market. Non-integrated ones deal with essentially the same decision-making challenges and have the same supply chain structure. Unlike the decentralized case, where airlines and forwarders play games with pricing and capacity allocation, the decision-making for integrated xpress carriers in the direct channel market is primarily centralized. As a result, it is thought that the integrated express carrier decision-making process is less complicated than the decentralized carrier decision-making process. Since combination airlines are representative of the air cargo industry, we concentrate our discussion on their case.

Airlines (or carriers) offer a range of services to freight forwarders and shippers, such as capacity booking, advice, packing, loading, sorting, transportation, dispatching, and cargo tracking and tracing. Various levels of air cargo services are categorized based on the shipper's priority level 2 requirements, such as speed and reliability. Rates for perishable foods, hazardous materials, live animals, high-value items, and other cargo types differ based on cargo type and service priority (Nobert and Roy, 1998).

Several essential procedures make up the normal service flow for air cargo transport (Nobert and Roy, 1998). It starts when trucks carrying bulk or containerized cargo are brought to the origin airport cargo terminal by forwarders or the shippers themselves. The cargo is emptied and

arranged based on the shipping documentation's additional details, which include weight, dimensions, quantity of pieces, and kind of freight, as well as its final destination. In order to verify the items in later handling, the airline computes tariffs and creates a waybill. Bulk cargo is packed into a container or left on a pallet protected from the elements with straps and a net covering. Since not all destinations have direct flights, the cargo can be shipped to an airport that serves as a hub, where it will be unloaded, sorted, and reloaded at the freight terminal before being sent to the destination airport. When it arrives at the airport, it is checked and taken to a warehouse where local freight forwarders can deliver it or consignees can pick it up (Kasilingam, 2003).

Because air cargo transport involves more parties, more complex procedures, weight and volume considerations, different priority services, integration and consolidation tactics, and multiple network itineraries than passenger transport, it is more complex than the latter (Leung et al., 2009; Li et al., 2009; Wang and Kao, 2008; Bartodziej et al., 2009).

2.2.5 Ramp Handling Service

The term "ramp handling" refers to providing aircraft maintenance while it is stationary (both upon arrival and prior to departure) (Guiding material GH Malaysia CAA, 2012.

Comprising

a) Marshaling the aircraft on the ground at arrival and departure;

b) Assistance to aircraft parking and provision of suitable devices;

c) Communication between the aircraft and the air-side supplier of services;

d) The loading and unloading of the aircraft, including the provision and operation of suitable means, as well as the transport of crew and passengers between the aircraft and the terminal, and baggage transport between the aircraft and the terminal;

e) The provision and operation of appropriate units for engine starting;

f) The moving of the aircraft at arrival and departure, as well as the provision and operation of suitable devices;

g) The transport, loading on to and unloading from the aircraft of food and beverages.(Civil aviation authority of malarial guiding material 8709,2016)

2.2.5.1 Aircraft Marshaling

An essential component of controlling the aircraft near the ramp is the marshal-er. The vital visual link that the aircraft marshal-er provides helps the flight crew position the aircraft properly. The flight crew is ultimately in charge of ensuring the aircraft is operated safely while on the ground, but the ground crew—including the Marshall-er—has an obligation to ensure that the flight crew has the proper guidance information. It also makes sure that best practices are always followed in order to minimize the chance of unintentional harm. A reflective safety vest, an auditory earmuff helmet, gloves, marshaling wands, and handheld illuminated beacons are the standard equipment of a marshal-er (Guiding material GH Malaysia CAA, 2012).

2.2.5.2 Baggage Loading/Unloading

One of the turnaround's most time-consuming procedures is loading and unloading bags. Ground handling agent-employed baggage handlers perform the tasks of loading and unloading luggage. A conveyor belt is first placed inside the baggage compartment. After that, one or more baggage handlers enter the compartment, unload the bags, and place them on the conveyor. When the luggage reaches the end of the belt, it is loaded onto the baggage tug and transported to the terminal's baggage area. Following the completion of check-in, or if there are sufficient bags to load, the loading process begins. Loading is the reverse process of unloading (Guiding material GH Malaysia CAA, 2012)

2.2.5.3 Cleaning/Tidy-Up Services

After passengers disembark, cleaning takes place and lasts until boarding. A lot of full-service airlines clean in between each segment of the flight. Low-cost airlines, on the other hand, don't charge for cleaning unless absolutely essential because passengers don't typically eat much while flying. When the plane arrives, cabin attendants "tidy-up" the trash and take it out rather than cleaning. They can cut down on turnaround times and cleaning expenses by doing this instead of having to pay for cleaning agents (Guiding material GH Malaysia CAA,2012)

2.2.5.4 Lavatory Service and Portable Water Service

While portable water service replenishes the aircraft with clean water, restroom service handles the drainage of used water, particularly from toilets. On both of the aircraft's back sides are portable water trucks and restroom drainage trucks. Low-cost airlines are not required to perform these procedures in between each flight. Clean water consumption has a limit, which the purser monitors and requests water supply if it is below. The same applies to restroom services as well. The restroom service is requested if the amount of water used is more than the per-established threshold (Guiding material GH Malaysia CAA, 2012).

2.2.6 Special Handling Services

2.2.6.1 Routine Maintenance Check (Pr-flight Inspections)

Pr-flight checks, also known as maintenance on the aircraft, are performed prior to each flight to ensure everything is operating as intended. The aircraft mechanic walks around the aircraft, inspects various components, and replaces engine oil and filters as needed. This is a daily requirement and a routine operation (Guiding material GH Malaysia CAA,2012).

2.2.6.2 Fueling

A fuel company will fill up an aircraft using a fuel tank that holds fuel or a hydrant dispenser vehicle that is attached to the ground and uses a floor connection to dispense and transfer fuel to the aircraft. Passengers should not be inside the aircraft while it is being refueled for safety reasons. For this reason, fueling occurs after passengers disembark and ends prior to passenger boarding. On the other hand, fueling can only be done under the fire brigade's supervision if the flight is a transfer and the passengers must wait inside the aircraft (Guiding material GH Malaysia CAA, 2012).

2.2.6.3 Surface Transport

Included are the following: any special transportation requested by an airport user; the planning and execution of crew, passenger, baggage, freight, and mail transportation between various terminals of the same airport, but not the same transportation between the aircraft and any other point within the airport's perimeter (Guiding material GH Malaysia CAA, 2012).

2.2.7 Performance Management Theory

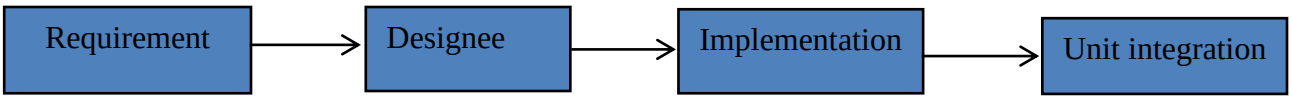
It is a crucial component of HRM and organizational behavior since they support companies in managing and inspiring their workforce. Performance management has many different theories, but how each is applied varies depending on the nature of the workplace and the demands of its workers. Performance management theory's primary goal is to increase worker productivity through development and motivation.

Performance management theories comprise a collection of guiding principles that managers use to inspire and motivate their staff. Usually, they achieve this by utilizing research to establish and preserve a productive workplace where staff members perceive their managers to be important, appreciative, and empowering. Theories of performance management can also assist managers in comprehending their responsibility for fostering a positive work environment for their staff. This is because they offer more direction on how to better meet the needs of their employees. Performance management theories typically establish goals and incentives that staff members at all organizational levels can strive towards (Suzan H., 2013).

2.2.8 Real-time Scheduling Theory

In order to facilitate the design of complex systems, boost efficiency, and promote re usability, many real-time systems are constructed with operating systems that offer multitasking capabilities, according to Frank S. (2019) however, multitasking complicates predictability analysis because it requires consideration of task scheduling in order to verify temporal constraints in scheduling analysis.

Figure 1: Real time schedule operating system diagram



Source: Literature review, Frank S., 2019

2.2.9 Customer Service and Satisfaction Theory

Many businesses and experts in the modern era think that knowing, listening to, and understanding the customer is essential if they want to win the business competition and make profits (Wooddruff and Gradial, 1996). “What does a customer mean? Even in the office, whether in person or via mail, the customer is the most important person. Customers are dependent on us, not the other way around. A client is the reason we do our work; he is not an interruption. He is doing us a favor by providing the chance to serve him; we are not doing him a favor by doing so. A customer is not someone with whom to spar or play games of skill. An argument with a customer is never won. A Customer is a person who brings us his wants. It is our job to handle them profitably to him and to ourselves”.

Customers can refer to any individual, group, or organization that purchases and uses a product or service offering, according to Johnson (1998).

Some experts use the relationship between perceived service satisfaction and willingness to pay to define what constitutes a customer. Regarding pricing, Blumberg (1991) identified at least three categories of consumers in the market.

According to the American Marketing Association (1960), services are defined as distinct, essentially intangible activities that satisfy consumer needs and are not always connected to the sale of goods or other services. The use of tangible goods may or may not be necessary in order to produce a service.

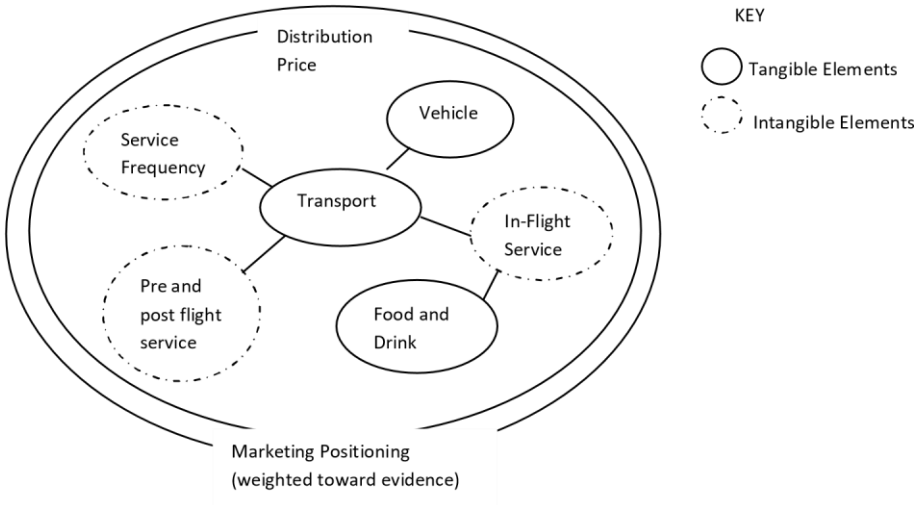
Certain definitions in the context of transport view classify transportation as a service.

1. Foote and Hatte (1953) propose a 'Quaternary' level classification for transportation.

2. Whiteman (1981) defines transportation as the movement of people and products by bus, rail, air, and sea, but not by private automobile.

Shostack (1977) emphasizes the significance of intangibility as a basic feature of services, such as transportation. It can only be experienced rather than physically possessed in the airline (or air transportation) industry.

Figure 2: Customer service and satisfaction model, tangible and intangible elements



Source: Literature review, tangible intangible elements of customer service

According to Zeithamal et al. (1990), customer-defined standards are the only ones that matter when assessing the quality of a service. Based on their research, he established ten broad criteria or dimensions, which are

a. Tangible: Appearance of physical facilities equipment, personnel and communication materials
b. Reliability: Ability to perform the promised service dependably and accurately
c. Responsiveness: Willingness to help customers and provide prompt service
d. Competence: Possession of the required skills and knowledge to perform the service
e. Courtesy: Politeness, respect, consideration, and friendliness of contact personnel.
f. Credibility: Trustworthiness, believe ability, honesty of the service provider.
g. Security: Freedom from danger, risk or doubt
h. Access: Approach ability and ease of contact
i. Communication: Keeping customers informed in language they can understand and listening to them
j. Understanding the customer: Making the effort to know customers and their needs.

According to Stradling et al. (2007), a number of non-instrumental factors, including cleanliness, privacy, safety, conveniences, stress, social interaction, and scenery, influence how satisfied customers are with bus services in the context of public transportation. User satisfaction with public transportation has been found to be significantly influenced by attributes in the Service Dimension, such as cleanliness, driver (staff) behavior, comfort, information, frequency, and dependability (Bates et al. 2001, Beirao& Cabral 2007, Friman&Garling 2001, Hencher et al. 2003).

Conversely, the 2009 report from Karlstad University's SAMOT (Service and Market Oriented Research Group) identifies the public service dimension based on four fundamental factors: comfort, staff behavior, system (including supply and reliability items), and safety/security (see the authors or SAMOT, 2009).

Customer satisfaction

Customers are the only ones who can determine whether a service is "good" in terms of quality, even though they may not have been satisfied with the overall experience (Randall and Senior, 1996).

When a person is upset and furious with an unprofessional customer service representative when they need assistance, it indicates that they are not happy with the service. Customer satisfaction is frequently recognized as having significant value in understanding customers' perceptions and assessments (Oliver, 1997). As a result, a lot of experts attempt to define and develop theoretical frameworks regarding how services ought to function and how to provide high-quality services to increase client satisfaction.

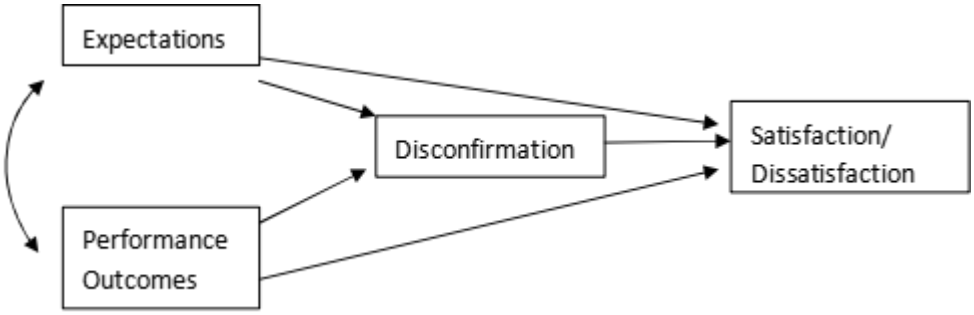
Customer satisfaction, according to Woodruff and Gardial (1996), is a customer's opinion—whether favorable or unfavorable—about the value they felt they received from utilizing a specific organization's offering in a given set of use cases. This emotion may be a response to a recent use scenario or it may be a general response to a number of use scenario experiences. Furthermore, evaluating a product or service to determine whether it meets or falls short of expectations is basically an evaluation process. It is necessary for the client to evaluate performance. It should be mentioned that the actual performance of the product or service is irrelevant. Customer perception or product performance are the only factors that determine

customer satisfaction. Subsequently, the standard that represents the service performance that the customer expected is compared with the perceived product (or service) performance.

According to the same interpretation, one of the most widely used theories of customer satisfaction is the expectancy dis confirmation with performance (EDP) framework (Oliver, 1997). A fundamental premise is that contentment or discontent arises from contrasting expectations with real outcomes. Consider a person who commutes by public transportation on a daily basis. She considers whether the service met her expectations one day. In certain instances, the initial expectations are verified, while in other instances, the real performance is refuted.

A person will develop dis confirmation beliefs (also known as the dis confirmation effect) if their expectations for a service's performance are higher or lower than what the service delivers. A curved, double-headed arrow connecting expectations and performance is shown in Figure 1, suggesting a relationship between the two. Oliver believes that depending on the service under investigation, this correlation will change. When someone feels in control of their performance, there may be a positive relationship between expectations and performance; when performance is entirely out of one's control, there may be no relationship at all; and when expectations are high, moderate performance may be negatively weighed.

Figure 3: The Expectancy dis confirmation with performance model



Source: Literature review, Oliver, 1997

2.2.10 Systems Management Theory

An alternative to traditional organizational planning and management is provided by systems management. According to the theory of systems management, businesses, like the human body,

are made up of various parts that must cooperate harmoniously for the larger system to function as best it can (Fremont E. and James E., 1970).

2.2.11 Transaction Cost Theory

Reduced transaction fees and distribution costs for booking, ticketing, and messaging via distribution channels become a critical managerial concern for airlines as a result of ongoing pressure from increased operating costs (Henrich R. Greve, Linda Argote, 2015). To examine how IOS affects transaction costs and structure, transaction cost theory is frequently employed.

(i) Decrease external and internal financial burdens associated with a transaction and

(ii) Increase operational efficiency.

According to Rugman and Oh (2014), the transaction costs of multinational service enterprises increase as they become more distant from their home region on a national level. The term "distance" encompasses both institutional and geographical distance. This suggests that the company's ability to adapt its firm-specific technological advantage—such as its diverse technology standards, intangible proprietary assets, and effective distribution network—to the conditions present in its home region and to participate in institutional activities in collaboration with foreign partners accounts for its success in cutting costs (Banalieva and Dhanaraj, 2013). These firm-level technological capabilities in an institutional setting are linked to lower transaction costs and a global presence.

2.2.12 Distribution Theory

A crucial step in the supply chain process that finally gets products to customers or end users is distribution management. In essence, managing distribution involves controlling the flow of goods from a retailer to a customer or from a wholesaler to a retailer. Managing distribution channels to ensure that perishable goods are delivered without spoiling and to prevent loss are the main goals of distribution management. It is a component of the broader logistics system, which also plans and creates procedures for handling transportation and inventory management. It involves a number of things, including fleet management, warehousing and storage, packaging, and routing.

Any person or company that delivers goods to a customer can be considered a distributor. A pharmaceutical company, for instance, distributes goods to pharmacies, whereas an online retailer like Amazon distributes goods to customers. Good distribution management lowers shipping costs, speeds up deliveries, and improves client satisfaction (Synchronix Technologies Inc, 1988).

2.2.13 Resource Based Theory

An organizational strategy called resource-based theory emphasizes internal resources as a way to gain a competitive edge. Resource-based theory revolves around the concept of competitive advantage. When a business is able to produce sales or profits that are noticeably higher than average for its industry, it is said to have a competitive advantage. A competitive advantage enables the company to produce higher returns for its investors.

There exist multiple strategies for a company to establish a competitive edge. Using its special resources and abilities to create a cost or differentiation advantage is the most popular strategy. For instance, a company may be able to create a unique product that sells for more money or have access to cheaper inputs. It is important to remember that not every advantage in resources will translate into a competitive advantage. An advantage needs to make things difficult or impossible for rivals in order to last (Barney, J. B. 1991).

2.2.14 Institutional Theory of Management

An approach to comprehending organizations and management techniques as the result of social forces as opposed to economic ones is known as institutional theory. Because it can be used to explain organizational behaviors that are not consistent with economic rationality, this perspective has gained popularity in the field of management theory.

The institutional and regulatory frameworks that control travel markets and distribution networks have undergone significant changes as a result of airline companies (Button and McDougall, 2006). Multinational corporations' organizational innovation and strategic changes are guided by institutional forces (Vaidya, 2012). According to DiMaggio and Powell (1991), no-institutional theory describes how organizations adopt policies and procedures that could increase their legitimacy in the eyes of external stakeholders. Neo-institutional theory is widely used in

institutional studies to examine the impact of normative, regulative, and institutional structures because more and more innovation-focused businesses are suffering from isomorphic powers—that is, normative, mimetic, and coercive mechanisms—that are heavily cultivated by competitors and trading partners (Dwivedi et al., 2011).

This theory sees institutional organizations as organizational innovations and the isomorphic forces influencing institutional organizations adoption in institutional literature. Similarly, the neo- institutional theory postulates in human resource organization related studies that executives of multinational corporations are not able to accurately assess the financial consequences of their strategies (Banalieva and Dhanaraj, 2013). According to the theory, a decision characterized by uncertainty gains information and legitimacy from the past choices and actions of suppliers, competitors, and partners. Because of the concurrent technical pressure and institutional concerns, a multinational may also exhibit a strong inclination towards the global markets in the event that its stakeholders become globally dependent (Lee et al., 2017; Rugman and Oh, 2013).

2.2.15 Human Capital Theory

According to the human capital theory, people can become more productive by getting more education and skill development. The theory's detractors contend that it confuses labor and capital and is faulty and unduly simplistic.

According to human capital theory, spending money on education is required to develop the skills and training that will boost an individual's capital (Blundel, 2017).

2.2.16. Determinant Factors of Ground Handling Service Performance

2.2.16.1 Supplier Relationship

Supply chain management emphasizes the importance of collaboration, trust, and effective communication between organizations and their suppliers to achieve operational efficiency and enhance service performance (Li et al., 2019). Relationship marketing theories also highlight the significance of long-term partnerships and mutually beneficial relationships with suppliers for improved service quality and customer satisfaction (Morgan et al., 2019).

2.2.16.2 Air Traffic Control

The Aviation operations management highlights the importance of effective coordination, communication, and information sharing between ground handlers and air traffic control authorities for improved operational efficiency and safety (Belobaba et al., 2015). Human factors theories focus on the role of human-machine interaction and the impact of human behaviour, decision-making, and cognitive processes on air traffic control effectiveness and service performance (Wickens et al., 2013).

2.2.16.3 Passengers, Cargo, and Ramp Handling

The literature on service operations management emphasizes the importance of well-defined processes, standard operating procedures, and efficient resource allocation for effective handling of passengers, cargo, and ramp operations (Fitzsimmons et al., 2019). Customer experience theories highlight the significance of customer- center approaches, personalized services, and positive interactions with ground handling staff in shaping customer satisfaction and loyalty (Lemon &Verhoef, 2016).

2.2.16.4 Customer Services

The concept of marketing emphasizes the importance of service quality, service encounters, and customer satisfaction in shaping customer perceptions and loyalty (Zeithaml et al., 2016). Customer relationship management theories highlight the significance of building strong customer relationships, understanding customer needs, and delivering personalized services for enhanced customer experiences and long-term customer retention (Peppers et al., 2016).

2.2.16.5 Infrastructure and Facilities

The importance of efficient resource utilization, capacity planning, and facility layout design for improved operational efficiency and service performance (Chase et al., 2018). Service design theories focus on the role of physical evidence, service environments, and facility aesthetics in shaping customer perceptions and experiences (Bitner et al., 2008).

2.2.16.6 Skilled Manpower

Human resource management emphasizes the importance of recruitment, selection, training, and development of skilled employees for enhanced organizational performance (Noeetal., 2019). Organizational behavior theories focus on the impact of employee motivation, job satisfaction, and organizational culture on individual and team performance within the ground handling context (Robbins et al., 2017).

2.2.16.7 Technology and Innovation

Technological innovation theories focus on the adoption, implementation, and impact of new technologies on organizational performance and competitiveness within the ground handling industry (Damanpour, 2014).

2.2.16.8 Safety and Security

The literature on risk management highlights the importance of proactive safety measures, risk assessment, and mitigation strategies to ensure the safety and security of passengers, employees, and assets within the ground handling context (Flin et al., 2013). Organizational behaviour theories focus on the role of safety culture, employee attitudes, and safety-related behaviors in shaping safety performance within organizations (Clarke, 2010).

2.2.16.9 Integration/Communication & Collaboration:

The integration, communication, and collaboration can be examined within the framework of organizational theory and inter-organizational collaboration. Importance of coordination, integration, and communication between different departments and stakeholders to achieve organizational goals and enhance service performance (Scott, 2014). Inter-organizational collaboration theories focus on the benefits and challenges of collaboration among different organizations and stakeholders in the aviation industry to improve operational efficiency and service quality (Huxham&Vangen, 2005).

2.2.16.10 Weather Climate

The challenges posed by adverse weather conditions and the need for contingency planning, resource allocation, and operational flexibility to mitigate their impact on ground handling service performance (Chopra et al., 2015).

2.3 Empirical Review of Ground Handling Services

The challenges of Ground handling services

There are several challenges that could get hold of from major ground handling services. The following are some of them.

2.3.1 Vehicle Routing

The core of distribution management is the vehicle routing problem (Cordeau et al., 2007). The vehicle routing problem in aircraft ground handling (GH) operations has also been studied by numerous researchers, such as Di-Yuan et al. (2012), Kuhn & Loth (2009), and Loth (2011). A greedy randomized adaptive search algorithm was presented by Di-Yuan et al. (2012) to optimize the scheduling of de-icing vehicles in airports. By optimizing, the best use of resources is achieved and flight delays are minimized. Due to the bottleneck that is present individual actors in the Air Transport System (ATS) determine the system's overall efficiency, optimization is essential. The Vehicle Routing Problem (VRP) served as the foundation for the construction of this mathematical model for vehicle routing, which takes into account a number of variables including capacity and operation count. The effectiveness of the developed algorithm was tested and assessed using a case study based on real-life data collected at Stockholm Arlanda Airport over the course of one complete day in February 2007. The suggested algorithms greatly reduced both the delays and the waiting time. It should be highlighted, though, that despite excellent optimization, worker availability was overlooked. Additionally, a Mixed Integer Linear Program for airport service vehicle scheduling has been proposed by Kuhn & Loth (2009). Because vehicles that arrive on time contribute to the efficient use of resources—that is, vehicles—it is imperative to look into scheduling algorithms. Because vehicles that arrive on time contribute to the efficient use of resources—that is, vehicles—it is imperative to look into scheduling algorithms. To test the model, an airport case study was employed. Tested at Hamburg Airport,

the results demonstrated the significant advantages of demand-based planning. In addition, there were 20% fewer delays and shorter vehicle travel times. Despite achieving a net improvement in scheduling, workers and other resources were overlooked.

2.3.2. Ground Handling Resource Allocation

Allocating the various resources that are available on the air-sides of airport terminals is referred to as ground handling resource allocation. Numerous scholars have investigated this field. A selection of published works in the field are shown in this section. A mathematical model for resource allocation in GH operations was created by Justesen (2014). Many issues were encountered and resolved. These issues were divided into two primary groups: GHO and airport operations.

In addition, the following resources are handled: taxi-way routes, stands, gates, and check-in counters. A greedy heuristic algorithm was implemented as a potential solution after simulation techniques were used to gain a better understanding of the real issue. A 10% increase in the effectiveness and quality of resource allocation was observed following testing of the results in the airports of Frankfurt and Copenhagen. Furthermore, it has been demonstrated that making corrections for individual flights before landing actually causes a significant loss in quality; as a result, in order to allocate resources effectively, all flights arriving within a 45-minute window must be considered. The schedules and availability of the workers and the vehicles were not taken into consideration, despite the persuasiveness of the research's findings.

Furthermore, Dohn and Kolind (2009) have created a model that maximizes the number of tasks while utilizing resources as effectively as possible to optimize workforce allocation in GHO. The primary issue here is how to properly assign the various worker teams to the various tasks that need to be completed while keeping certain constraints in mind. The outcomes have demonstrated the best possible solutions, which include resource efficiency and the requirement for synchronized task execution. Despite the fact that this research study considers both workers and tasks, the vehicles that will be utilized are disregarded. It should be mentioned that the timing of the vehicles may affect how accurate this model is. In addition, Kabongo (2015) has suggested a multi-agent based model for GH management at airports in an effort to boost turnaround times and aircraft handling effectiveness and efficiency.

The distribution of resources for GHO was examined mathematically, excluding the effects of risk or uncertainty. Brasilia Airport served as a case study for testing the model. The paper's future works section indicates that the research results will be covered in a later paper, but the results themselves were not discussed in that paper. In order to create a structured resource management system for the effective management of both mobile and immobile resources, Kelemen (2005) proposed a resource management system for aircraft GH operations. In this instance, the airport personnel, cars, and all other mobile equipment are referred to as mobile resources, while immobile resources are immobile equipment like desks and check-in counters. The check-in, gate, baggage, staff, and equipment allocation are the five distinct modules that make up the proposed system. For every one of these modules, Gantt charts will be shown by this system. However, this system does not account for the distribution of workers and equipment jointly. An enhancement to aircraft GHO resource allocation was suggested by Marintseva et al. (2015). This paper introduced two subdivisions: aircraft GH and terminal handling, since GHO are performed on two distinct sites: land-side and air side. An algorithm with a mathematical foundation was put forth to minimize the overall turnaround time while maximizing the number of employees. Kyiv Airport was used as a case study to verify and test the study's findings.

2.3.3 Ground Handling Vehicles and Workers Allocation

The term "aircraft GH vehicles and workers' allocation" describes how best to divide up vehicles among workers. Not much research has been done in this field. The papers listed below offer various perspectives on the distribution of workers and vehicles. In his research, JorgHerbers (2005) addressed the optimization issues that arise during the GHO planning phases. In addition, two algorithms were primarily utilized for shift scheduling models and task level shift planning, which is connected to vehicle routing. Additionally, a different algorithm was created for intricate cyclic roistering. The latter is based on an established model for concurrently solving cyclic roistering and shift scheduling. The conducted experiments validated the suggested model's effectiveness. In fact, this model has demonstrated a decrease in shift costs of 22.7% while maintaining moderate solution times when compared to a heuristic algorithm. Despite being shown to be successful, the suggested model only considered task scheduling and ignored factors such as worker availability, schedules, and the availability of the vehicles to be used.

A multi-agent based model for airport service planning was presented by Chung et al. (2010). The suggestion was made that the allocation of maintenance vehicles could be optimized in order to lower operating costs and boost airports' competitiveness. Five agents were included in the model: the decision maker agent, the agents for tractors, cleaning vehicles, water vehicles, and airplanes. In this model, the agent decision maker, who verifies the availability of various vehicles based on the present need, acts as a mediator for communication between the aircraft agent and the other vehicle agents. This study used Hong Kong International Airport in China as a case study to evaluate the effectiveness of the suggested multi-agent based model. By using this model, delays were avoided and there was a clear optimization of the vehicles in use. Despite having established effective channels of communication and accounting for various agents, this model neglected to account for the various worker types employed by GHO. The allocation of workers was predicated solely on the supposition that distinct workers are situated within distinct vehicles.

Fink et al. (2016) suggested column generation while accounting for several synchronization constraints in vehicle routing problems. The planning and modeling of operational GH was the main focus of the study. Similarly, a mathematical model called Vehicle Routing Problem with Workers and Vehicles Synchronization (AVRPWVS) has been proposed. The primary goal of this AVRPWVS is to manage vehicles and labor in GH while reducing delays and vehicle routing expenses. In this instance of AVRPWVS, five different synchronization types are taken into account: load synchronization, task synchronization, movement synchronization, resource synchronization, and operation synchronization. All of these are meant to work together in order to synchronize every aspect of vehicle routing. Additionally, the model has been developed using two algorithms: an extended vector method algorithm and a labeling algorithm. In addition, an algorithm known as the branch-and-price heuristic was created to fix the altered routes. The findings indicate that the Branch and Price Heuristic (BAPH) and the MILP run for nearly the same amount of time and have nearly the same gap. But no real-world scenario has been used to test this model. As a result, the outcomes might not be reliable.

2.3.4. Ground Handling Operation Scheduling

Guimarans et al. (2015) presented an optimization strategy for GHO scheduling that aims to eliminate delays, reduce waiting times for operations, and maximize turnaround times overall.

Model implementation was done via Constraint Programming (CP). Additionally, Guimarans et al. (2015) considered a variety of factors, including the arrival and departure times of aircraft and the various requirements for turnaround operations. The study's findings indicate that various strategies could be used for operations scheduling; however, no quantitative findings have been provided. This paper considers both vehicle routing and operations scheduling, but it ignores the workers, who are an integral part of all operations. Moreover, an optimization strategy akin to that put forth by Guimarans et al. (2015) was proposed by S.P. Astorga (2014). The primary goals were to reduce the number of delays. Constraint programming (CP) is another technique that S.P. Astorga (2014) chose to employ. A variety of other algorithms, including Variable Neighborhood Descent (VND), Large Neighborhood Search (LNS), and Insertion Heuristics Method (IHM), were also employed. Similar to Guimarans et al. (2015), no numerical findings were provided. However, the system was tested in two airports: Barcelona and Palma de Mallorca. It was claimed to allow proper scheduling of operations. The findings demonstrate that the suggested model enables GH vehicles to be properly scheduled within the allotted time. However, the workers were not taken into account in this study. Bevilacqua et al. (2014) suggested an additional method for scheduling ground handling operations from a different perspective. The methodology involves utilizing Business Process Re-Engineering (BPR) in order to assess the effects of the GHO expansion. Bevilacqua et al. (2014) used distinct tools and techniques, including the Delphi method, IDEF3, and discrete event simulation, in contrast to Guimarans et al. (2015) and S.P. Astorga (2014).

Furthermore, the "as-is" scenarios and methods for enhancing and optimizing them in order to reach the "should-be" scenario were the primary focus. Similarly, several recommendations have been made to optimize the scheduling of operations; one such recommendation was to add a staff member. However, the scheduling of the vehicles and the abilities and availability of the workers were not taken into consideration in this simulation.

2.3.5 Ground Handling Resource Scheduling

The planning and scheduling of the various resources that are available on the airside of airports is referred to as "GH resource scheduling." Numerous scholars have examined the current problems in this field. A multi-project scheduling of airport GH under uncertainty was proposed by Mao et al. (2007). There are delays and disruptions because the GH operations and services

are typically regarded as autonomous parties. Mao et al. suggested a heterogeneous multi-agent framework as a remedy for this issue. The latter comprises two agent types: the GH operations and the aircraft. Because each agent is independent, it is possible for them to take individual benefits into account when determining when to schedule tasks. Additionally, online scheduling reduces the possibility of rescheduling in the event of unforeseen circumstances, and turnaround operation timeslots are primarily assigned through a market-based mechanism for project activities. Airports are dynamic environments, so operations cancellations and/or rescheduling are frequent occurrences. The idea of adding spare time in between various tasks was explored as a way to address this problem. An MPSP (Multi-Project Scheduling Problem) specific to airports was used as a case study to evaluate the effectiveness of the recommended solution. The ultimate outcomes have demonstrated that the suggested model has no defects and reacts appropriately in the face of uncertainty. The suggested model completely eliminated the need to schedule aircraft arrivals under uncertainty. Disruptions brought on by GH events also decreased significantly. However, a few incidents were reported as a result of resource inefficiency. While the scheduling problem was resolved, there were still a few other factors that needed to be considered in order to improve the system's efficiency, primarily the availability of workers and vehicles.

2.3.6 Ground Handling Service and Performance of Airlines

Productivity, efficiency, security, safety, and service quality are just a few of the areas that are included in ground handling operation performance (ACI, 2012). Airport quality standards are directly impacted by monitoring these latter (Vreedenburgh, 1999). Researchers have examined ground handling performance from a variety of perspectives, including optimization, operational costs, and delays.

This section covers the body of research that has been done on GHO. GHO performance has been discussed from an optimization perspective by Nugroho et al. (2012), Bite (2010), Gomez &Scholz (2009), and Pestana et al. (2010). Initially, Nugroho et al. (2012) concentrated on three distinct GHO tasks in an effort to raise the On Time Performance (OTP) rate: baggage handling, passenger handling, and aircraft cleaning. The equipment and physical infrastructure recommendations made by the researchers included things like adding more desks and information boards to expedite airport operations. It has been claimed that the results of the proposed model enhance the efficiency of ground handling operations; however, no tests have

been conducted to substantiate these claims. Similar to Nugroho et al. (2012), Bite (2010) has also suggested a method to enhance GHO's performance by introducing new gadgets that would facilitate vehicle-to-object tracking communication.

Furthermore, Gomez &Scholz (2009) have offered suggestions for enhancing GHO with regard to the DOC. Direct Operating Costs, or DOCs for short, are all of the costs associated with operations and maintenance. To begin with, a number of theories have been put forth. To reduce the unnecessary time consumption brought on by the current push-back method, autonomous push-back was proposed. Another suggestion for reducing passenger wait times was to use air stairs rather than air bridges. In order to more accurately assess these costs, the Association of European Airlines (AEA) method served as the foundation for the DOC calculations. The turnaround time has decreased, according to the results. The suggested remedies have a direct beneficial impact on aircraft DOC and may also enhance the GH environment. The technical aspect of GH was overlooked, despite the fact that this study offers ways to enhance GH performance.

Finally, to model and optimize GH operations, Pestana et al. (2010) proposed an Advanced Surface Movement Guidance and Control Systems (A-SMGCS) approach. Air traffic controllers, operations officers, GH managers, and vehicle drivers can all communicate effectively thanks to the A-SMGCS system implementation, also known as A-Guidance. Additionally, this system has the ability to incorporate data that is currently available from the airport, such as GPS vehicle data and data from the surface monitoring radar. Numerous benefits, including the ability to use sensors as data sources, smaller antennas, automatic transmission, automatic position broadcasting, and a 120-times-per-minute automatic position update, led to the adoption of this system. In actuality, the Conflict/Infringement Detection (CID) module is in charge of it at the application server level. To further assist decision makers, the A-Guidance has a Decision Support System (DSS). While cars are taken into consideration, it is also important to take into account the drivers, GH workers, and their availability and skills.

2.4 Determinant Factors Affecting Ground Handing Operation/Services

2.4.1 Supplier Relationship

Lack of coordination between airlines and ground handling service providers can negatively impact supplier relationships, resulting in inefficiencies and service delivery disruptions (De Wit, J. W., & Meyer, R. ,2010). Inadequate supplier relationship management can lead to low service quality, which can aggravate customers and have a detrimental effect on an airline's reputation (Zhang, A., & Wu, Y. 2015).

Weak supplier relationships can be characterized by a lack of trust and commitment, which can hinder collaboration, knowledge sharing, and innovation between airlines and ground handling service providers (Rogers, D. S., Lambert, D. M., &Croxton, K. L. (1998). The absence of effective performance measurement systems and metrics can make it challenging for airlines to assess the performance of ground handling service providers accurately (Veldman, J., &Nijholt, J.,2016).

The process of selecting and evaluating ground handling service providers is crucial for airlines. It is important to consider factors such as experience, capabilities, quality standards, and reliability when choosing suppliers (Ellram, L. M., & Liu, B. (2002). The sourcing decision in a multiple-supplier environment. Clear and well-defined contractual agreements between airlines and ground handling service providers are essential. These agreements should outline service level expectations, performance metrics, penalties, and dispute resolution mechanisms to ensure accountability and alignment of interests (Wagner, S. M., & Bode, C., 2008) .

For operations to run smoothly, airlines and ground handling service providers must effectively collaborate and communicate. Hendricks, K. B., &Singhal, V. R. (2003) state that regular communication, cooperative planning, and information sharing can help resolve problems, enhance coordination, and improve overall service performance.

Relationships with suppliers should promote innovation and ongoing improvement. Through cooperative initiatives, feedback mechanisms, and performance reviews, airlines and ground handling service providers can work together to find opportunities for process optimization, cost

reduction, and service enhancement (Cousins, P. D., Lamming, R. C., Lawson, B., & Squire, B. 2008).

Supplier relationships should also consider risk management aspects. Airlines need to assess the potential risks associated with their ground handling service providers and implement strategies to mitigate those risks, such as backup plans, diversification of suppliers, and contingency measures (Gligor, D. M., & Holcomb, M. C. (2012) .

2.4.2 Air Traffic

Airport congestion and delays caused by heavy air traffic have a direct impact on ground handling operations. Ground handling employees may experience longer turnaround times, decreased efficiency, and even service disruptions as a result of increased aircraft arrivals and departures (Gudmundsson, S. V., &Cattaneo, M. 2010).

Staffing and resource allocation must be done efficiently when managing ground handling services during periods of high air traffic. To guarantee smooth operations, adequate staffing levels, equipment availability, and coordination become essential. Service delays and poor performance can arise from inadequate staffing or resources during periods of high air traffic (Belobaba, P. P., Odoni, A., & Barnhart, C. 2009).

To manage aircraft flow and maximize ground handling operations, there must be effective coordination and communication between air traffic control, airlines, and ground handling service providers. Bieger, T., Wittmer, A., &Laesser, C. (2009) state that efficient and timely information exchange helps avoid bottlenecks, shortens turnaround times, and enhances overall service performance.

Risks to ground handling operations' safety may arise from increased air traffic. It becomes essential to coordinate properly and follow safety procedures in order to avoid collisions, accidents, or other incidents. For service performance to be guaranteed in a high-traffic environment, strong safety cultures and efficient safety management systems are essential (Zhang, A., Li, X., & Fu, X., 2018).

2.4.3 Customer Service

The effectiveness of an airline's ground handling services has a significant impact on passengers' overall satisfaction and experience. Research indicates that aspects of service quality like assurance, responsiveness, consistency, empathy, and tangibles have a big influence on how satisfied customers are (Parasuraman, A., Zeithaml, V. A., & Berry, L. L.,1988).

Customer loyalty and repeat business may be impacted by an airline's quality of ground handling services. Loyal passengers are more likely to show loyalty, tell others about the airline, and keep enduring connections (Sivadas, E., & Baker-Prewitt, J. L.,2000).

The effectiveness of the airline's ground handling services can affect word-of-mouth referrals and reputation. While unfavorable experiences can damage an airline's reputation, positive experiences with effective ground handling services can encourage positive word-of-mouth (Hennig-Thurau, T., Gwinner, K. P., &Gremler, D. D., 2002).

When airlines are in a service recovery situation, they have an especially important opportunity to promptly address customer complaints and resolve issues through effective ground handling service performance. Regaining the trust and loyalty of customers can be facilitated by effectively managing complaints (Tax, S. S., Brown, S. W., &Chandrashekaran, M., 1998).

Baggage handling, check-in procedures, and boarding are examples of ground handling services that have a major impact on an airline's overall dependability and punctuality. By reducing delays and interruptions, prompt and effective ground handling service operations can improve customer service (Matsumoto, H., & Nishimura, E., 2019).

Customer satisfaction depends on efficient communication and prompt information delivery to passengers about ground handling services, including flight updates, gate changes, and baggage handling status. Effective communication is essential for controlling client expectations and averting possible annoyances (Kim, H., & Kim, W. G., 2018).

The ability of ground handling personnel to offer individualized and careful service has a significant impact on client satisfaction. A positive customer service experience is enhanced by helpful and friendly employees who attend to the specific needs and preferences of each individual customer (Dedeke, A. N., & Yusuf, M. A., 2020).

Airport facilities, lounges, and amenities are also included in ground handling services. Customers' opinions of service quality and general satisfaction can be greatly impacted by the caliber and accessibility of these facilities (Johnson, L. W., & O'Leary-Kelly, A. M., 2003).

By accommodating unique tastes and requirements, ground handling services that provide personalization choices like seat preference, special meal requests, and priority boarding can increase customer satisfaction (Kandampully, J., &Suhartanto, D., 2000).

It is difficult to manage the airport and satisfy the needs of our patrons because there are many infrastructures, systems, workers, and regulations that are impacted by (customers) either directly or indirectly, according to Paternoster (2007). She added that a comprehensive, strategic approach to customer service and airport branding should be carefully considered by airport management. Positive passenger experiences were positively correlated with increased airport net revenue. Its tracking is made possible by the relationship between passenger satisfaction and airport revenue.

The tactic is based on synergy, which is created when a business's product or service fulfills the requirements and expectations of its clients. Accountability for customer complaints as well as for services, facilities, procedures, systems, and standards is crucial for establishing and meeting customer standards.

According to Kompas (2009), the research indicates that the issues at Indonesian Airport with regard to customer satisfaction stemmed from inadequate airport management to cater to passengers, capacity issues rather than passenger volume, and a failure to prioritize customer needs like security and comfort.

2.4.4 Infrastructure

Airport infrastructure capacity, the effectiveness of ground handling services can be strongly impacted by the size and capacity of the airport's infrastructure, which includes the runways, taxiways, aprons, and terminal buildings. According to Oum, T. H., Zhang, A., & Zhang, Y. (2011), insufficient infrastructure capacity can cause traffic jams, delays, and inefficiencies in the provision of services.

The effectiveness and efficiency of ground handling services can be impacted by the accessibility and caliber of terminal buildings and ground handling machinery, including boarding gates, baggage handling systems, and check-in counters. Customer dissatisfaction and service disruptions can result from outdated or inadequate equipment (Samimi, A. J., &Amiri, M., 2014).

The reliability and performance of baggage handling systems directly impact ground handling service quality. Efficient baggage handling systems minimize lost or mishandled baggage incidents, contributing to passenger satisfaction and operational efficiency (Gudmundsson, S. V., &Cattaneo, M, 2010).

Investments in modernizing and upgrading ground handling infrastructure have the potential to increase overall operational efficiency, shorten turnaround times, and improve service performance. The quality of ground handling services can be positively impacted by upgraded facilities and technologies (Forsyth, P., & Gillen, D., 2004).

The effectiveness of ground handling services can be impacted by the airport's integration and connectivity with other modes of transportation, such as the road and rail networks. According to Martínez-Budría and Serrano-Domingo (2004), the provision of smooth cargo and passenger transfers can be facilitated by efficient inter-modal transportation links, thereby improving the quality of service.

2.4.5 Skilled Manpower

Provision of high-quality services is contingent upon the proficiency and training of ground handling personnel. Personnel who possess the requisite training and expertise can proficiently manage diverse responsibilities, including but not limited to baggage handling, ramp operations, and passenger assistance, resulting in enhanced service delivery (O'Connell, J. F., & Williams, G., 2005).

Strong customer service skills, such as communication, responsiveness, and problem-solving abilities, can improve the overall passenger experience for ground handling personnel. Improved customer satisfaction is a result of positive interactions with knowledgeable and helpful employees (Marques, C. S., Reis, R. R., Nunes, L. C., & de Sousa, J. P., 2016).

Multilingualism, it can be helpful to have ground handling staff who speaks several languages in an international and diverse setting. Proficiency in language facilitates efficient interaction with travelers from diverse backgrounds, guaranteeing unambiguous guidance and support, and enhancing the caliber of services provided (Chen, C. F., & Tsai, C. H., 2007).

Awareness of safety and security, to maintain a seamless and safe operating environment, ground handling staff members need to give top priority to safety and security measures. Efficient service delivery and customer confidence are facilitated by appropriate training and knowledge of safety and security procedures (Rose, J., &Domański, R., 2011). Teamwork and coordination: Ground handling involves multiple tasks performed by different personnel and departments. Effective teamwork, coordination, and collaboration among ground handling staff are crucial for seamless service operations and timely execution of tasks (Zhang, A., Li, X., & Fu, X., 2018).

2.4.6 Technology and Innovation

Automation and self-service technologies: Self-check-in kiosks, automated baggage handling systems, and biometric identification systems are examples of automation and self-service technologies that can be adopted to increase the speed and efficiency of ground handling operations. According to Wang, Li, and O'Leary (2018), these technologies have the potential to improve service performance by cutting down on wait times, simplifying processes, and facilitating more individualized client interactions.

Digital platforms and mobile applications: By utilizing these tools, passengers and ground handling staff can communicate and share information more successfully. These technologies improve customer satisfaction and service performance by enabling real-time updates, personalized alerts, and seamless interactions (Sigala, M. ,2017).

Resource allocation and ground handling operations can be optimized through the use of data analytic and predictive modeling techniques. Airlines can enhance service performance by optimizing staffing levels, planning ahead, and anticipating passenger flows through the analysis of past data and patterns (Dresner, M., & Lin, C.,2017).

Internet of Things (IoT) and real-time tracking: IoT technologies, such as sensors and tracking devices, enable real-time monitoring of baggage, equipment, and processes. By providing

accurate and up-to-date information, IoT facilitates proactive decision-making, reduces errors, and enhances overall operational efficiency in ground handling services (Tiwari, R., Bhatnagar, R., &Tikoria, J., 2017).

Sharing economy and collaborative platforms: These two ideas can help airlines and ground handling service providers work together and share resources more easily. Better coordination, flexibility, and cost savings are made possible by these platforms, which enhance operational effectiveness and service performance (Kim, J. H., Agrusa, J., & Moon, H. C. 2017).

2.4.7 Safety and Security

Safety procedures and culture: Safe and effective service delivery depends on a robust safety culture in ground handling operations. Accidents, incidents, and disruptions can be reduced by following safety regulations, following standard operating procedures, and putting strong safety management systems in place (Zhang, A., Li, X., & Fu, X. ,2018).

Competency and training: Employees involved in ground handling should undergo in-depth instruction in risk management, emergency response protocols, and safety procedures. Competent and well-trained employees are better suited to manage possible security and safety issues, reducing risks and guaranteeing a secure workplace (Bieger, T., Wittmer, A., &Laesser, C., 2009).

Security procedures and guidelines: In order to safeguard travelers, planes, and airport infrastructure from possible dangers, ground handling service providers are required to put strict security procedures in place. A secure operating environment is maintained by means of strong security screening processes, access control systems, and cargo security protocols (Belobaba, P. P., Odoni, A., & Barnhart, C., 2009).

Working together and coordinating: Effective cooperation and coordination among multiple stakeholders, such as airlines, airport authorities, and regulatory agencies, are necessary for safety and security in ground handling services. The efficacy of safety and security measures is increased by open lines of communication, information exchange, and cooperative exercises (Gudmundsson, S. V., &Cattaneo, M., 2010).

Feedback systems and ongoing improvement: Ground handling service providers should set up feedback systems and take lessons from near-misses and safety-related incidents. Proactive measures and improved service performance can result from the identification of possible safety and security gaps through a continuous improvement culture (SauríMarchán, S., & Koo, B., 2018).

2.4.8 Integration/Communication and Coordination

Open and efficient communication channels are crucial for effective coordination in ground handling services. Timely and accurate information sharing among ground handling staff, airlines, and other stakeholders facilitates better decision-making, problem-solving, and overall service performance (Bieger, T., Wittmer, A., &Laes). Integration involves seamless coordination and information exchange between different functions, such as baggage handling, ramp operations, and passenger assistance, ensuring smooth operations and minimizing delays (Zhang, A., Li, X., & Fu, X.,2018).

Building collaborative relationships and partnerships among airlines, ground handling service providers and airport authorities can enhance coordination and service performance. Joint planning, regular meetings, and shared goals contribute to smoother operations and improved efficiency (Gudmundsson, S. V., &Cattaneo, M.,2010).

Standardized procedures and protocols in ground handling operations promote consistency and clarity in communication and coordination. Having established guidelines and protocols ensures that tasks are performed consistently and efficiently, leading to improved service performance (Bieger, T., Wittmer, A., &Laesser, C., 2009).

Utilizing technology-enabled communication tools, such as digital platforms, mobile applications, and real-time tracking systems, can enhance coordination and information sharing among ground handling personnel. These tools facilitate instant communication, task assignment, and status updates, leading to improved service performance (Zhang, A., Li, X., & Fu, X.,2018).

2.4.9 Weather/Climate

Adverse weather conditions: Adverse weather conditions, such as heavy rain, strong winds, fog, or snow, can significantly impact ground handling operations. These conditions may lead to flight delays, cancellations, or diversions, which in turn affect ground handling activities and overall service performance (Gudmundsson, S. V., &Cattaneo, M.,2010).

Weather conditions can pose safety risks to ground handling operations. For example, lightning storms or strong crosswinds may require the suspension of ground handling activities to ensure the safety of personnel and equipment. Ensuring the safety of ground handling operations under challenging weather conditions is crucial for maintaining service performance (Belobaba, P. P., Odoni, A., & Barnhart, C., 2009).

Effective contingency planning is essential for ground handling services due to the unpredictable and variable nature of weather. Creating backup plans that take bad weather into consideration can help reduce operational disruptions and sustain service quality. These plans might cover communication protocols, equipment upkeep, and alternative staffing arrangements (Bieger, T., Wittmer, A., &Laesser, C., 2009).

Ground handling services rely heavily on weather monitoring and forecasting systems. Personnel responsible for ground handling can anticipate weather-related difficulties and modify operations in accordance with accurate and timely weather information. Decision-making and service performance optimization are aided by having access to trustworthy meteorological data (Zhang, A., Li, X., & Fu, X. (2018).

2.4.10 Regulatory Body

The establishment and enforcement of guidelines and standards for ground handling operations are greatly aided by regulatory bodies. Adherence to these regulations guarantees the ground handling services' safety, security, and quality. Penalties, disruptions, and possibly detrimental effects on service performance may arise from noncompliance with regulatory requirements (Gudmundsson, S. V., &Cattaneo, M.,2010).

Credentialing and licensing: Generally, in order to operate, ground handling service providers must obtain licenses or certifications from regulatory bodies. These licenses guarantee that

service providers fulfill a set of requirements concerning infrastructure, gear, safety, and training. Fulfilling the prerequisites for certification and licensing indicates the competence and dependability of ground handling service providers, which enhances service performance (Zhang, A., Li, X., & Fu, X.,2018).

SLAs, or service level agreements, are frequently established by regulatory organizations to specify the performance goals and minimal requirements for ground handling services. These SLAs set standards for dependability, efficiency, and quality of service. Customer satisfaction and consistent, acceptable service performance are enhanced when SLAs are followed (Bieger, T., Wittmer, A., &Laesser, C., 2009).

Regulation supervision and tracking: Regulatory agencies keep an eye on and supervise ground handling activities to make sure rules and guidelines are followed. Frequent evaluations, audits, and inspections aid in locating possible problems and areas in need of development. Good regulatory supervision helps to improve safety and service performance over time (Belobaba, P. P., Odoni, & Barnhart, C., 2009).

2.4.11 Passenger, Cargo and Ramp Handling

Passengers:

a. Well-executed check-in and boarding procedures improve overall service quality. Passenger discontent and possible disruptions to ground handling operations can result from delays or inefficiencies in these processes (Gudmundsson, S. V., &Cattaneo, M. ,2010).

b. Improving service performance requires offering first-rate customer service and passenger assistance. To ensure a positive passenger experience, ground handling staff should be properly trained and equipped to handle inquiries from passengers, special requests, and potential problems (Zhang, A., Li, X., & Fu, X. ,2018).

Cargo:

a. Sustaining service performance depends on accurate and efficient cargo handling. The overall effectiveness and dependability of cargo operations are influenced by timely delivery, accurate documentation, and suitable handling techniques (Bieger, T., Wittmer, A., &Laesser, C., 2009).

b. Certain cargo types require special handling, such as hazardous materials or perishable goods. Following these guidelines helps to improve overall service performance by ensuring the cargo's safety and integrity (Belobaba, P. P., Odoni, A., & Barnhart, C., 2009).

Ramp handling

a. Sustaining service performance depends on an aircraft's timely and effective turnaround. In order to minimize delays and maximize operational efficiency, ground handling operations on the ramp, such as fueling, catering, cleaning, and baggage loading, should be smoothly coordinated and carried out (Gudmundsson, S. V., &Cattaneo, M.,2010).

b. Security and safety procedures: Activities related to ramp handling have an effect on the security and safety of aircraft operations. Maintaining service performance and guaranteeing the general safety of operations depend heavily on adherence to safety and security protocols, such as correct fuel handling, baggage screening, and aircraft marshaling (Zhang, A., Li, X., & Fu, X. 2018).

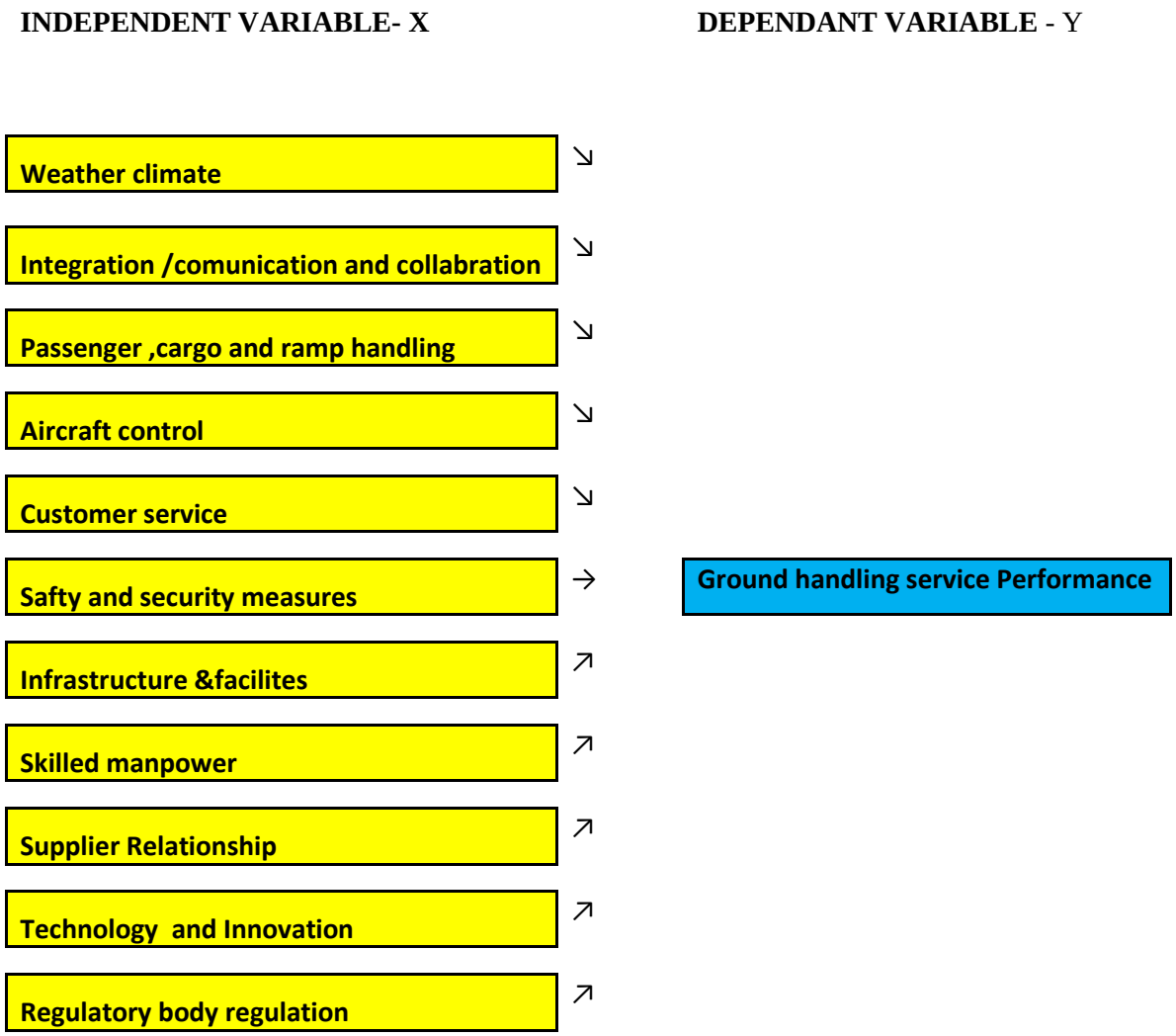
The major gaps of the previous studies are: -

- So far there is no clear and adequate study that included every parallel issues and no conclusive evidence about the potential challenges and determinants of ground handling services performance in the case of Ethiopian airlines.
- There is no clear evidence written whether the determinants of ground handling services are significantly affecting EAG performance with support for the existing relevancy theories on ground handling services.
- No sufficient and well study made regarding the determinants of ground handling in developing world including Ethiopian airlines and other research only focus on optimization issues on specific operation area.
- It shows that inadequate research was done on areas of the determinants of ground handling services performance that incoorporate both land side and airside in Ethiopian Airlines. Factors that could affect the ground handling performance was not properly studied with support of empirical data with context and circumstance of all regions and

most important factors. As far as the knowledge of the researcher, that still invites further research to take part on the challenge of the ground handling services.

Therefore, this study generally aims to fills the above stated gap in the literature by identifying the factor that affects or determine ground handling services performance in the case of Ethiopian airlines and contributes for the development of the company by addressing the issues by providing additional facts to the theories of ground handling services by considering some bench mark and common practice of others who are engaged with same practices.

Figure 4: Conceptual Framework on the determinants of ground handling services performance



Source: Related research review of the ground handling service in airline industry

CHAPTER THREE

RESEARCH DESIGN AND METHODS

3.1 Introduction

This chapter provides a brief overview of the overall framework for this specific study, including the selection of an appropriate research method and the modified and applied methodology. The approach can be used to articulate and analyze the factors determining ground handling service performance. Econometrics models, which assist in conducting regression, testing the significance of each variable, and illuminating the correlation between economic variables, have been used as a tool in the analysis. In order to verify, explore, and provide an answer to the research questions that have been posed, this study used primary data as well as secondary data from the company database. Variables were defined and developed in accordance with the theories and conclusions of the literature presented in the first two chapters.

The research design is presented in section 3.1 of the chapter, which is followed by sections on population and sample, data collection approach (data sources and instruments), model specification, data analysis, and limitations on data sources, sample, and instrument use for data analysis in sections 3.4, 3.5, and 3.6, respectively.

3.2 Research Approach

Research methodology is the approach a researcher takes to collect, analyze, and interpret data. This study used a mixed approach, combining quantitative and qualitative methods.

By observing how people behave, act, and react, data is gathered, analyzed, and interpreted using a qualitative approach (Creswell, 2003). It is recognized as an inductive approach that makes use of case studies and interviews among other data collection and analysis methods. In the words of Garson (2002), "qualitative research designs try for the in-depth understanding of subjects, using techniques such as participant observation or narrative analysis, or they may strive for an in-depth comprehension of texts through such procedures as exegesis or deconstruction." The motivations and causes were examined in a qualitative manner using the non-statistical qualitative research approach (Creswell, 2003).

The quantitative approach included a sizable sample size, posed the aforementioned queries, and predetermined the possible answers. According to (Bryman and Bell, 2007), the quantitative research methodology is useful for analyzing the study's perspectives and issues as well as for revealing hidden values, attitudes, and motivations. It is the most effective approach because it follows a logical process, gathers data, and evaluates pertinent theories. The mixed approach contains the merits of both approaches together.

3.3 Research Design

According to Eriksson &Wiedersheim-Paul (2001), research can be exploratory, descriptive, or explanatory depending on the nature of the problem. Given the importance of research design in assessing the validity of data and producing significant findings, the researcher chose a descriptive design after taking the study's nature into account. Descriptive design is essentially chosen to pinpoint the root causes of issues that arise on the unique ground handling service. It employed a quantitative and qualitative approach and employed a structured instrument that was specifically designed to measure the characteristics outlined in the research questions. After a single examination, the relationships between the variables of interest in a sample of subjects are ascertained. The correlation between independent and dependent variables was ascertained through quantitative analysis, while non-quantifiable data was described through qualitative methods.

3.4 Population

In conducting research, the entire group of persons or objects that have the characteristics that interest the researcher considered as study population (Harder, 1980).

The target populations for this study are

i. Ethiopian Airlines Premium Passengers,
ii. Ethiopian Airlines group management level Ground Handling service employees (First line management Supervisor, Manager and Director).

The total number of Ethiopian ground service management (first line supervisor, Manager and Director level) employees under ground handling departments is 118 (EAG HR, 2023) who work

under four departments in the airline including passenger departure service (23) Ramp services (50), Cargo services (15), special service (30).

The management staff were selected considering the fact that they have good expertise and experience and can provide detailed information than other employees.

The premium passengers were selected due to the reason that they frequently travel, repeatedly use the ground services and their relevancy and impact is high and less time consuming considering the total passengers.

3.5 Sampling Design

The process of choosing a subset of the target population for a research study is known as sampling. In most research, sampling is used to infer and draw conclusions about the entire population because it is costly and difficult to include every member of the population.

Kothari (2004) states that the ideal sample size is one that is neither too big nor too small. He states that for the target population, which is not very large, 5–10% of the total, could be sufficient. As a general rule of thumb, a correlation or regression requires at least 50 participants, though there are more intricate formulas. An ideal sample, in this sense, satisfies the needs of effectiveness, representatives, dependability, and flexibility.

i. Sample size for Ethiopian ground service management employee.

To determine the sample size the common scientific statistical formula, Yamane (1967) formula was applied from total of 118 management employees working in four departments directly related to the ground handling operation at Ethiopian Airlines Group some of them selected due to the fact that using the entire population as stated above is difficult and time-consuming accordingly the study applied the below Yamane (1967) formula accordingly the sample size will be 91 employees.

n= N/ (1 + N(e)2)

N= Total population (118 employees)

e= Error level

n = Number of samples

The research uses a 95% confidence interval. The error allowed is 5%, hence the total of 91 employees were taken to represent the 118 employees based on the above scientific sampling formula.

n= N/ (1 + N(e)2)

n= 118/1+118(.05)2 = 91 sample size

Table 1: Stratified sampling distribution table

Strata by working unit	Number of employees (target population)	Percentage	Sample size
Passenger services handling	23	20%	18
Ramp service	50	42%	38
Cargo service	15	13%	12
Special services	30	25%	23
	118	100%	91

Source: Based on data from ET ERP system (2023)

ii. Sample size for premium passengers.

The research population was premium passengers of Ethiopian airlines. Per the data obtained from the customer service and Sheba mile unit more than half million premium passengers flown with Ethiopian from more than 100 routes. Based on the formula of Bill Godden(2004) for determining sample size for infinite Population (where the population is greater than 50,000) applied. Accordingly, the sample size is:

SS= Z2X(P) X (1-P) / C2

SS = Sample Size

Z = Z-value (1.96 for a 95 percent confidence level)

P = Percentage of population picking a choice (0.5)

C = Confidence interval, expressed as (0.5)

SS=1.96 2 X (0.5)X(1-0.5) /0.52

=3.8416x0.5x0.5/0.52

=0.9604/0.25

SS= 384

A total sample of 384 passengers using Ethiopian airlines will be taken as respondents from the infinite population that are premium international passengers of Ethiopian airlines who have been on at least double-trip international flight in the past twelve months by Ethiopian airlines.

The respondents were taken from Bole international Airport to make the sample representative since Addis Ababa international airport is the international travel hub for Ethiopian airlines, and passengers of all 115 routes were found in Addis Ababa terminal. The questionnaires were distributed in a week from 10 Jan to 15 Jan 2024.

There are Several sampling methods applied in research where probability and non-probability sampling methods are the common classifications (Wiley P.,2019). Accordingly, for this research paper stratified probability sampling will be used and found appropriate. For the selection of sample from each stratum simple random, specifically lottery method was applied due to the fact that there are different ground handling service provider unit and randomly from different unit representative management staff selected using lottery method was found convenient.

3.6 Data Collection Methods

3.6.1 Sources and Types of the Data

To measure and test the nine independent variable including Supplier relation sheep, Infrastructure and facility, passenger handling, Ramp handling and Cargo handling, safety and security Integration and communication, customer services, skilled manpower, regulatory bodies, weather climate conditions, primary data is used mainly that have been collected from the users using both questioners, interviews and observation from the selected EAG ground handling management employee. EAG management employee and Premium international passengers data published on their respective official airlines firms website or online on the internet provide

priority, in addition secondary data found on magazine, newspapers, various publication and reports by international organization like ICAO, IATA, AFRA, SKYTRAX, Air craft manufactures forecasts was also employed .Airline firms not post their publication officially was not taken in to consideration for this research purpose.

While deciding about the method of data collection for the study two types of data applied primary and secondary.

Primary Data: Primary data for this study has been collected basically through interviews from key informants (KEI) and questionnaires. The questionnaires were dispatched to 91 selected respondents of management ground handling employee and 384 premium passengers. Moreover, for the qualitative purpose interviews for key ground handling employee supervisor and above supervisor level were interviewed anticipating that reduce the possibility of getting the wrong answer; attention was also paid on the reliability and validity of the questionnaire.

Each of the items incorporated in the questionnaire rated with the aid of five Likert-scale subjects ranging between one and five; where **5= Excellent/ strongly agreed, 4=Very Satisfactory /Agreed, 3=Satisfactory/Disagreed, 2=Poor/ Strongly disagreed**, **1=Very Poor/NA**. Then, the questionnaire was translated and pr-tested before the actual survey.

Secondary Data: The secondary data has gathered from different sources mainly data mined from the airline database, BI and OPEX report, financial statements,IATA report, Selamta Magazine, Daily Customer Service rating QSR report, published books, and research papers.

3.6.2 Data Producing (Collection) Instruments

Operational definition of Variables

In this part both independent and dependent variables, how they were derived for the research questions is stated clearly. The independent variables are developed based on the reviewed literature. The independent variables for this study include Suppliers relationship, Infrastructure and facility, Skilled manpower, Integration/communication and collaboration, safety and security, Passenger, cargo and ramp service, Regulation and compliance and were tested to find out relation and its influence on the dependent variable grounding handling service performance.

To clarify the relation between the independent and dependent variables, customer service/passenger, cargo and ramp service were used as control variables.

Since variables such as Infrastructure and facility with technology and innovation, customer service with passenger, cargo and ramp service, Air traffic and safety and security have similar or closer purpose and impact it has been merged and consider as one variable to make the analysis easier and avoid multicollinariy issues up on analysis of the data later on in chapter four.

- **Dependent variable**

The dependent variable for this study is ground handling performance (Y) which is believed to significantly affect the service in general while handling aircraft and passenger on ground. The task includes many activities which make it much more complicated to understand. Hence, it also determines the ground handling service performance against the standards set in handling aircraft on ground. Precisely the determinants are reflected in two ways respect to on time performance, customer satisfaction of the business unit but for this study on time performance or punctuality will be taken as dependent variable since its chain impact is a lot such as on customer satisfaction, airline cost increment/decrement and revenue, the airline competitiveness and overall credibility of EAG. Accordingly, the variables measured as follows.

  - ✓ **OTP (On time performance) = OTP t – OTP t-1 / OTP t-1**
    It measures the change, improvement or decline in service delivery on a timely basis and per schedule.
  - ✓ **Customer satisfaction measured by lacerate scale:**
    With respect to customer service on the ground, luggage service delivery and OTP per the schedule.
- **Independent variables**
  - ✓ **Suppliers Relationship (X1)**
    Determine the costs and benefits of different supplier relationships, and explores how organizations rely on external resources such as suppliers

- ✓ **Infrastructure and Facility (X2)**

Address the planning, design, operation, and maintenance of physical assets to support organizational objectives and activities. The variable Technology and innovation paired with this variable considering as facilities or tools to smooth customer handling and increase customer satisfaction. Moreover, to avoid multi collinearity issues, it is found necessary to combine with the following variables.

- ✓ **Skilled manpower(X3)**

  Determine how recruiting, training, managing, and retaining employees achieve organizational goals.
- ✓ **Safety and security(X4)**

  Risk management frame works, aim to identify, assess, and mitigate risks to ensure the safety and security of passengers, employees, and assets and its impact on performance

Note that **Air traffic control** included under those variables for easy of regression and have parallel purposes so as to avoid multi collinearity problems while processing regression.

- ✓ **Integration/Communication & Collaboration(X5)**

  Determine the level of information exchange and coordination between different group functions.
- ✓ **Regulatory bodies(X6)**

  Aim to keep the standard operation to maintain quality service
- ✓ **Passenger, cargo, and ramp handling (X7):**

  Determine the service operation management to meet or exceeding customer expectation, The other variable, customer service has same issues and pair relationships, so combined under this variable for easy of regression and avoiding multicollinearity issues between independent variables.

NB, Weather Conditions, the variable not sufficient data and indirect impact so excluded from regression.

3.7 Model Specification

The study employed a multiple regression model to assess the level of significance of the connection between the dependent and independent variables to determine the cause-and-effect relationship between the dependent and independent ones. The following is a representation of the model used to demonstrate and described as follows.

Therefore, Model, will be;

$$\mathbf{Y1 = \beta 0 + \beta 1X1 + \beta 2X2 + \beta 3X3 + \beta 4X4 + \beta 5X5 + \beta 6X6 + \beta 7X7 + e}$$

Y = The challenges of ground handling service performance

X1 = Suppliers relationship

X 2 Infrastructure and facility

X3 = Skilled manpower

X4 = Safety and security

X5 = Integration and communication

X6 = Regulatory bodies

X7 = Passenger, cargo, special and ramp handling

e = error term

β0, β1, β2, β3, β4, β5, β6, β7= the coefficient of the variables

- e = the error term

Description of Variables and Models

Table 2: Description of variables

	VARIABLES	SCALE
Independent	Supplier relationship	Ordinal
	Infrastructure and facility	Ordinal
	Skilled manpower	Ordinal
	Customer service	Ordinal
	Safety and security	Ordinal
	Integration and communication	Ordinal
	Regulatory bodies	Ordinal
	Passenger, Cargo, Ramp and special handling	Ordinal
Dependent	The Determinants of ground handling services performance	Ordinal & cardinal

3.8 Data Analysis

All the data collected were analyzed using frequencies, percentage distributions, means, and other descriptive statistics. In line with that, Pearson's linear correlation coefficient was used to test the given hypothesis. It is also important to calculate the coefficient that shows the degree of proximity between variable ground handling services (X) and variable of the determinants of ground handling (y).

On the other hand, multivariate analysis was applied as it helps to calculate the influence variable ground handling services (x) to variable the challenge of Ground handling (y). The 0.05 level of significance was used to determine the strength of the relationship between the independent and dependent variables.

3.9 Ethical Consideration

When doing research, various ethical factors must be taken into account, according to the Leedy&Ormrod study (cited in Yohannes, 2014). These include protection from danger, the right to informed consent, the right to privacy, and open communication with coworkers at work. Participants will be thus shielded from bodily and psychological harm; they only participated voluntarily; their right to privacy will be respected; and the outcomes will be provided in a precise and genuine manner. All participants agreed fully after being informed of the goals of the study. It is known as informed consent.

3.10 Reliability and Validity Test

3.10.1 Reliability

Reliability is the degree to which measurements can be repeated when performed by different people, at various times, under various conditions, and with apparently distinct devices that purport to measure the same item. Overall, consistency of measurement or stability of measurement under various settings, where essentially the same results should be produced, is reliability. The trustworthiness of the data is shown by a Cronbach's alpha coefficient greater than 0.7, according to Field (2006) and Zikmund (2010). Cronbach's alpha result must be higher than 0.7, indicating that the results of the question are credible.

3.10.2 Validity Test

The degree to which differences detected by a measuring device accurately represent those under test is known as validity (Kothari, 2004). In other words, validity is the most important criterion and shows how closely a measurement matches its intended purpose. To guarantee high standards of the research design, substance, and construct validity. The research adviser will check the content validity after considering the suitability of the measuring scales and the questions.

3.10.3 Continuity

The two main issues with validity are whether the measurement instruments are accurate and whether they are actually measuring what they aim to measure. Internal and external validity

relate to two different facets of the validity concept (Winter, 2000). Internal validity ensures that the researcher investigates the subject under investigation. The degree to which the questionnaire assesses what the researcher wants to measure to establish internal validity is referred to as internal validity it also refers to the extent to which the questionnaire's measurements provide the data necessary to carry out the study's goals. External validity is the extent to which study results can be generalized to a larger population. All surveys will be given out by the researcher in person to participants. The questions were modified from Li et al. (2006), Lenny et al. (2007), and Priscila and Luiz and are standard research questions widely used to evaluate supply chain management practice and competitiveness (2011). For clarity, they will also worded in simple terms that respondents could easily comprehend.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND DISCUSSION

4. Introduction

In the previous section, we provided a thorough explanation of the research methodology utilized in this study, following a predetermined framework. This section is dedicated to presenting the findings and carrying out a comprehensive analysis of the data collected from both premium passengers and the chosen Ethiopian Airline ground handling management personnel.

At the Bole International Airport terminal, a total of 384 questionnaires were distributed among the targeted premium passengers. Of these, 373 were completed and returned, while 16 respondents chose not to participate. Additionally, 21 questionnaires were returned blank. As a result, a substantial date set consisting of 336 questionnaires was compiled for thorough analysis. This equates to an 88% return rate, indicating a remarkable level of response suitable for detailed examination and the formulation of meaningful conclusions.

4.1 Reliability Test

Table 4.1: Cronbach's Alpha test table

Reliability Statistics		
Cronbach's Alpha	**Cronbach's Alpha Based on Standardized Items**	**N of Items**
0.775	**0.796**	**7**

Table 4.1 above shows Cronbach's Alpha value, the Cronbach's Alpha value is 0.775, which suggests a relatively high level of internal consistency among the items included in the scale. Additionally, the Cronbach's Alpha based on standardized items is 0.796, indicating that even after standardizing the items, the scale demonstrates a high level of internal consistency.

4.2 Descriptive statistics-premium Passengers and EAG MalmanagementEmployee

Demographic characteristics of- Premium passenger

Table 4.2: Age and Gender of respondents

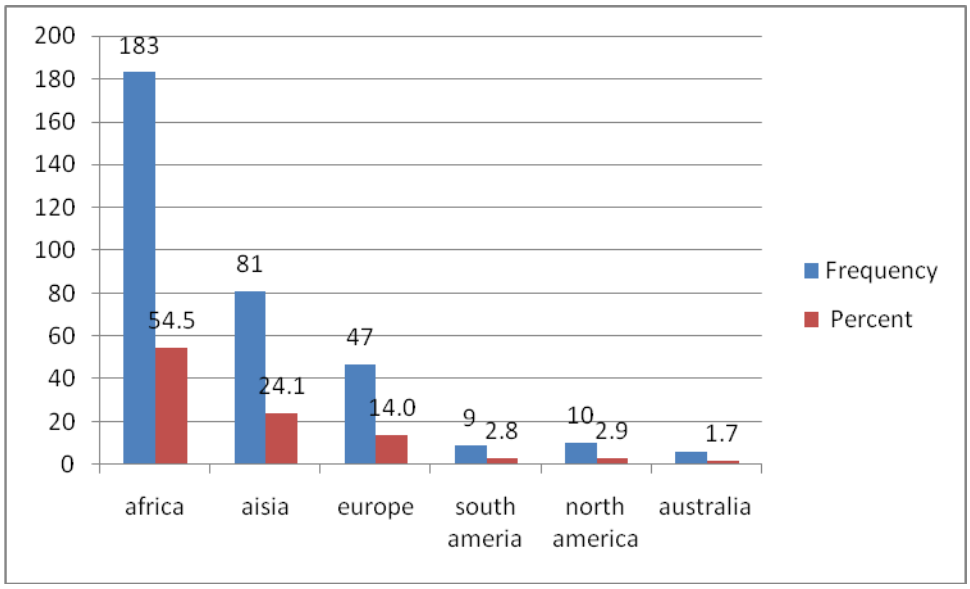
Gender of respondents	**Frequency**	**Percent**
Male	**241**	**71.7**
Female	**95**	**28.3**
Total	**336**	**100**
Age of respondents	Frequency	percent
18-35	**100**	**29.8**
36-50	**148**	**44**
51-65	**40**	**11.9**
66-90	**48**	**14.3**
Total	**336**	**100**

Sources: Own field survey data, 2024

Table 4.2 above, shows that information on the demographic makeup of respondents who are premium passengers of Ethiopian Airlines, focusing on their gender and age. The data reveals a noticeable gender discrepancy, with males comprising the majority at 71.7%, while females make up 28.3% of the total respondents. This gender imbalance highlights an area where Ethiopian Airlines could enhance its marketing strategies to better meet the needs and preferences of female travelers.

Regarding age distribution, the largest group of respondents falls within the 36 to 50 age range, accounting for 44% of the total. The next age group is 18 to 35, representing 29.8% of the respondents. Additionally, older passengers aged 51 to 65 and 66 to 90 constitute 11.9% and 14.3% of the respondents, respectively. These findings indicate that a significant portion of Ethiopian Airlines' premium passengers fall within the working-age range of 18 to 50, presenting ample opportunities for the airline to target this demographic segment and foster long-term customer loyalty through tailored services and offerings..

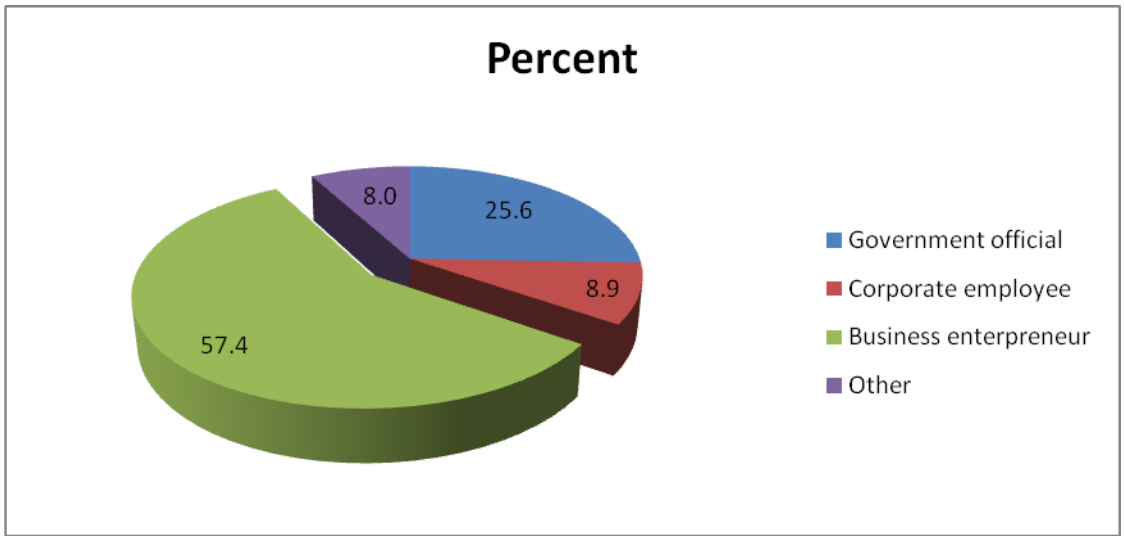
Figure 5: Frequency and percentage of respondent's nationality



Source: Own field survey data, 2024

According to the data, the majority of premium passengers (54.5%) come from Africa. The second-highest number of premium passengers from Asia, which accounts for 24.1% of all premium passengers comes from European nationals, who make up 14% of all premium passengers traveling with ET, followed by North America and Australia. This suggests that the company's most common premium passenger demographic, which contributes to its success, is African.

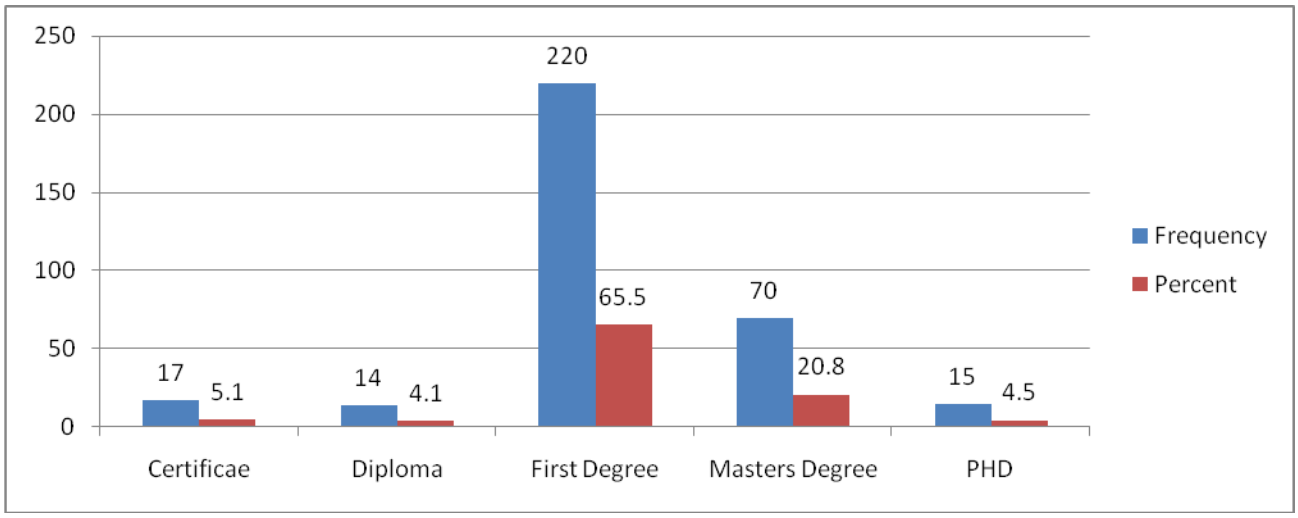
Figure 6: Occupation of respondents



Source: Own field survey data, 2024

As indicated in Fig number 6 the majority,57.4% of premium passengers from business entrepreneur occupation, followed by government official which accounts 25.6%, corporate employees and others like from medical filed and engineering each account 8% up to 8.9%, respectively .

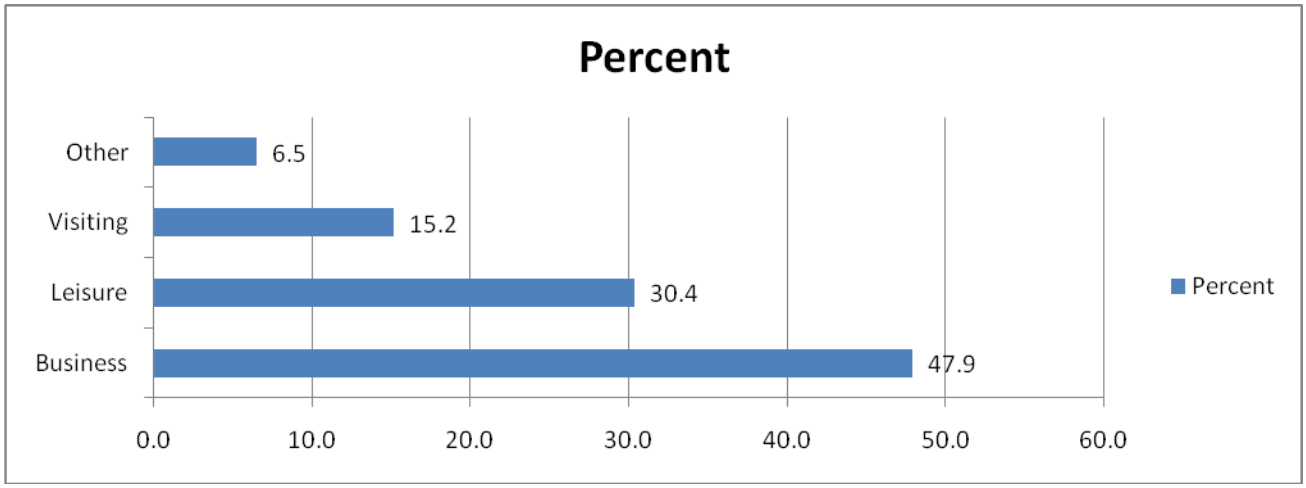
Figure 7: Education qualification of respondents



Source: Own field survey data, 2024

Figure 7 indicates that 65.5% of respondents have a first degree, roughly 21% have a second degree, and 4.5% have a doctorate degree. This suggests that the premium passengers have a combination of educational levels, with the lowest level being a certificate at 5.1% and the highest level being a doctorate degree at 4.1%, with the majority having better education levels ranging from diplomas to second degrees.

Figure 8: Purpose of travel and percentage of premium passengers



Source: Own filed survey data, 2024

The data presented in Figure 7 above indicates that 47.9% of premium passengers traveled with the intention of conducting business. The second most common reason for travel was leisure or vacation (30.4%), which was followed by visiting friends and family (15.2%) and other reasons (approximately 6.5 percent), such as meetings, medical needs, and other professional services.

4.2.1 Tangibility of Ground Handling Services

The following table describes the tangibility perspective of the ground handling services of EAG, which include the appearance, gesture, facilities etc.

Table 4.3: Descriptive statistics of passenger's response on Tangibility dimension of ground service

		PERCEPTION						
	Dimensions	**Level of satisfaction**						**Total**
No	**1. Tangibility**		5	4	3	2	1	
1.1	Appearance, gesture and uniforms of Ground service Agents.	Frequency	84	228	22	2		336
		Percent	25	67.5	6.5	0.6		100
1.2	Modern and clean check-in and boarding area, facilities and equipment's	Frequency	90	192	54			336
		Percent	26.8	57.1	16.1			100
1.3	Providing visually appealing equipment, like, seats, toilet etc	Frequency	57	102	122	32	23	336
		Percent	17	30.4	36.3	9.5	6.8	100

Source: Own field survey data, 2024

As indicated on table 4.3 above the dimension pertains to the tangible aspects of the ground service provided to passengers Appearance, Gestures, and Uniforms of Ground Service Agents response of respondents were, very satisfied (28.9%), Satisfied (64%), Neutral (6.5%) and Dissatisfied (0.6%). The majority of premium passengers (93.9%) expressed satisfaction or high satisfaction with the appearance, gestures, and uniforms of ground service agents. This shows that premium passengers place considerable importance on the professionalism and appearance of the staff they interact with.

And the respondents reply to Modern and Clean Check-in and Boarding Area, Facilities, and Equipment that Very satisfied (26.8%), Satisfied (57.1%), Neutral (16.1%) and Dissatisfied (N/A). A significant portion of premium passengers (84%) rated modern and clean check-in and boarding areas, facilities, and equipment as important or very important. This underscores the importance of maintaining a clean and contemporary environment for premium passengers.

According to table 4.3, Providing Visually Appealing Equipment, Like Seats and Toilets the respondents respond Very satisfied (17%), Satisfied (30.4%), Neutral (36.3%), Dissatisfied: (9.5%) and very dissatisfied (6.8%). A substantial portion of premium passengers (47.4%)

expressed satisfaction or high satisfaction with visually appealing equipment. However, there is a notable proportion (46.3%) who are neutral or dissatisfied, indicating that improvements may be needed in this area to better meet passenger expectations.

Generally, these findings show that the significance of tangible service elements in shaping the overall perception of premium passengers and emphasize the importance of investing in areas such as staff presentation, facility cleanliness, and equipment aesthetics to enhance the passenger experience.

4.2.2 Reliability of Ground Handling Services

Below able describes the reliability of ground handling service of EAG with respect to punctuality, curtsy and efficiency of check in and boarding or passenger handling services.

Table 4.4: Descriptive statistics of passenger's response on Reliability dimension of ground service

		PERCEPTION						
	Dimensions	**Level of satisfaction**						**Total**
No	**2.Reliability**		**5**	**4**	**3**	**2**	**1**	
2.1	On time performance of schedule flights.	Frequency	17	226	67	3	23	336
		Percent	5.1	67.7	19.9	0.9	6.8	100
2.2	Remedial procedures for deployed or missing baggage.		64	202	69		1	336
		Percent	19	60.1	20.5		0.3	100
2.3	Efficiency of the check in process and transfer at departure.	Frequency	38	202	96			336
		Percent	11.3	60.1	28.6			100

Source: Own survey data, 2024

According to Table 4.4 above, the majority of premium passengers 67.7% are content with the scheduled flights' on-time performance, and 5% of them are extremely satisfied. On the other hand, 6.8% of them are extremely dissatisfied, and 19.9% are neutral.This highlights a need for

the airline to enhance its on-time performance to address the concerns of the dissatisfied minority and solidify its reputation as a reliable carrier for premium customers.

As a result, the airline will put in more effort to maximize the OTP or punctuality in order to satisfy the 6.8% of premium passengers who are dissatisfied with flight delays and establish itself as a dependable airline for its premium customers.

The majority of respondents to the second reliability dimension question (remedial action for missing or delayed passenger baggage) were more than 60% satisfied, 20% were neutral, and 0.3% were very dissatisfied. This suggests that, despite the majority's satisfaction with the remedial action, a small number of passengers remain dissatisfied, and baggage service needs to be prioritized in order to maximize customer satisfaction and improve EAG's ground handling service performance.

Similar to this, the majority of premium passengers 60.1% are satisfied with the effectiveness of the check-in and transfer procedures at departure; 11.3% are extremely satisfied, indicating a need for the airline to maintain its performance; and 2.9% are dissatisfied, indicating a gap and an opportunity for the airline to meet customer demand.These findings underscore the importance of maintaining and improving service quality across all dimensions to ensure a positive passenger experience and uphold Ethiopian Airlines' reputation as a preferred carrier among premium travelers.

4.2.3 Responsiveness of Ground Handling Service

The following table shows the responses of ground handling service which includes response up on emergency, special need, up on delayed flight etc.

Table 4.5: Descriptive statistics of passenger's response on Responsiveness dimension of ground service

		PERCEPTION						
	Dimensions	**Level of satisfaction**						**Total**
No	**3.Responsiveness**		**5**	**4**	**3**	**2**	**1**	
3.1	Capable to response to emergency situations.	Frequency	99	114	123			336
		Percent	29.5	33.9	36.6			100
3.2	Understanding the specific needs of individual.	Frequency	81	248	7			336
		Percent	24	73.9	2.1			100
3.3	Prompt respond of employees of the airline to your request or of the airline to your request or complaint	Frequency	24	308	4			336
		Percent	7.1	91.7	1.2			100
3.4	Keeping customers informed about when services will be performed	Frequency	42	235	59			336
		Percent	13	69.9	17.6			100
3.5	Capacity to respond to canceled or delayed flights.	Frequency	70	190	46	29	1	336
		Percent	20.8	56.5	13.7	8.6	0.3	100

Source: Questioner's

According to the data in Table 4.5 above, 34% of premium passengers were satisfied with the response in an emergency, while 36% of respondents were neutral. The majority of respondents were satisfied with the company agents' ability to communicate with them and understand their unique needs.

Table 4.5 demonstrates once more how well employees respond to requests for help or compliant handling. Additionally, agents inform passengers consistently throughout the service, which has been reported to satisfy 91% of respondents. Workers' ability to react when a flight is canceled or delayed varies, as the table illustrates. Although the majority of respondents (56%) were satisfied, some rated their responses as extremely dissatisfied. This suggests that there is a

problem, and that the airline needs to improve its service in relation to when flights are canceled and delayed.

4.2.4 Assurance of Ground Handling Services

As indicated in the table below, assurance service includes knowledge of the employee, patience and courteous of employee for the customer.

Table 4.6: Descriptive statistics of passenger's response on Assurance dimension of ground service

		PERCEPTION						
	Dimensions	**Level of satisfaction**						**Total**
No	**Assurance**		**5**	**4**	**3**	**2**	**1**	
4.1	Knowledgeable employees to answer customers Question	Frequency	113	132	63	27	1	336
		Percent	33.6	39.3	18.8	8.0	0.0	100
4.2	Sincerity and patience in resolving passengers Problems	Frequency	115	161	60			336
		Percent	34	47.9	17.9			100
4.3	Probability of flight breakdowns.	Frequency	64	206	54	12		336
		Percent	19	61.3	16.1	3.6		100
4.4	Employees are consistently courteous	Frequency	34	294	8			336
		Percent	10.1	87.5	2.4			100

Sources: own survey, 2024

According to table 4.6 above, employees have a high level of knowledge when it comes to responding to customer requests, as evidenced by the majority of premium passengers who rated themselves as satisfied or very satisfied (39% and 33%). However, some passengers remained dissatisfied (8%), indicating that there was a gap in service efficiency that needed to be closed by management.

Regarding the second set of questions for premium passengers, the majority of respondents (48%) and (34%), respectively, affirm that the agents are sincere and patient in resolving

passengers' problems. However, 17.8% of respondents are hesitant to respond, indicating that the service point needs to focus more on improving its response rate in order to maximize customer satisfaction. Similarly, 87.5% of premium passengers react, and happy staff members are polite and consistently deliver service.

4.2.5 Empathy of Ground Handling Services

The following table shows empathy of ground handling service that include concerns on passenger needs such as ticketing channels, loyalty programs and other means of travel service on ground.

Table 4.7: Descriptive statistics of passenger's response on Empathy dimension of ground service

		PERCEPTION						
	Dimensions	**Level of satisfaction**						**Total**
No	**Empathy**		**5**	**4**	**3**	**2**	**1**	
5.1	Numerous, easy to use ticketing channels.	Frequency	25	294	17			336
		Percent	7.4	87.5	5.1			100
5.2	Spontaneous care and concern for passenger's needs.	Frequency	66	174	96			336
		Percent	20	51.8	28.6			100
5.3	Having other travel related partner e.g. car rental, hotels, travel insurance.	Frequency	34	274	26		2	336
		Percent	10.1	81.5	7.7	0.6		100
5.4	Having a sound loyalty program to recognize you as a Frequent customer.	Frequency	26	176	100	22	12	336
		Percent	8	52.4	29.8	6.5	3.6	100

Source: Questioner's

The data summary presented in Table 4.8 shows that 87.5 percent of respondents agreed and were satisfied with the ease of use of ticketing channels, apart from 17% who were neither in agreement nor disagreement. The majority also agreed that the passengers received spontaneous

care and concern, accounting for 51% of respondents who were satisfied and 20% who were very satisfied.

While some passengers disagreed with the third question posed to them, the majority of respondents (81% and 10%, respectively) expressed satisfaction and high satisfaction with the hotel and car rental services they received in response to their requests and with the particular service.

Regarding the loyalty program, 52% of respondents were satisfied and 8% were very satisfied; however, 3.6% and 6.5% of respondents, respectively, were still not satisfied and very dissatisfied.

4.2.6 Gap Analysis between Perception and Expectation of Premium Passengers

The table belwo summarized the gap analysis for perception and expectation of customer service of premium passengers.

Table 4.8: Mean perception, expectation and gap score analysis

Service quality attributes Tangibility dimension	**Perception Mean**	**Expectation mean**	**Gap Score (PE)**
Appearance, gesture and uniforms of Ground service Agents.	4.21	4.26	(0.05)
Modern and clean check-in and boarding area, facilities and equipment's	4.11	4.28	(0.17)
Providing visually appealing equipment, like, seats, toilet etc	3.41	3.93	(0.52)
Average mean	**3.91**	**4.15**	**(0.24)**
Total mean	**11.73**	**12.46**	**(0.73)**
Service quality attribute's reliability dimension			
On time performance of scheduled flights.	3.63	3.69	(0.06)
Remedial procedures for deployed or missing baggage.	3.98	3.99	(0.01)
Efficiency of the check in process and transfer at departure	3.83	3.87	(0.04)
Average mean	**4.85**	**5.08**	**-0.23**
Total mean	**38.80**	**5.18**	**-0.25**

Service quality attributes Responsiveness dimension			
Capable to response to emergency situations.	3.93	4	(0.07)
Understanding the specific needs of an individual.	4.22	4.26	(0.04)
Prompt respond of employees of the airline to your request or of the airline to your request or complaint	4.06	4.09	(0.03)
Keeping customers informed about when services will be performed	3.95	4.13	(0.18)
Capacity to respond to canceled or delayed flights.	3.89	3.88	0.01
Average mean	**9.81**	**4.26**	**-0.09**
Total mean	**58.85**	**4.10**	**-0.07**
Service quality attributes Assurance dimension			
Knowledgeable employees to answer customers Question	3.98	3.97	0.01
Sincerity and patience in resolving passengers Problems	4.16	4.18	(0.02)
Probability of flight breakdowns.	3.96	3.92	0.04
Employees are consistently courteous	4.08	4.1	(0.02)
Average mean	**14.14**	**4.09**	**-0.03**
Total mean	**84.84**	**4.06**	**-0.01**
Service quality attributes Empathy dimension			
Numerous, easy to use ticketing channels.	4.02	4.06	(0.04)
Spontaneous care and concern for passenger's needs.	3.91	3.93	(0.02)
Having other travel related partner e.g. car rental, hotels, travel insurance.	4.01	4.03	(0.03)
Having a sound loyalty program to recognize you as a Frequent customer.	3.54	3.63	(0.09)
Average mean	**19.08**	**3.97**	**-0.03**
Total mean	**114.46**	**3.95**	**-0.04**

Source: Own field survey data, 2024

Table 4.8 presents a detailed examination of the average perception, expectation, and gap scores for different service quality attributes categorized into distinct dimensions: Tangibility, Reliability, Responsiveness, Assurance, and Empathy.

In the Tangibility dimension, which encompasses the physical aspects of service provision, the average perception scores slightly fall short of the expectation scores. This results in gap scores ranging from 0.01 to 0.52. Specifically, customers express slightly lower levels of satisfaction in areas such as the appearance of ground service agents and the provision of visually appealing equipment. This suggests the need for the airline to focus on enhancing these tangible elements to better align with customer expectations.

Similarly, in the Reliability dimension, there are slight disparities between the average perception and expectation scores, leading to gap scores ranging from -0.01 to -0.25. While customers generally perceive the airline as reliable, there are minor areas where expectations are not fully met, such as on-time flight performance and baggage handling procedures. Addressing these discrepancies could improve the overall perception of reliability among customers.

Moving on to the Responsiveness dimension, customers generally perceive satisfactory responsiveness from the airline. However, gap scores ranging from -0.01 to -0.18 suggest minor areas where responsiveness could be improved, such as keeping customers informed about service timelines and promptly addressing complaints. Enhancing responsiveness could further enhance customer satisfaction and loyalty.

In the Assurance dimension, customers generally perceive satisfactory assurance from the airline. However, minor gaps ranging from -0.01 to -0.04 indicate areas for improvement, such as sincerity in problem resolution and consistent employee courtesy. Strengthening assurance aspects could enhance customers' trust and confidence in the airline.

Finally, in the Empathy dimension, customers perceive satisfactory empathy from the airline. However, minor gaps ranging from -0.02 to -0.09 exist, particularly in areas such as having a sound loyalty program and demonstrating spontaneous care for passenger needs. Improving empathy could foster stronger emotional connections with customers and enhance overall satisfaction.

Thus then, analysis demonstrates that while the airline generally meets customer expectations across various service quality dimensions, there are minor gaps that need to be addressed to ensure a more seamless and satisfying customer experience. By focusing on improving tangible

elements, reliability, responsiveness, assurance, and empathy, the airline can enhance its overall competitiveness and meet or exceed customer performance expectations.

4.2.7 Demographic Characteristics of Ground Handling Management Staff

Below table indicate the working experience, level of education, sex and working unit characteristic management staff under ground handling service of EAG.

Table 4.9: Summary of general information of ground handling staff of EAG.

	Sex		**working experience**			**Level of education**				**Working unit**			
	M	F	1-3 yr	4-6 yr	>6 yr	2nd Degree	First Degree	Diploma	Certificate	Passenger svs	Ramp svs	Cargo	Support svs
Total	70	21	0	5	86	10	81	0	0	19	38	11	23
percent	69	31	0	5.5	94.5	11	89	0	0	20	42	13	25

Source: Own field survey data, 2024

Table 4.9 provides a comprehensive summary of the general information pertaining to the ground handling staff of Ethiopian Airlines Ground Services (EAG).

Firstly, the data indicates a clear gender disparity, with 69% of respondents being male and only 31% female. This suggests that male employees constitute the majority within the ground handling staff of EAG.

In terms of working experience, a significant proportion of respondents (over 94%) have accumulated more than six years of experience, indicating a seasoned workforce within the management staff.

When considering the level of education, the majority of respondents (89%) hold a first degree, while 11% possess a second degree. Interestingly, no respondents hold a diploma or certificate, indicating a high level of educational attainment among the ground handling staff, particularly in higher education qualifications.

Furthermore, the distribution of respondents across various working units reveals that the departure passenger service area accommodates the largest proportion of employees, with 20% of respondents working in this unit. This suggests a focus on passenger services within the operational structure of EAG.

In sum, the data presented in Table 4.8 above indicates that a predominantly male workforce with extensive experience and high educational qualifications, particularly at the first-degree level. Additionally, the concentration of employees in the departure passenger service area underscores the importance placed on passenger services within the ground handling operations of EAG.

4.3 Descriptive Statistics of Independent Variables

Passenger, cargo and ramp handling, supplier relationship, infrastructure and facility, skilled manpower, integration and communication, safety and security, Regulation and compliance.

Passenger handling services of EAG

Below table indicate the analysis of passenger handling services specifically check in and boarding service including punctuality of the service performance of EAG ground handling unit.

4.3.1 Descriptive Statistics of Ground Handling Passenger Service

Table 4.10 below describes and summarizes the efficiency of check in services, boarding services and the overall on time performance of passenger handling services.

Table 4.10: Check-in efficiency, boarding efficiency and on time performance

		Statistic	Bias	SE	95% confidence interval	
					Lower	Upper
Check in efficiency	N	91	0	0	91	91
	Mean	3.82	0.00	0.08	3.67	3.97
	Std. Deviation	0.754	-0.008	0.071	0.607	0.885
	Skewness	-0.967	0.004	0.194	-1.382	-0.635
	Minimum	2				
	Maximum	5				
Boarding efficiency	N	91	0	0	91	91
	Mean	3.79	0.00	0.07	3.65	3.92
	Std. Deviation	0.659	-0.006	0.048	0.556	0.744
	Skewness	-0.228	0.003	0.233	-0.693	0.200
	Kurtosis	0.171	-0.033	0.461	-0.647	1.179
	Minimum	2				
	Maximum	5				
On time performance	N	91	0	0	91	91
	Mean	3.41	0.00	0.11	3.18	3.63
	Std. Deviation	0.73	-0.008	0.072	0.893	1.738
	Skewness	-0.526	0.015	0.174	-0.846	-0.154
	Kurtosis	-0.186	-0.004	0.350	-0.785	0.617
	Minimum	1				
	Maximum	5				

Source: Own survey regression statistical result output, 2024

Table 4.10 above indicates that, a comprehensive analysis of check-in efficiency, boarding efficiency, and on-time performance (OTP) within ground handling operations.

Check-in efficiency, with an average score of 3.82 and a standard deviation of 0.754, indicates some inefficiencies in customer service. The significant variability in scores among respondents suggests potential factors such as skilled labor shortages or issues with

infrastructure and facilities. These areas require improvement to enhance ground handling standards.

Similarly, boarding efficiency, with an average score of 3.79 and a standard deviation of 0.659, reveals deviations in handling customers at the boarding gate. This indicates that skill labor shortages, improper handling, and infrastructure/facility issues contribute to service inefficiencies. Addressing these concerns is necessary to improve ground handling standards.

For OTP, the average score of 3.41 suggests a lack of efficiency in flight handling operations, with a standard deviation of 0.73 indicating considerable performance variability. Factors like setup, environmental conditions, skilled labor shortages, and improper handling contribute to these inefficiencies. It is crucial to address ground handling service standards, infrastructure, and equipment issues to improve OTP.

Additionally, ramp handling operations, including tasks like passenger transportation and baggage handling, play a vital role in ensuring OTP and efficient aircraft turnaround. Further examination and optimization of these operations are necessary to enhance overall service reliability. Generally, the analysis emphasizes the need to address inefficiencies in ground handling operations to enhance customer service quality and overall operational performance.

4.3.2 Ramp Handling Service of EAG

Ramp handling service includes loading/unloading of cargo, passenger baggage, connecting transit passenger baggage, handling live animals, handling BRS system, rump bus, push back and other equipment that needed to speed up the flight turnover of the airline on the ground and directly involve the customer goods and satisfaction etc.

Table 4.11: Descriptive statistics for loading /unloading, baggage, BRS management, safety and security, ramp bus, claim file and on time performance of ramp handling service.

		Statistic	Bias	SE	95% confidence interval	
					Lower	Upper
Loading /Unloading	N	91	0	0	91	91
	Mean	3.80	0.00	0.06	3.68	3.93
	Std. Deviation	0.600	-0.006	0.040	0.515	0.674
	Skewness	0.103	-0.027	0.141	-0.224	0.329
	Kurtosis	-0.379	0.023	0.291	-0.797	0.305
	Minimum	3				
	Maximum	5				
Connecting baggage handling	N	91	0	0	91	91
	Mean	3.79	0.00	0.06	3.66	3.92
	Std. Deviation	0.606	-0.003	0.041	0.518	0.684
	Skewness	0.129	-0.020	0.139	-0.226	0.351
	Kurtosis	-0.432	-0.007	0.251	-0.836	0.185
	Minimum	3				
	Maximum	5				
BRS system handling	N	91	0	0	91	91
	Mean	3.71	0.00	0.07	3.58	3.86
	Std. Deviation	0.719	-0.005	0.039	0.641	0.790
	Skewness	0.490	-0.004	0.144	0.228	0.787
	Kurtosis	-0.933	0.035	0.193	-1.284	-0.545
	Minimum	3				
	Maximum	5				
Safety Regulation Compliance	N	91	0	0	91	91
	Mean	4.24	0.00	0.05	4.14	4.34
	Std. Deviation	0.479	-0.004	0.034	0.411	0.543
	Skewness	0.589	0.056	0.326	0.086	1.300
	Kurtosis	-0.199	0.037	0.665	-1.311	1.404
	Minimum	3				
	Maximum	5				
Priority Baggage Delivery	N	91	0	0	91	91
	Mean	4.01	0.00	0.04	3.92	4.10
	Std. Deviation	0.434	-0.005	0.047	0.333	0.524
	Skewness	0.061	0.026	0.329	-0.517	0.865
	Kurtosis	2.553	0.207	1.390	0.740	6.460

	Minimum	**3**				
	Maximum	**5**				
Rump bus/Push back /Passenger step handling	**N**	**91**	**0**	**0**	**91**	**91**
	Mean	**3.76**	**0.00**	**0.06**	**3.65**	**3.88**
	Std. Deviation	**0.584**	**-0.002**	**0.039**	**0.505**	**0.656**
	Skewness	**0.088**	**-0.019**	**0.172**	**-0.313**	**0.372**
	Kurtosis	**-0.403**	**-0.014**	**0.266**	**-0.797**	**0.240**
	Minimum	**3**				
	Maximum	**5**				
Claim File creation	**N**	**91**	**0**	**0**	**91**	**91**
	Mean	**3.63**	**0.00**	**0.08**	**3.47**	**3.78**
	Std. Deviation	**0.770**	**-0.006**	**0.057**	**0.651**	**0.870**
	Skewness	**-0.586**	**-0.006**	**0.190**	**-1.030**	**-0.254**
	Kurtosis	**0.028**	**0.012**	**0.398**	**-0.584**	**0.940**
	Minimum	**2**				
	Maximum	**5**				
On time performance (OTP), ramp handling	**N**	**91**	**0**	**0**	**91**	**91**
	Mean	**3.99**	**0.00**	**0.09**	**3.80**	**4.18**
	Std. Deviation	**0.913**	**-0.006**	**0.065**	**0.780**	**1.025**
	Skewness	**-0.785**	**0.013**	**0.131**	**-1.041**	**-0.520**
	Kurtosis	**-0.012**	**0.025**	**0.426**	**-0.712**	**0.922**
	Minimum	**2**				
	Maximum	**5**				

Sources; Own statistical result output, 2024

Table 4.11 above, the statistical data regarding various aspects of ramp handling services, encompassing activities like loading/unloading, baggage handling, BRS system management, safety and security compliance, ramp bus/push back operations, claim file creation, and on-time performance.

Loading/Unloading: The average score of 3.80 suggests some inefficiencies in the process of loading and unloading, and the standard deviation of 0.600 indicates variances in responses.

Connecting Baggage Handling: The mean score of 3.79 indicates potential coordination issues in transferring bags, as evidenced by the standard deviation of 0.606.

BRS System Handling: The average score of 3.71 suggests possible inefficiencies in managing the BRS system, and the standard deviation of 0.719 indicates variations in responses.

Safety Regulation Compliance: With an average score of 4.24, safety and security compliance appear to be highly efficient, supported by the low standard deviation of 0.479.

Priority Baggage Delivery: The mean score of 4.01 indicates relatively efficient handling of priority baggage, and the standard deviation of 0.434 suggests consistent responses.

Ramp Bus/Push Back Handling: The average score of 3.76 suggests some inefficiencies in ramp bus and push back operations, as reflected by the standard deviation of 0.584.

Claim File Creation: The mean score of 3.63 suggests room for improvement in creating claim files, with a standard deviation of 0.770 indicating variations in responses.

On-Time Performance (OTP) of Ramp Handling Service: The average score of 3.99 indicates below-average on-time performance, and the standard deviation of 0.913 suggests variations in responses and potential inefficiencies in the service.

Overall, while safety regulation compliance and priority baggage delivery demonstrate relatively high efficiency, there are areas that require improvement, such as loading/unloading, BRS system management, and claim file creation. Addressing these issues can enhance the overall performance and reliability of ramp handling operations.

4.3.3 Cargo Handling Services of EAG

Cargo handling services is one the major services provided by EAG on the ground which includes ULD services, Towing service and cargo documentation. The table below summarizes the specific service under cargo management at EAG.

Table 4.12: Cargo documentation service, towing delivery and ULD service

		Statistic		SE	95% confidence interval	
					Lower	Upper
Documentation service	N	91	0	0	91	91
	Mean	3.95	0.00	0.06	3.68	3.93
	Std. Deviation	0.600	-0.006	0.040	0.515	0.674
	Skewness	0.103	-0.027	0.141	-0.224	0.329

	Kurtosis	**-0.379**	**0.023**	**0.291**	**-0.797**	**0.305**
	Minimum	**2**				
	Maximum	**5**				
Towing delivery cargo	**N**	**91**	**0**	**0**	**91**	**91**
	Mean	**4.00**	**0.00**	**0.06**	**3.66**	**3.92**
	Std. Deviation	**0.780**	**-0.003**	**0.041**	**0.518**	**0.684**
	Skewness	**0.129**	**-0.020**	**0.139**	**-0.226**	**0.351**
	Kurtosis	**-0.432**	**-0.007**	**0.251**	**-0.836**	**0.185**
	Minimum	**3**				
	Maximum	**5**				
Availability of ULD	**N**	**91**	**0**	**0**	**91**	**91**
	Mean	**3.95**	**0.00**	**0.07**	**3.58**	**3.86**
	Std. Deviation	**0.779**	**-0.005**	**0.039**	**0.641**	**0.790**
	Skewness	**0.490**	**-0.004**	**0.144**	**0.228**	**0.787**
	Kurtosis	**-0.933**	**0.035**	**0.193**	**-1.284**	**-0.545**
	Minimum	**2**				
	Maximum	**5**				
On time performance (OTP) cargo handling	**N**	**91**	**0**	**0**	**91**	**91**
	Mean	**3.85**	**0.00**	**0.09**	**3.80**	**4.18**
	Std. Deviation	**0.98**	**-0.006**	**0.065**	**0.780**	**1.025**
	Skewness	**-0.685**	**0.013**	**0.131**	**-1.041**	**-0.520**
	Kurtosis	**-0.011**	**0.025**	**0.426**	**-0.712**	**0.922**
	Minimum	**2**				
	Maximum	**5**				

Source: Own statistical result output, 2024

Table 4.12 presents statistical data regarding cargo documentation services, towing delivery, availability of Unit Load Devices (ULD), and the on-time performance (OTP) of cargo handling services.

Documentation Services: The average score of 3.95 suggests a moderate level of efficiency in documentation services, and the standard deviation of 0.600 indicates some variation in responses.

Towing Delivery Cargo: With an average score of 4.00, towing delivery cargo services demonstrate relatively good performance. However, the standard deviation of 0.780 indicates some fluctuations in responses, which could lead to deviations from service level agreements (SLAs).

Availability of ULD: The mean score of 3.95 indicates a reasonable level of ULD availability, but the standard deviation of 0.779 suggests some variability in service performance. This variability may affect ground handling operations.

On-Time Performance of Cargo Handling Service: The average score of 3.85 reflects below-optimal on-time performance, and the standard deviation of 0.98 highlights significant variations in service delivery and potential inefficiencies in cargo handling operations.

Generally, while towing delivery cargo services exhibit relatively good performance, there is room for improvement in documentation services, ULD availability, and the on-time performance of cargo handling services. Addressing these areas of inefficiency can enhance the overall effectiveness and dependability of ground handling operations.

4.3.4 Supplier Relationship and Ground Handling Service of EAG

It summarize as indicated below the relation of organizational trust, collaboration and effective communication between the airline and suppliers.

Table 4.13: Descriptive statistics for Supplier relationship

	SR1.1	SR1.2	SR1.3	SR1.4
N	**91**	**91**	**91**	**91**
Mean	**4.16**	**3.9**	**3.43**	**3.51**
Median	**4**	**4**	**4**	**4**
Std. Deviation	**0.454**	**0.597**	**0.661**	**0.681**
Skewness	**0.661**	**0.033**	**-0.485**	**-0.965**
Kurtosis	**0.914**	**-0.177**	**-0.272**	**0.761**
Minimum	**3**	**3**	**1**	**1**
Maximum	**5**	**5**	**5**	**5**

Source: own survey, 2024

Table 4.13 above indicates the supplier relationship of EAG and its impact on ground handling service and on-time performance.

Supplier Relationship Quality: The data indicates a generally positive relationship between EAG and its suppliers, with a mean score of 4.1 out of 5. While this suggests good relations, the standard deviation of 45% implies some variability, indicating room for improvement in supplier management to further enhance service quality and on-time performance.

Trust Issues: Despite the overall positive relationship, trust appears to be an area of concern. The mean score of 3.9 out of 5 suggests some level of trust between EAG and its suppliers, but the standard deviation of 9% indicates variability and potential gaps in trust. Addressing trust issues is crucial as it directly and negatively impacts both service quality and on-time performance.

Strategies and Best Practices: The data reveals that EAG's strategies and best practices in supplier management may need improvement. With a mean score of 3.43 out of 5 and a standard deviation of 0.66, there appears to be a gap between current practices and industry standards. Enhancing strategies and adopting best practices can lead to increased efficiency in supplier management and ultimately improve ground handling service performance.

Communication and Information Sharing: Effective communication and information sharing are vital aspects of supplier relationships. The mean score of 3.51 out of 5 suggests moderate communication and information sharing between EAG and its suppliers. However, the standard deviation of 68% indicates significant variability, highlighting potential challenges in information exchange. Improving communication channels and sharing relevant information can lead to better coordination and efficiency in ground handling operations, ultimately improving on-time performance.

Overall, while EAG maintains a generally positive relationship with its suppliers, there are areas such as trust, strategies, and communication that require attention and improvement to enhance ground handling service quality and on-time performance. Addressing these aspects can lead to smoother operations and better service delivery in the long run.

Other researcher findings : As indicated in chapter two this study such as De wit,.w, & Meyer R.2010 also confirms a negative impact if airline and supplier lack coordination and trust and have impact on airline reputation since create low level quality service aggravate customer ,Per the finding of Hendrick ,K.B,&Singhal V.R.2003 regular collaboration, cooperative planning and information sharing can help resolve problem .

4.3.5 Infrastructure and Facility

Are resources essential for operation and provide efficient service includes facility layout and different facilities at land side and airside of the airport. Below table summarize the infrastructure and facility relationship with service, operation and performance of ground handling services of EAG.

Table 4.14: Descriptive statistics for Infrastructure and facility

	IS2.1	IS2.2	IS2.3	IS2.4	IS2.5	IS2.6	IS2.7	IS2.8	IS2.9
N	91	91	91	91	91	91	91	91	91
Mean	3.84	3.88	3.85	4.3	4.03	3.95	3.79	3.99	4.18
Median	4	4	4	4	4	4	4	4	4
Std. Deviation	0.637	0.697	0.842	0.505	0.458	0.689	0.837	0.913	0.485
Skewness	0.152	0.168	0.3	0.366	0.133	0.071	-0.634	-0.785	0.431
Kurtosis	-0.56	-0.905	-1.531	-0.697	1.941	-0.853	0.07	-0.012	0.528
Minimum	3	3	3	3	3	3	2	2	3
Maximum	5	5	5	5	5	5	5	5	5

The above table summarizes the infrastructure and facility effect on the efficiency of ground handling operation and service performance. The data revealed that the average mean score was 3.9 with maximum value 5 and minim value 3 and its average standard deviation 60% indicates that the infrastructure and facility resource affect the services of ground handling services. The capacity planning, the layout and the infrastructure environment were not smooth as required and negatively impacted on the services and on the time performance of the ground handling service.

The data show that the mean score for the required infrastructure was 3.94, and the standard derivation of 60% suggests that these requirements are not met in order to provide the service

effectively, which may have an effect on how well ground handling services performance. However, the capacity planning and design ability mean score, which is displayed in the above table, is better, with a mean value of 4.03 and a standard deviation of 45%. This suggests that resource planning has a much better capacity and has a positive impact on timely performance, even though it isn't up to the required maximum standard.

In addition, the mean score 4.03 and standard deviation score 23% regarding to customer center environment indicate slightly better apart from the infrastructure and facility resources issues. Regarding infrastructure layout, some passengers' perception and satisfaction are affected, which can be an opportunity for improvement.

Other researcher findings: As indicated in chapter two of empirical evidences the effectiveness of ground handling service strongly impacted by ground the size and capacity of the Airport infrastructure including run way, taxi way ,apron and terminal building According to Oum, T.H., Zhang A. and Zhang Y(2011) findings show that insufficient infrastructure causes traffic Jams, delays and inefficiency in service .

Finding per Samimi, A,, and Amiri M 2014) indicate also that effectiveness and efficiency of ground handling service impacted by accessibility of basic infrastructure such as caliber, terminal building machinery, boarding gate, baggage handling system and check in counters.

4.3.6 Skilled Manpower

Personnel who possess the required skills and training to manage devise responsibility, strong customer service skills such as communication, responsiveness and problem-solving abilities improve overall performance (Marques, C.S, Resis, R.RNunes. L,C and de Sousa .P 2016).

The following table presents summary of skilled manpower data analysis of EAG ground handling services.

Table 4.15: Descriptive statistics for skilled manpower

	SM3.1	SM3.2	SM3.3	SM3.4
N	**91**	**91**	**91**	**91**
	0	**0**	**0**	**0**
Mean	**3.84**	**4.25**	**4.11**	**3.78**
Median	**4**	**4**	**4**	**4**
Std. Deviation	**0.654**	**0.485**	**0.526**	**0.757**
Skewness	**-0.793**	**0.544**	**0.13**	**0.392**
Kurtosis	**1.419**	**-0.32**	**0.535**	**-1.151**
Minimum	**2**	**3**	**3**	**3**
Maximum	**5**	**5**	**5**	**5**

Source: Regression output SPSS 26

As indicated in table 4.15 above on average the data revels that the mean score was 3.8 with maximum 5 and minimum 3 which deviate from the standard required skill to deliver the service with competences due to the fact that inadequate training and development, lack effective recruitment system that attract and retain capable skilled manpower and lack leadership on handling human capital which leads to high turnover of ground handling staffs .

Other researcher findings: Skills specially on customer service such as personnel speaks two and more language, staffs properly aware process, safety and security, staffs have good communication capabilities, staffs have good teamwork have a positive impact on ground handling service and performances (Zhang,A,Li,X.,&FU,X,2018).

4.3.7 Safety, Security and Air Traffic Control

Important aspect of the ground handling service due to the act that billons of USD dollars cost in aviation industry according to IATA report related to this factors that can be saved if perfectly the safety and security measure on ground .Moreover it is critical factors in airline industry to, insure the safety of passengers, employees and asset of the airline (Flin et al, 2013).

Below table summarize the safety and security analysis of ground handling service of EAG.

Table 4.16: Descriptive statistics for safety and security

	SS4.1	SS4.2	SS4.3	SS4.4	SS4.5	SS4.6	SS4.7	SS4.8	SS4.9
N	**91**	**91**	**91**	**91**	**91**	**91**	**91**	**91**	**91**
Mean	**4.04**	**3.84**	**4.01**	**4.07**	**4.26**	**3.7**	**4.07**	**4.62**	**4.03**
Median	**4**	**4**	**4**	**4**	**5**	**4**	**4**	**5**	**4**
Std. Deviation	**0.665**	**0.637**	**0.505**	**0.25**	**0.941**	**0.548**	**0.291**	**0.489**	**0.277**
Skewness	**-1.901**	**0.152**	**0.021**	**3.557**	**-0.555**	**-0.042**	**2.068**	**-0.482**	**1.238**
Kurtosis	**8.556**	**-0.56**	**1.079**	**10.892**	**-1.659**	**-0.55**	**7.913**	**-1.808**	**10.33**
Minimum	**1**	**3**	**3**	**4**	**3**	**3**	**3**	**4**	**3**
Maximum	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**

Source: Regression SPSS 26 out put

Table 4.16 summarized safety and security factors effect on the ground handling service performance of EAG, on average the mean value was 4 with minimum 3 and maximum 5, the standard deviation score was on average 45% implies that EAG has good and safety and security measure and its impact was good on the performance of ground handling service relative to other factors due to the fact adapted good safety management system and good leadership and commitment and culture for safety and security for its passenger , employee and asset of EAG .

Other researchers findings: According to(Zhang,A,Li,X.,&FU,X,2018) suggest well trained employee in safety and security risk management are better suited to manage possible security and safety issues .Collaboration and good communication with other stakeholders such as Airport security or authority have positive impact on ground handling service and the safety and security of passenger, goods and employees including terminals and facility from possible damage.

4.3.8 Integration, Communication and Technology

Coordination, integration, and communication between different departments and stakeholders are important aspect to achieve organizational goals and enhance service performance for one organization (Scott, 2014).

Below table summarize the integration, communication and technology aspect of ground handling service of EAG

Table 4.17: Descriptive statistics for Integration, communication and Technology

	IC5.1	IC5.2	IC5.3	IC5.4	IC5.5	IC5.6	IC5.7
N	**91**	**91**	**91**	**91**	**91**	**91**	**91**
Mean	**3.74**	**4.62**	**4.03**	**4.03**	**4.03**	**4.55**	**4.25**
Median	**4**	**5**	**4**	**4**	**4**	**5**	**5**
Mode	**4**	**5**	**4**	**4**	**4**	**5**	**5**
Std. Deviation	**0.593**	**0.489**	**0.233**	**0.233**	**0.277**	**0.543**	**0.926**
Skewness	**0.148**	**-0.482**	**2.246**	**2.246**	**1.238**	**-0.626**	**-0.529**
Kurtosis	**-0.492**	**-1.808**	**15.468**	**15.468**	**10.33**	**-0.773**	**-1.642**
Minimum	**3**	**4**	**3**	**3**	**3**	**3**	**3**
Maximum	**5**	**5**	**5**	**5**	**5**	**5**	**5**

Source: Regression output SPSS 26

The data show that the mean score for the required integration and communication was 3.74, and the standard derivation of 59% suggests that these requirements are not met in order to provide the service effectively, which may have an effect on how well ground handling services perform.

Furthermore the data indicates that technology factors and facility mean score high 4.55 and 4.25 indicate that EAG adaptation of technology is helpful in achieving better performance in ground handling services.

Other researchers finding:

As per the finding Zhang, A., Li, X., & Fu, X. (2018) research seamless coordination and information exchange between different functions, such as baggage handling, ramp operations, and passenger assistance, ensuring smooth operations and minimizing delays

According to Gudmundsson, S. V., &Cattaneo, M. (2010) joint planning, regular meetings, and shared goals contribute to smoother operations and improved efficiency.

According to Wang, Li, and O'Leary (2018), technologies such as digital platform and mobile applications have the potential to improve service performance by cutting down on wait times, simplifying processes, and facilitating more individualized client interactions.

4.3.9 Regulation and Compliance

Adherence to regulations guarantees the ground handling services' safety, security, and quality. Penalties, disruptions, and possibly detrimental effects on service performance may arise from noncompliance with regulatory requirements (Gudmundsson, S. V., &Cattaneo, M., 2010).

The table below summarizes the effect and relationship between regulation, compliance and ground handling service performance of EAG.

Table 4.18: Descriptive statistics for Regulation and compliance

	RC6.1	RC6.2	RC6.3
N	**91**	**91**	**91**
Mean	**4.19**	**4.09**	**4.03**
Median	**5**	**4**	**4**
Mode	**5**	**4**	**4**
Std. Deviation	**0.893**	**0.285**	**0.277**
Skewness	**-0.38**	**2.96**	**1.238**
Kurtosis	**-1.654**	**6.911**	**10.33**
Minimum	**3**	**4**	**3**
Maximum	**5**	**5**	**5**
Std. Error of Skewness		**0.253**	**0.253**
Kurtosis		**-1.654**	**6.911**
Std. Error of Kurtosis		**0.5**	**0.5**
Minimum		**3**	**4**
Maximum		**5**	**5**

Source: Regression output SPSS 26

The data in the above table shows that, on average, the mean score was higher than 4, with minimum and maximum values of 3 and 5, respectively, and an average standard deviation of 50%. This suggests that, in order to improve customer satisfaction and on-time performance,

ground handling services must be more sophisticated in their handling of regulations and compliance requirements.

Other researcher findings

According to Zhang, A., Li, X., & Fu, X. (2018) findings shown that fulfilling the prerequisites for certification and licensing indicates the competence and dependability of ground handling service providers, which enhances service performance

According to Bieger, T., Wittmer, A., &Laesser, C. (2009) Customer satisfaction and consistent, acceptable service performance are enhanced when SLAs are followed.

According to the study and findng of Belobaba, P. P., Odoni, & Barnhart, C. (2009), Good regulatory supervision helps to improve safety and service performance over time.

4.4 Descriptive Statics between Independent and Dependent Variable, on Time Performance

The below table summarize the relation and characteristics between the seven-independent variable with deponent variables

Table 4.19: Descriptive statistics for In-dependent and Dependent variables (On time performance)

Statistics								
	SR	IS	SM	SS	IC	RC	PC	OTP
N	91	91	91	91	91	91	91	91
Mean	3.75	3.9784	3.9945	4.0707	4.178	4.1023	4.0907	4.0596
Median	3.75	4	4	4.11	4.43	4.33	4.25	4
Std. Deviation	0.51908	0.41291	0.4425	0.28824	0.36666	0.36208	0.23427	0.39821
Variance	0.269	0.17	0.196	0.083	0.134	0.131	0.055	0.159
Skewness	-0.746	0.773	0.157	0.207	-0.078	0.369	0.368	0.332
Kurtosis	0.565	-0.419	-0.14	0.267	-0.981	-0.319	1.524	-0.568
Minimum	2.25	3.44	3	3.44	3.71	3.67	3.75	3.43
Maximum	4.75	5	4.75	5	5	5	5	5

Source: SPSS version 26 regression out put

Mean value of on time performance (OTP)

Measured as the change in on time performance between current year with last year over current year on time performance, on average the mean value of on time performance was 4.05 with minimum value 3.04 and maximum value 5 the statistical value of OTP was skewed to the rightthejustification is statistical media score value was 4 somehow far from its statistical mean sore value 4.05.

The summary of descriptive statistics between the seven dependent and independent variables is shown in table 4.18 above. The average score for safety and security, integration and communication, rules, and compliance was found to be higher than that of skilled labor, infrastructure, and supplier relationships. The variables with the highest means scores were integration and communication.

The standard deviation values in the table, for example, for the supplier relationship (0.51), the infrastructure and facility (0.41), the skilled labor (0.44), the safety and security (0.28), and so on, suggest that the variable deviates from the expected standard service provided because of infrastructure problems, a shortage of skilled labor, problems with integrated communication, and compliance issues that must be resolved to meet operational demands and maintain on-time performance.

4.5 Descriptive Statistics of Interviews

The interview was carried out in addition to the questioners for 6 representatives of different unit accordingly the majority argued the infrastructure and facility issues are incompatible with the demand of operation, in addition skilled labor issues currently have in shortfall, according to their explanation high employee turnover due to salary and workload imbalance and other issues such as environmental issues, leadership issues are among the factors. Some of the interviewed said that the regulatory body such as airport authority, NISS security, immigration and custom authority are a bottle neck for the service on the ground.

Hence majority of the interviewers suggested that new sophisticated airport should be built as the number of passengers and goods or service demand increasing .More over more technology application such as at check in counter and boarding gate as well as baggage service are required

and re integration between units and departments also required as necessary to fill the gap on operation and improve the ground handling service performance.

4.6 Correlation Analysis

Table 4.20 below summarize the correlation between independent variables Supplier-relation (SR), Infrastructure (IS), skill-manpower (SM), Integration and communication (IC), Safety and security (SS), Regulation and compliance (RC) and passenger, ramp and cargo services (PC).

According to Brook (2008), a correlation between two variables indicates the degree of linear association between them, thus the parson correlation coefficient was used to test the correlation between the variables.

Table 4.20 displays the correlation analysis's outcome. Regarding the multicollinearity issue, according to Keendy (2008), multicollinearity existed among the independent variables if the correlation coefficient value was above 0.7.

Table 4.20 Correlation between independent variables

Correlations							
	SR	**IS**	**SM**	**SS**	**IC**	**RC**	**PC**
SR	**1**						
IS	**.642**	**1**					
SM	**.221**	**.644**	**1**				
SS	**.265**	**.392**	**.326**	**1**			
IC	**0.088**	**0.188**	**.252**	**.633**	**1**		
RC	**0.073**	**0.188**	**.279**	**.646**	**.573**	**1**	
PC	**0.194**	**.302**	**.387**	**.314**	**0.184**	**0.107**	**1**
**** Correlation is significant at the 0.01 level (2-tailed).**							
*** Correlation is significant at the 0.05 level (2-tailed).**							

Source: Regression output SPSS 26

As shown in table 4.21 the correlation between independent variables is direct or positive each other.

SR (Supplier Relationship) and IS (Trust Issues): Correlation coefficient: 0.642 shows that there is a strong positive correlation between Supplier Relationship (SR) and Trust Issues (IS), indicating that as the quality of supplier relationship improves, trust issues also tend to increase.

SM (Strategies and Best Practices) and IS (Trust Issues): Correlation coefficient: 0.644 indicates that there is a strong positive correlation between Strategies and Best Practices (SM) and Trust Issues (IS), suggesting that as strategies and best practices improve, trust issues tend to increase as well.

SS (Supplier Relationship) and SM (Strategies and Best Practices): Correlation coefficient: 0.392 shows, there is a moderate positive correlation between Supplier Relationship (SR) and Strategies and Best Practices (SM), indicating that as the quality of supplier relationship improves, so do strategies and best practices.

IC (Information and Communication) and SM (Strategies and Best Practices): Correlation coefficient: 0.633 suggests that there is a strong positive correlation between Information and Communication (IC) and Strategies and Best Practices (SM), suggesting that as information and communication improve, strategies and best practices also tend to improve.

RC (Responsiveness and Communication) and IC (Information and Communication): Correlation coefficient: 0.646 indicates that there is a strong positive correlation between Responsiveness and Communication (RC) and Information and Communication (IC), indicating that as responsiveness and communication improve, so does information and communication.

PC (Performance and Communication) and SR (Supplier Relationship): Correlation coefficient: 0.194 shows there is a weak positive correlation between Performance and Communication (PC) and Supplier Relationship (SR), suggesting that as performance and communication improve, supplier relationship also tends to improve, but to a lesser extent.

Thus then, the correlation table provides insights into the relationships between different independent variables, helping to understand how changes in one variable may affect another.

4.7 Model Diagnostic Test

The aim of model diagnostic test is that to test and contain statistically significant repressor and to test the classical linear regression model assumptions violated or not, thus if the data fits the basic assumptions of classical linear regression model it is confirmation for the acceptability of the regression result since it enhance the reliability of the regression input and output at hand .Based on these aim the common diagnostic test was done ,accordingly below each of the test are presented as follows.

4.7.1 Multicollinearity Test

The basic aim of testing multicollinearity is to test the situation where there is either an exact or approximately exact linear relationship among the explanatory variables Brooks (2008). According to Kennedy (2011) the variables to be valid the correlation result between two variables shouldn't be greater than 0.7, If the multicollinearity problem occurred the estimates of the sample parameters become inefficient and entail large standard errors, which makes the coefficient values and signs unreliable. It also hides the real impact of each variable on the dependent variable Brooks (2008). High degrees of multi-collinearity can result in both regression coefficients being inaccurately estimated, and difficulties in separating the influence of the individual variables on the dependent variables. In addition, multiple independent variables with high correlation add no additional information to the model.

When we look at table 4.3 in this study no variable correlation matrix exceed 0.7 between the independent variables, the maximum correlation observed was 0.64 and low correlation among variables except between integration and communication with safety and security. Thus, there is no problem of multicollinearity in this study which confirms the reliability of the regression analysis.

4.7.2 Auto Correlation Test

The test of autocorrelation done to confirm no error terms correlated, between the error terms over time the covariance is zero. To test no autocorrelation the DW test rule of autocorrelation was applied.

It is the assumption of independent error tenable or reasonable test. Durbin-Watson used to test for serial correlation between errors. The test statistic can vary between 0 and 4, with a value of 2 meaning the residuals are uncorrelated (Field, 2006). A value greater than 2.5 indicates a negative correlation between adjacent residuals, whereas a value below 2.5 indicates a positive correlation. Similarly, Ott and Longnecker (2001) defines when there is no serial correlation, the expected value of the Durbin–Watson test statistic d is approximately 2.0; positive serial correlation makes d < 2.0 and negative serial correlation makes d > 2.0. Although, values of d less than approximately 1.5 (or greater than approximately 2.5) lead one to suspect positive (or negative) serial correlation. The test produces a test statics that ranges from 0-4. The value close to 2 (the middle of the range) suggests less auto correlation and values close to 0 and 4 indicate greater positive or negative auto correlation respectively.

Table 4.21: Autocorrelation test DW

Model Summary[b]	
Model	Durbin-Watson
1	2.286[a]

Source: Own computation SPSS result 26

As stated above the DW value 2.20 indicate that there was no autocorrelation issue, and the assumption of autocorrelation has been met.

4.8 Regression Analysis

So far, the descriptive statistics and model diagnostic test done in the above section of the chapter thus the final section of this chapter present the empirical econometric regression result regarding to the subject of this study i.e. the determinants of ground handling performance on EAG. Thus table 4.22 below reports regression results between the dependent variable Performance of ground handling service and independent variables supplier relationship (SR), Infrastructure and facility (IS), integration and communication (IC), Passenger, ramp and cargo service (PC), Safety and security (SS), Regulation and compliance (RC) and Skilled manpower (SM).

Table 4.22: Regression output model summary between independent and dependent variable

Model Summary b							
Model	**R Square**	**Adjusted R Square**				**Durbin-Watson**	
			F Change	**df1**	**df2**		
1	**0.878**	**0.868**	**85.431**	**7**	**83**	**1.72**	
a Predictors: (Constant), PC, RC, SR, SM, SS, IS, IC							
b Dependent Variable: OTP							

Source: Regression output SPSS 26, 2024

4.8.1 Analysis and Evaluation on the Regression Output

Based on the criteria of decision presented below a detailed analysis and discussions presented to evaluate whether the regression result in line with the standard criteria or not. Therefore R-squared result, adjusted R-squared result. T test, P value, F stat and DW statistic value of table 4.22 evaluated as follows.

***R*-Squared value:** As indicated in table 4.22 above the R-squared value was 87%, it implies that the proportion of the total sample variation in the dependent variable that is explained by the independent variable was 87% and the remaining 13% was not explained by the model. The decision rule was that the closer the R^2 is to 1 or 100% the better the goodness of fit. The R^2 lies between zero and one. A value of R^2 that is nearly equal to zero indicates a poor fit of the OLS line (Wooldridge, 2009). Thus, the conclusion is the R –squared value was close to 100% i.e. was 87% thus have better goodness of fit.

Adjusted *R*-Squared value: The adjusted R-squared value as indicated in table 4.22 was 86%. It measures the goodness of fit after penalizing additional explanatory variables by using a degree of freedom adjustment in estimating the error variance. This value indicates that collectively the change in independent variable explains 86% of the dependent variable on time performance. Hence it can be said the variables were a good explanatory variable to determine on time performance of ground handling service of EAG and the remaining 14% was determined by other factors not included in this model and still it confirms the goodness of fit.

Durbin-Watson (DW) Statistic: It assists in specifying the right combination of the explanatory variables (Gujarati, 2004) .It also test to identify serial correlation problem (Wooldridge, 2009).Based on the test in section 4.3.2 of this chapter the DW test result was 2.28 and confirm there is no auto correlation problem thus it can be concluded that the explanatory variables combination was right for this study. This suggests that there is no significant autocorrelation present in the model residuals, which is essential for the validity of the regression analysis.

4.8.2 Analysis of the Regression Output between Independent and Dependent Variables

This part focuses mainly on the results of the regression analysis for the selected input variables for this study that have an impact on Ethiopian airlines ground handling service performance based on , the research objectives and research question developed in chapter one section 1.3.2 and the theory summarized in chapter two of the literature review .The selected input factors was supplier relationship ,infrastructure and facility ,passenger, ramp and cargo service, interpenetration and communication, safety and security ,Regulation and compliance, Skilled manpower and discussed one by one as follows:

Table 4.23: Regression output result dependent variable onetime performance and seven independent variables.

	Un standardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-1.311	0.311		-4.214	0
SR	0.096	0.041	0.126	2.363	0.02
IS	0.448	0.068	0.464	6.625	0
SM	0.134	0.051	0.149	2.622	0.01
SS	0.058	0.11	0.042	0.529	0.598
IC	0.475	0.105	0.438	4.526	0
RC	0.063	0.088	0.057	0.708	0.481
PC	0.052	0.075	0.03	0.691	0.01

Source: Own statistical result output, 2024

Supplier relationship: The regression results as indicated in table 4.23 confirm there is a positive relationship between supplier relation and on time performance. It implies that when supplier relation increase by 1%, on time performance increase by 0.09 percent, other factors remain constant, in other word as the supplier relation of EAG increase, on time performance increase. The coefficient of supplier relation statistically significant at 1% statistical level.

Infrastructure and facilities: The regression result indicated in table 4.23 confirms there is a positive relationship between Infrastructure and facilities and on-time performance. It implies that when infrastructure facilities increase by 1%, on time performance increase by 0.44 percent, other factors remain constant, in other word while infrastructure facilities increase, on time performance increase and statistically significant at 1% statistical level which confirm also the airport infrastructure has high impact on time performance.

Skilled manpower: The regression result indicated in table 4.23 confirm there is a positive relationship between skilled manpower and on time performance. It implies that when skilled manpower increases by 1%, on time performance increase by 0.13 percent, other factors remain constant, in other word when skilled manpower increase, on time performance increase and statistically significant at 1% statistical level which confirm also skilled manpower has moderate impact on time performance.

Safety and security: The regression result indicated in table 4.23 confirms there is a positive relationship between safety and security and on time performance. It implies that when safety and security increase by 1%, on time performance increase by 0.06 percent, other factors remain constant, in other word when safety and security increase on time performance increase and statistically significant at 1% statistical level which confirm also skilled manpower has moderate impact on time performance.

Integration and communication; the regression result indicated in table 4.23 confirms there is a positive relationship integration and communication and on time performance. It implies that when Integration and communication increase by 1%, on time performance increase by 0.47 percent, other factors remain constant, in other word when Integration and communication increase, on time performance increase and statistically significant at 1% statistical level which confirm also Integration and communication has moderate impact on time performance.

Regulation and compliance: The regression result indicated in table 4.23 confirms there is a positive relationship regulation and compliance and on time performance. It implies that when Regulation and communication increase by 1%, on time performance increase by 0.06 percent, other factors remain constant, in other word when Regulation and communication increase, on time performance increase but statistically insignificant at 1%,5% statistical level.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSSIONS AND RECOMMENDATIONS

5.1. Summary of Major Findings

The study was conducted with the objective of identifying the determinants of Ground handling service performance of EAG. The study selected seven main variables based on theoretical and empirical literature. Consequently, seven variables namely customer relationship, infrastructure and facility, passenger, cargo and ramp handling services, skilled manpower, regulation and compliance, integration and communication and safety and security were selected to explain the deterring factor determine ground handling service performance of EAG.

Accordingly, to measure the effect of selected variables on dependent variable of on time performance multiple liner regression model was applied. In the other part of the study, research methodology and design selected, and data collected from the EAG workers directly involved in ground handling operation collected in addition to premium passengers mainly Primary data through questions. Finally, the collected data was analyzed and tested based on linear regression model assumptions to analyze and describe the data descriptive statistics, tables, ratios, model tests and regression analysis done using SPSS version 26.

The regression output indicates that the variables supplier relation, infrastructure and facility, passenger, cargo and ramp service have positive and significant effect on ground handling service performance of EAG. The variable internal integration and communication, safety and security including regulation and compliance have moderate and positive effect on ground handling performance .Though the result of the variables shows the positive and significant effect, the data obtained from interviews indicate that the infrastructure, facilities issues has brought delay to meet on time performance and poor customer handling which needs improvement ,in addition, the regulator compliance ,lack of communication and integration affect the daily tasks and overall EAG ground handling performance .

Based on the regression analysis the finding of the study the on-time performance of ground handling service over all have positive and good.The variable supplier relation coefficient value.0.22 And its P value 0.00, and r=0.51 indicate a high impact on the time performance of the company.

The variable passenger, cargo and ramp service also have positive relation with ground handling performance a correlation coefficient; passenger, cargo and ramp handling service (r=0.35), infrastructure and facility (r=0.76), integration and communication (0.66), skilled manpower (r=0.62) and the correlation between regulation and compliance were high and strong.

5.2 Conclusion

Airline industries is very dynamic industry working in a very competitive environment where the maximum efficiency and effectiveness depends on the ground handling services factors, among the factors the passenger, cargo and ramp service, supplier relation, infrastructure and facility, skilled manpower and communication is high due to the fact that a basic factors determine the ground handling operation and performance of EAG.

EAG has been working on all dimension to improve the factors affecting the ground handling performance for instance expanding airport infrastructure including aviation training facility, train and supply skilled manpower, adapting technology and so on to improve the ground handling service and meet the customer demand that enabled it to earn a remarkable achievement on punctuality and customer service, nevertheless it is not adequate and swift and not fulfilled the demand on the ground.

Based on the regression analysis all factors applied in determining on time performance, specifically the supplier relation, infrastructure and facility, integration and communication, safety and security, skilled manpower, passenger, cargo and ramp handling showed positive and statistically significant effects on time performance and customer satisfaction.

The infrastructure and facility and skilled manpower are found to be very important variable for the ground handling service of EAG, moreover the passenger service, cargo and ramp service also very important where each interaction with the customers need to be in the way that creates good customer experience and punctuality of service.

In addition, supplier relations could also be considered as another important variable affecting the ground handling service of EAG. This implies that supplier relations created with its suppliers should be sustainable and capable of assuring its long-term competitive advantages and on-time performance.

Integration and communication are also found to be essential tools for successful ground handling operation of EAG. This signifies the importance of integrated information flow and quality of information management.

Furthermore, the study revealed that the safety and security variable of the study is also found to be influential and determinant for the ground handling service of the group, though the air traffic controller has experienced the challenge still goes to the infrastructure issues in the air side since currently operating with very few run way and traffic jam made busy the air side and negatively affect the ram handling service performance with respect to onetime performance and accident and incidents on the aircraft .

In general, the study concluded that all the factors, supplier relation, Infrastructure and facility, integration and communication, safety and security, regulation and compliance, skilled manpower, passenger, cargo and ramp service are found to be very crucial that need special attention to improve the punctuality of the service and to provide excellent customer service that enable the ground handling and overall EAG performance competent.

5.3 Recommendations

Based on the findings and the conclusions of the study, the following recommendations have been forwarded.

1. The research suggests prioritizing investment and improvement efforts in ground handling services, encompassing skilled manpower, infrastructure, and safety measures, as they significantly influence the airline's competitiveness. Future research should delve deeper into specific strategies for enhancing these aspects to maximize their impact.
2. Recognizing the dynamic nature of the airline industry, future research should emphasize the importance of continuous improvement in ground handling services. Investigating

effective methodologies and tools for implementing continuous improvement initiatives could provide valuable insights for airline management.

3. To mitigate operational issues stemming from infrastructure deficiencies like inadequate airport capacity, future research should explore innovative solutions and strategies. Investigating the economic and operational implications of infrastructure upgrades could guide decision-making processes for airline stakeholders.

4. Engaging all stakeholders, including top management and team leaders, is crucial for understanding the pivotal role of ground handling services in the airline's success. Future research could focus on developing frameworks or models for effective stakeholder engagement in ground handling service management.

5. Strengthening relationships with customers through effective customer relationship management (CRM) practices is essential for long-term success. Future research could examine best practices in CRM within the aviation industry and explore novel approaches for measuring and improving customer satisfaction levels.

6. Research should explore the implementation of value stream improvement projects to optimize ground handling services. Investigating the integration of ground handling services with other critical functions like Maintenance, Repair, and Overhaul (MRO), cargo, and logistics could uncover synergies and efficiency gains.

7. Taking a proactive approach to adapt to the evolving business environment is imperative. Future research should focus on identifying proactive strategies and mechanisms for maximizing the efficiency of ground handling services. This could involve predictive analytics, scenario planning, and risk management techniques tailored to the aviation sector.

5.4. Suggestions for Further Studies

The research only focused on Addis Ababa Bole international Airport, it did not incorporate other affiliated Hub airlines in Africa with EAG and other researchers can conduct their study by including another Hub affiliated share company working with EAG.

This study was conducted based on seven determinant factors, but research can be done by considering more independent variables that can affect the ground handling operation of EAG performance.

Furthermore, the future studies can examine the proposed relationships by bringing some contextual variables and additional dimensions into the model in order to fill the observed limitation of this study

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APPENDICES

ADDIS ABABA UNIVERSITY

MA PROGRAM IN INTERNATIONAL BUSINESS LEADERSHIP

QUESTIONNAIRES TO BE FILLED BY PASSENGERS, OAL GROUND CREW AND EMPLOYEE OF ET GROUND SERVICES DEPARTMENT

PART ONE: QUESTIONNAIRES FOR PASSENGER

Dear passengers,

This questionnaire is designed to collect primary data about the service quality and customer Satisfaction towards the services provided by Ethiopian airlines on the ground. The research is undertaken as an academic requirement of master's degree in international leadership management. I want to assure you that this research is only for academic purposes which is authorized by Addis Ababa University. Your input is important for the study and will be treated with anonymity and confidentiality.

Thank you very much for your cooperation.

I. Profile of respondents: Please circle your answer

1**.** Gender A. Male B. Female

2**.** Age A. 18-35 B .36-50 C. 50-65 D. 65 -90

3**.** Educational A. Certificate (other) B. Diploma C. First degree D. Second degree E. Master's degree F. Doctorate degree

4**.** Your Nationality belong to A. Africa B. Asia C. Europe D. North America E. South America F. Australia G. Antarctica

5**.** Occupation A. Government official B. Corporate employee C. Business entrepreneur

D. Retiree E. Student F Others (specify) ----------

6**.** How many times you fly using Ethiopian airlines in the last one year?

A. 1-3 B. 4- 6 C. 7-9 D. More than 9 times

7. Purpose of travel

A. Business B. Leisure C. Visiting friends /relatives D. Others (specify) ------

8. Travel class A. Economic class B. Business class3

II: Please indicate on a five-point scale the extent to which you find the following statements important by ticking on the box in the first column and also indicate on a five point scale the extent to which you are satisfied or dissatisfied in the second column with the following statements.

Expectations: 1= Not Important 2= Less Important 3= Neutral 4=Important 5= Very important

Perceptions: 1= very dissatisfied 2= dissatisfied 3= Neutral 4= Satisfied 5= Very satisfied

	EXPECTATION (How important is this item to you					**PERCEPTION (Level of satisfaction with this item**				
	5	**4**	**3**	**2**	**1**	**5**	**4**	**3**	**2**	**1**
Dimensions										
Tangibility										
Appearance, gesture and uniforms of Ground service Agents.										
Modern and clean check-in and boarding area, facilities and equipment’s										
Providing visually appealing equipment, like , seats, toilet etc										
Reliability										
On time performance of schedule flights.										
Remedial procedures for deployed or missing baggage.										

Efficiency of the check in process and transfer at departure.										
Responsiveness										
Capable to response to emergency situations.										
Understanding the specific needs of individual.										
Prompt respond of employees of the airline to your request or of the airline to your request or complaint										
Keeping customers informed about when services will be performed										
Capacity to respond to canceled or delayed flights.										
Assurance										
Knowledgeable employees to answer customers Question										
Sincerity and patience in resolving passengers Problems										
Probability of flight breakdowns.										
Employees are consistently courteous										
Empathy										
Numerous, easy to use ticketing channels.										
Spontaneous care and concern for passenger's needs.										
Having other travel related partner e.g. car rental, hotels, travel insurance.										
Having a sound loyalty program to recognize you as a Frequent customer.										

Customer overall satisfaction

Please make a circle on your overall satisfaction with EAL	
Very satisfied	
Satisfied	
Neutral	
Dissatisfied	
Very dissatisfied	

III. Please write your comment and impression about the ground service provided by Ethiopian

1. Have you ever faced any other problems while using the services of Ethiopian airlines?

A. Yes B. No, if your answer is yes, please specifying the problem _____

_____

_____

2. If you have any other comment to improve the service quality of Ethiopian airlines, please specify?_____

_____

PART II: EMPLOYEE SURVEY

Dear Ground service management Employees,

This questionnaire is designed to collect primary data from Ethiopian ground service department employees related to the day-to-day ground activities. The research is undertaken as an academic requirement of master's degree in international leadership management. I want to assure you that this research is only for academic purposes and your inputs are important for the study and will be treated with anonymity and confidentially.

General Instruction

➢ Please do not write your name or address on the questionnaire.

➢Please put a tick (√) mark in the appropriate box of your answer

➢ Contact address: if you have any question, please contact me through the following addresses

Telephone: 09 09 78 91 34

Email : derejeku@yahoo.com

Section A: General information

1. Gender: Male ☐ Female ☐

2.Education level:

Certificate ☐ Diploma ☐ Second Degree and Above ☐ First Degree ☐

3.Your work unit:

Passenger service ☐ Ramp service ☐ Support services ☐ Cargo services ☐

4.Work experience in your work unit:

1-3 years ☐ 4-6 years ☐ Above 6 years ☐

Section B: Below tables help to assess the determinant factors affecting ground handling performance hence please read carefully and evaluate by ticking on the box provided.

5= Strongly agreed 4= Agreed 3=Disagreed 2=Strongly disagreed 1= N/A

No.	Description	5	4	3	2	1
1	**Supplier relationship:**					
	EAG has a strong and collaborative supplier relationship in the ground handling services.					
	There is trust between organizations and suppliers					
	EAG have strategies and best practices for managing supplier relationships to achieve cost reduction and service quality improvement in ground handling					
	EAG has effective communication and information sharing between organizations and suppliers.					
2	**Air Traffic control**					
	EAG has different primary factors that influence air traffic control efficiency and safety in the ground handling context.					
	EAG faces challenges and barriers faced by air traffic control authorities in managing and coordinating the flow of air traffic in busy airport					
	EAG affected by human factors, such as decision-making and workload management, and impact the performance of air traffic control personnel in ground handling operations					
	EAG has potential strategies and approaches for improving communication and collaboration between air traffic control authorities and ground handlers to enhance overall operational efficiency					
3	**Customer Services:**					
	EAG have a mechanism while identifying expectations and preferences across different customer segments in terms of ground handling services.					
	EAG have effective strategies and practices for delivering personalized and exceptional customer service in ground handling operations.					
	EAG is affected by service quality in ground handling operations that impact customer perceptions and overall airport experience.					
	EAG has potential opportunities and challenges in leveraging digital technologies and self-service solutions to enhance customer services in the ground handling industry.					
4	**Infrastructure and Facilities**					
	EAG affected by critical infrastructure and facility requirements for efficient ground handling operations at airports.					
	EAG have capacity planning and facility design to optimize resource allocation and utilization in ground handling processes					

	EAG have mechanisms and considerations for creating a customer-centric service environment in ground handling facilities.					
	EAG is affected by the physical evidence, including facilities aesthetics and layout which also impact customer perceptions and experiences in the ground handling context.					
5	**Skilled Manpower:**					
	EAG have skilled manpower with key competencies and skills that required for ground handling personnel to perform their tasks effectively					
	EAG recruitment and selection processes attract and retain skilled manpower in the ground handling operation.					
	EAG fulfills the training and development needs of ground handling employees to enhance their performance and job satisfaction.					
	EAG organizational culture and leadership impact employee engagement and productivity in ground handling operations.					
6	**Technology and Innovation:**					
	EAG acquired emerging technologies and innovations that can transform ground handling operations and improve overall efficiency.					
	The digital transformation initiatives enhance the integration and automation of ground handling processes.					
	EAG has potential benefits and challenges associated with the adoption and implementation of new technologies in the ground handling service.					
	Technology-driven innovation impacts the customer experience and service quality in ground handling operations.					
	EAG acquired strategies and approaches for fostering a culture of innovation and continuous improvement in the ground handling context.					
7	**Safety and Security:**					
	Safety and security risks and challenges faced in ground handling operations at airports					
	EAG safety management systems and risk assessment processes effectively implemented to mitigate safety hazards in the ground handling operation.					
	EAG identified the critical factors and measures that contribute to a strong safety culture and proactive safety behaviors in ground handling organizations					
	EAG have adopted organizational leadership and safety-related training for employee commitment to safety protocols in ground handling operations					
	EAG acquired emerging trends and technologies for enhancing safety and security in ground handling, such as biometrics and advanced surveillance systems?					
8	**Integration/Communication & Collaboration:**					
	EAG has barriers and enablers for effective integration and collaboration among different stakeholders in the ground handling ecosystem.					
	EAG communication channels and information sharing platforms need to be improved to enhance coordination and decision-making in ground handling operations.					
	EAG has issues on effective strategies and practices for fostering collaboration and					

	trust among organizations, suppliers, and regulatory authorities in the ground handling operation.					
	Inter-organizational collaboration and coordination impact the overall efficiency and effectiveness of ground handling operations.					
	EAG have issues of potential approaches and frameworks for enhancing integration and communication across different stakeholders in the ground handling context.					
10	**Weather Climate:**					
	Weather-related risks and challenges affected EAG ground handling operations at airports.					
	Weather forecasting and monitoring systems are effectively utilized to minimize the impact of adverse weather conditions on ground handling processes.					
	EAG has strategies and practices for contingency planning and resource allocation in response to unpredictable weather events in the ground handling process.					
	Adverse weather affects the operational performance and customer experience in ground handling operations.					

11	**Passenger, Ramp, special and cargo service**					
I	**Passenger service,**					
	The setup, procedure and working environments are smooth and assist to increase my Check- in efficiency					
	My boarding efficiency affected by infrastructure, procedure and working environments					
	There is enough trained WCHR and disabled passenger Handling agents at airport					
	The overall procedure and working system are organized, smooth and assist to keep Onetime Performance - OTP of passenger service					
II	**Ramp Services**					
	The Loading /Unloading activity is smooth and well supported by required resources					
	Smart coordination and setup while connecting baggage					
	There is smooth system to handle BRS Report for Outgoing and incoming flight					
	Safety Regulation Compliance is meet and don't affect day to day performance					
	Very easy setup for handling of baggage delivery including priority baggage to arrival hall					
	There is adequate resource and infrastructure including Ramp Bus/Push back /Tug car/PASSENGER STEP to facilitate ramp handling					
	Procedure and working environments are smart while Claim File Creation					

	& Irregularity Handling					
	The overall infrastructure, procedure and working environments are organized, smooth and assist to keep Onetime Performance - OTP of ramp and baggage services					
III	**Support Services**					
	The infrastructure, procedure and working environments are organized, smooth and assist to increase Aircraft Cleaning, cabin dressing services					
	There is smooth set up for Water and toilet Servicing					
	There is organized environment and food for Lounge Services					
	Load Control service supported by good system and procedure have latest technology and IT infrastructure/system					
	The overall setup, procedure and working environments are organized, smooth to meet Onetime Performance - OTP of support services					
IV	**Cargo Service**					
	There is good set up and system of Documentation					
	There is well infrastructure for Towing/Delivery services					
	Requested ULD's resource provide timely for Cargo Loading					
	Good system for advising inventories of ULD's at ADD Upon Request.					
	The overall infrastructure, procedure and working environments are organized, smooth and assist to increase Onetime Performance - OTP of ULD & GSE					

Source: Different literatures on Airline ground handling service topic

Additional Comment free text

Interviews related with ground handling service performance

1. What is the major challenge while handling passenger, cargo and ramp service in EAG?
2. What are the effects of Infrastructure and facility on ground handling service performance of EAG?
3. What are the practices of supplier relationship management at EAG?
4. What are the effects and importance of integration and communication in EAG?
5. What are the challenges and importance of regulation, compliance with EAG?
6. What are the roles of the information sharing, safty and security for EAGy?

Thank you!